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Message from the Department Chair

Aloha alumni and the entire Earth Sciences 'ohana. Normally, my Chair's message would state that another academic year is safely behind us and we welcome summer's respite before a busy fall, but that would not be in any way accurate. Given the COVID-19 crises that we all are dealing with, it has not been a normal semester by any stretch of the imagination: our day-to-day operations continue to be severely impacted and the immediate future looks bleak. Thus, how we are coping and adapting will dominate this message.



The Fall of 2019 started off great: We welcomed a new group of undergraduate and graduate students in August, as well as new faculty member and Isotope Lab Specialist **Aaron Pietruszka**. A few months later, we greeted two additional faculty members (**Helen Janiszewski** and **Sloan Coats**) to our shores. Before then, over the summer, we had continued to improve our physical spaces. The undergraduate lounge was cleaned up, with new furniture and equipment purchased, resulting in a much more open and functional space. Our general-purpose lecture classroom (708) now offers new chairs, the seminar room (723) presents a fresh coat of paint (based on the tried and true formula of Joseph's coat), new wall-mounted maps and overhead projector, and a major redesign is taking place in our former computer room (733) which will be renamed the "Interactive Learning Center". We have mounted seven large-format UHD TVs on the walls and two matching large black glass writing boards. Once completed, instructors will be able to wirelessly cast presentations from a laptop, tablet or phone to all TVs and students can cast to the nearest TV.

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Chair: Paul Wessel
Editors: Scott Rowland, Bruce Houghton, Lily Shao, and the Relations & Honors Committee

Modern adjustable-height tables and stools complement the upgrade. We expect this room to be fully operational for Fall 2020. I had plans for many additional upgrades throughout the department, but alas the crisis has sadly derailed most of them.

The end of the fall semester brought us several bitter-sweet moments. Long-time faculty members **Michael Garcia** (43+ years of service), **Steve Martel** (27+ years) and **Kevin Johnson** (17+ years) retired at the end of the year (see [Retirements section](#) on page 12). None of these retirements came as a surprise since we knew of them from our ongoing position planning. In fact, we already had three faculty searches well underway by early fall for filling the tenured positions vacated by Mike, Steve, and **Steve Stanley** (who retired last summer). The SOEST director of Student Services, **Leona Anthony**, another long-time “GG” colleague, also retired at the end of last fall. Unlike these four, **Susan van Gorder’s** announcement of her retirement did come as a big surprise and resulted in a rushed farewell-party at the end of the academic semester and a frantic push to secure a replacement office manager. The winter break slowed us down and the search only got started in earnest in early spring.

The spring 2020 semester was at the half-way point when it became clear that something extraordinary was happening across the whole world. Since Governor Ige issued the stay-at-home order and UH employees were authorized to work from home by President Lassner, most of us have only infrequently seen the inside of the POST building. Over a short period of time we had to ensure all our operations could continue unabated given the new conditions. Fairly quickly, online solutions to our endless paper-trails were found. I must say this step has been a huge silver-lining given the ease with which we now can sign and submit documents electronically. I certainly hope we never go back to the days of “wet signatures”, with their delays as paper is shuffled between floors, buildings, and even off-campus locations. In that regard, the office staff, our fabulous Division Administrators **Arlene Sullivan**, **Connie Tsui**, and **Lily Shao** have collectively made the department tick like never before. Not only did they have to find ways to relocate their own digital offices to their homes; but they also had to deal with access to physical records in the division offices (all three still spend a few hours each week on campus), and not the least, pick up the slack from Susan’s departure. In these unusual times, having such dedicated and hard-working staff has been truly uplifting.

While faculty and staff scrambled to set up functional offices at home, students were hit the hardest. Suddenly, all classes had to go online, whether it made pedagogical sense or not. Fortunately, many of our largest introductory classes were already online which otherwise would have been the biggest transition. Nevertheless, faculty teaching core upper division courses with physical labs had their work cut out for them as we rushed to get online. I am proud to say the faculty did exceptionally well given the rapidly changing circumstances. It is true that online classes via zoom are not (at least yet) as engaging as face-to-face meetings, but both faculty, TAs and students made them work. And through it all, graduate students defended their theses and dissertations online, navigating the new presentation mode, and awards were handed out (see [page 24](#)). The academic semester ended with a well-received (and first!) SOEST **e-graduation ceremony** with world-famous physical chemist Sir David King giving an inspiring commencement address live from Cambridge, UK.

The spring semester was barely over when the Provost announced that planning for Fall had to commence. The question that everybody would like to know the answer to is this: What will the fall semester be like? Nobody knows, but a massive campus-wide planning operation is currently underway. Six-foot social distancing means all large (50+ students) classes must go online, and there is now a space crisis for accommodating smaller groups in spaced-out big classrooms. How do we deliver our numerous lab sections? Do we move them outside, under tents? Do we prepare for hybrid delivery using a mix of face-to-face sessions and online synchronous or asynchronous lectures? What happens if there is a second wave of infections and no face-to-face classes will be allowed? How will our many field trips be handled? Still nobody knows the answers, yet we must plan for all eventualities. How COVID-19 will affect Fall enrollment (and its budgetary implications for the campus) remains

unclear. We were perhaps prematurely celebrating an enormous increase in admissions to our Environmental Earth Science BA degree (over 150 admitted compared to 20 at this time one year ago), but it is anyone's guess as to how many will actually pay tuition and show up in August (online or otherwise). All I can say with certainty is that it will be an unusual summer. Other casualties of our circumstances are the sad postponements of both our REU Site program lead by **Bridget Smith-Konter** (but there is a shortened, online REU-lite program focusing on professional development) and the anticipated follow-up to our inaugural Alumni Days celebration last spring.

Eventually, economic realities will descend upon us. Some of them have already arrived in the form of hiring freezes announced back in April. That meant our five active searches immediately came to a grinding halt: Three tenure-track positions, one microprobe specialist faculty position, and the aforementioned office manager. Recently, the legislature passed bills to eliminate all vacant UH positions (but not yet the funds), and we are worried the other shoe might drop soon. As with so many other aspects of this crisis, it is unclear how the State will handle the economic downturn currently unfolding, what restrictions the UH system must grapple with, and ultimately how the campus leadership will choose to apportion the cuts to individual units. UH Mānoa's status as an R1 research university is at stake if massive, across-the-board cuts take place. I believe faculty are ready to bear their brunt of any collective sacrifice needed to offset the revenue shortfalls; we have individually been spared so far, yet the University, SOEST, and our department must play important roles in the recovery.

I do not yet despair, despite massively overdosing on a near-continuous stream of zoom conferences (with EXCOM, Provost, faculty, committees, students, collaborators throughout the world, etc.), watching dark budget clouds gathering on the horizon, coming to grips with frozen and possibly lost positions, and contemplating the havoc that this disruption brings to the teaching, research and service activities of all faculty and students. We focus on the positives: Our faculty members are resourceful and their grant writing has greatly increased. The transition to online delivery was overdue for many courses anyway but now it is happening. Mundane office tasks have sped up thanks to digital workflows. We have found time to renew efforts to improve curricula and courses. I am sure there is more.

Usually, I end my message by listing all our normal challenges related to funding. These are obviously not going away, but with many of you in worse situations than we are, it feels inappropriate to give my usual pitch for tax deductible donations. Yet, if your situation allows, you can visit our [donations page](#); it is always greatly appreciated.

On a personal note, I was getting excited about my upcoming 12-month sabbatical to Oxford University this summer, working with the legendary (and my former PhD advisor) Tony Watts, but those plans have been derailed by quarantines and travel obstacles as well. So, I shall remain your Chair on campus for at least the next 6 months, possibly longer if there are additional delays. No doubt these months will be hectic and somber as the fiscal crisis unfolds. Please stay safe, look out for your families, focus on what you can control, and trust that we will all emerge stronger and more dedicated to tackling life's challenges at the other end of this extraordinary period.

Mahalo for your support.

Paul Wessel, Chair

* * *

Structural Geology Field trip to Kīlauea

By Steve Martel

The effects of COVID-19 in 2020 have profoundly affected many people in Hawai‘i, the U.S. mainland, and the world as a whole. Times like these make us appreciate how important our relationships with each other are, and how important routine matters can be that we commonly take for granted. Everyone in the department hopes you are safe and healthy, and we extend our best wishes to you and your families.

A two-day Structural Geology field trip to Kīlauea in November has been a mainstay of the department’s undergraduate structural geology class for the past 25 years. For several reasons, Kīlauea is an excellent place to introduce students to structural geology. First, the structural geology around the Kīlauea caldera, the East Rift Zone, and the Koa‘e fault system (Figure 1) is spectacular, and it is active. Second, a broad variety of inter-related geologic structures occur within a small area, so time can be spent learning from the geology rather than driving to get to the geology. Third, the structures clearly are tied to volcanic and hydrothermal processes, increasing the relevance of the trip to the students. Fourth, the field trip is a wonderful venue for personal interactions. The students and I have gotten to know each other much better by being out in the field together, eating breakfast at Kīlauea Military Camp (KMC), and having scrumptious dinners at the Thai Thai restaurant in Volcano. These interactions have helped me write much more effective letters of recommendation about students for jobs and graduate school applications. Fifth, the field trips are great fun. Hopefully, this article will stir fond memories from alumni, and the department will continue to support the field trip in the future, resources permitting.

The field trip incorporates many contributions from many students. The graduate research of **Jason Langley** and **Ole Kaven** opened my eyes to the educational opportunities within the Koa‘e fault system. **Chris Okubo’s** undergraduate research introduced me to the structural processes that produce pit craters. Many teaching assistants have helped the structure class and field trip run smoothly. Thanks to **Alyssa Anderson, James Bishop, Dana Brodie, Liliane Burkhard, Marissa Cameron, Maria Janebo, Ole Kaven, Kelly Mitchell, Svetlana Natarov, Nicole Robinson, Jonathan Sleeper, and Melody Studer** for all their help. Students in the class of 2019 helped document the field trip, so most of the photographs here are from that year.

On Day 1 of the 2019 field trip, after a hearty breakfast at KMC, we briefly inspected damage to Crater Rim Drive in front of KMC produced by surface ruptures of faults that were reactivated in 2018. We then visited the

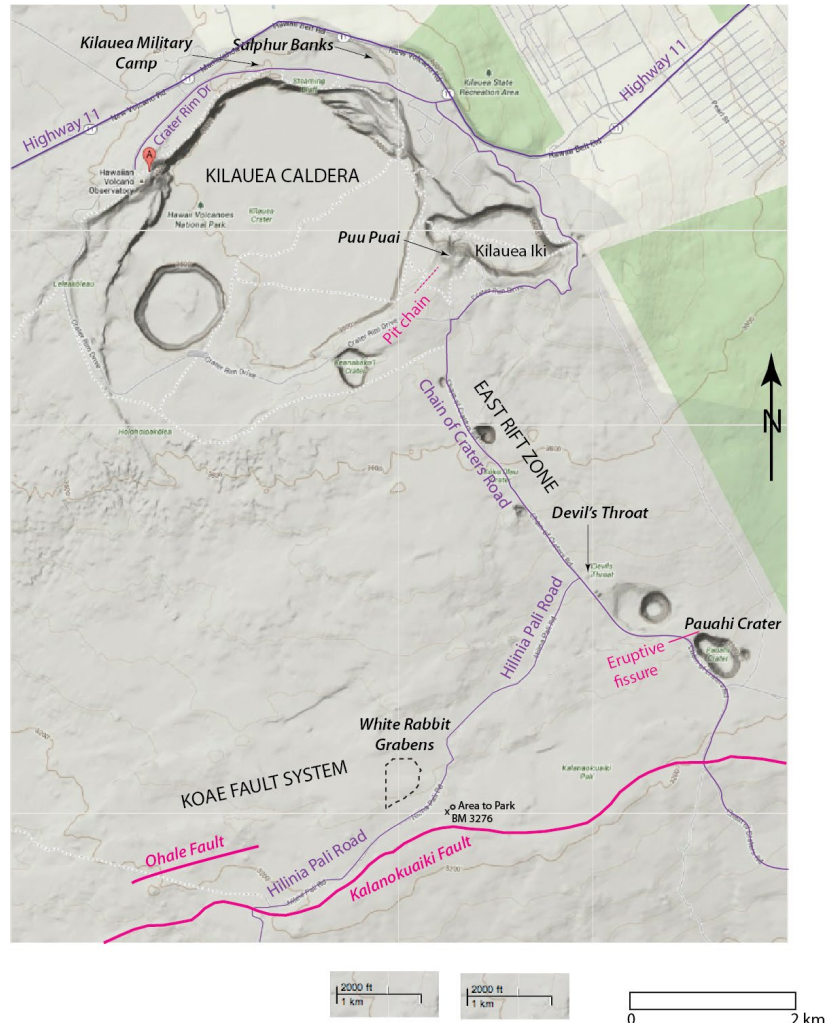


Figure 1. Map of stops for the structural geology field trip of 2019.

Sulphur Banks, near the visitor center. A series of fumaroles aligned along a rubbly normal fault scarp there (Figure 2) illustrate the control of faults and fractures on the flow of heat and fluids at Kīlauea, a recurring theme for the field trip.

Pauahi Crater, located near a sharp bend in the East Rift zone, was the next stop. The lack of a rim of ejecta around the crater establishes it as a collapse feature (i.e., a pit crater). A fissure eruption in 1973, a few meters from the northwest edge of the pit crater, generated spatter ramparts along the fissure (Figure 3), and lava cascaded over the crater edge onto the floor, about 100 m below. Here we can discuss how the vertical



Figure 2. View to the north of the normal fault scarp at the Sulphur Banks. Three fumaroles are circled.



Figure 3. Spatter ramparts along a dike that erupted in 1973 at the northwest edge of Pauahi Crater.

dike that fed the eruption could have propagated so close to the wall of a pre-existing pit crater without propagating into the crater at a lower elevation.

Next, we examined a long fissure a couple of hundred meters south of Pauahi Crater (Figure 4) to establish its aspect ratio, the ratio of its maximum width to its length. Using tapes to measure the fissure width and GPS apps on cell phones to locate positions along the fissure, we found the aspect ratio to be roughly 1:300, about the same as the aspect ratio of a standard playing card. This slender geometry helps explain why long fractures can cut through rock, as well as why paper cuts are so easy to get from playing cards: fissures and playing cards have sharp edges. We also found that “the fissure” actually consists of discontinuous segments, showing that even simple structures are more complicated than they initially appear.

We then motored west along the Hilina Pali Road to visit the largest fault in the Koa’e fault system: the Kulanaokuaiki fault (Figure 1). This normal fault is about 12 kilometers long and has a scarp as tall as about 30 meters (Figure 5). The ratio of maximum scarp height to fault length is about 1:300, similar to the aspect ratio of the fissure south of Pauahi Crater. This similarity implies that the stresses driving slip along the Kalanaokuaiki

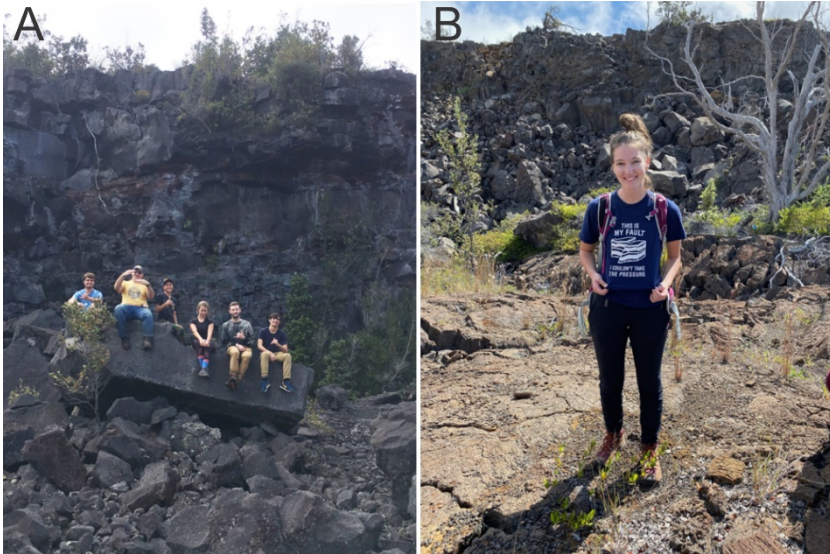


Figure 5. The rubble scarp of the Kulanao'kuaiki fault scarp in 2016 (A) and 2019 (B).



Figure 4. Students collecting data from fissures south of Pauahi Crater. The view is downrift, with Pu'u Huluhulu (left) and Mauna Ulu (right) on the skyline.



Figure 6. Road damage from surface rupture of the Kulanao'kuaiki fault in 2018.

fault nearly match the stresses driving the opening of the fissure near Pauahi Crater. Because the fault offsets lavas ~800 years old, the average slip rate on this fault reaches ~ 4 cm/year, somewhat greater than the slip rate on the San Andreas fault. Some gaping fissures near the top of this scarp are well exposed near the Mauna Iki trailhead. Where the road crosses the fault, a series of fresh fractures in the

asphalt shows that this fault was reactivated in the 2018 eruptive episode (Figure 6).

About one kilometer north of the Mauna Iki trailhead is the Ohale normal fault, our next stop (Figure 1). We considered two hypotheses for the growth of the fault: (1) down from the surface; or (2) up towards the surface. At one spectacular spot along this fault, a monoclinaly folded rock bridge extends over large cavity in the fault scarp (Figure 7). I

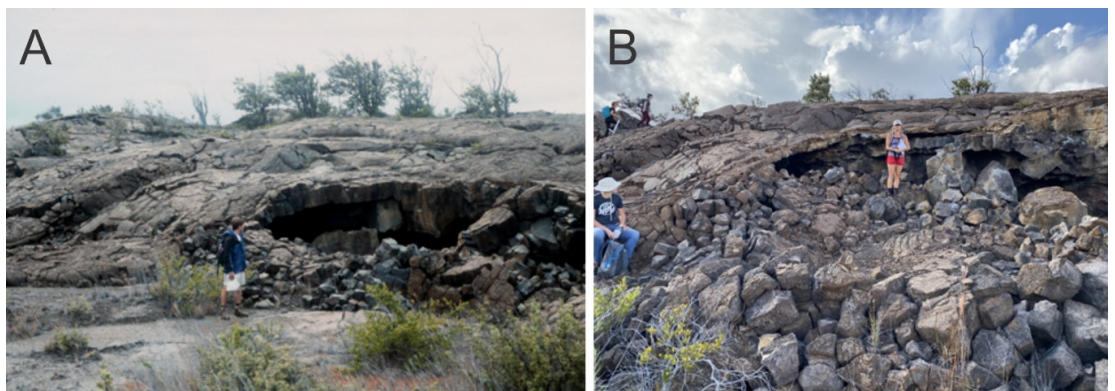


Figure 7. Cavity and monoclinaly folded rock bridge across the Ohale fault in 1999 (left) and 2019 right). The trees along the skyline are growing within vertical fissures.

had always wondered how long this delicate rock bridge would last, and indeed a large portion of it collapsed in 2018 (Figure 7). A series of discontinuous vertical fissures 2 meters wide split the uplifted side of the fault (Figure 8). The monocline shows that the fault grew up toward the surface from depth, bending the bedrock above the fault before the fault propagated all the way to the surface (Figure 9). Extensive fracturing on the uplifted side of the fault accompanied the bending (Figure 10).

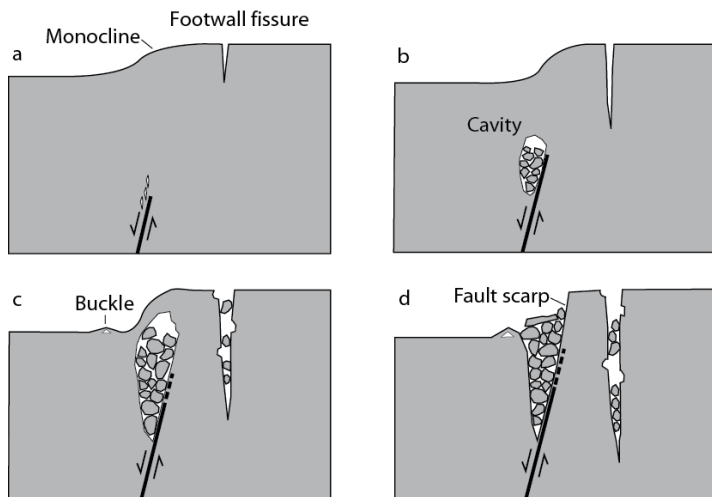


Figure 9. Sequence of cross sections showing the up-dip growth of the Ohale fault and formation of its scarp. Modified from Martel and Langley (2006, *J Structural Geology* **28**:2123-2143).



Figure 8. Students peer into a giant fissure on the uplifted footwall of the Ohale fault.



Figure 10. View to east of fissures on the uplifted north side of the Ohale fault. Note the deep cavity along the fault scarp, near the center of the photo, and a 2m-wide fissure at the left edge of the photo.

After a long day in the field, we scampered back to the vans in a *light* rain (a sharp contrast to the downpour of 2011). Two highlights awaited us back in Volcano village: hot showers at Holoholo Inn, and dinner at Thai Thai restaurant with its great curry dishes (Figure 11). The dinner always makes for a nice ending to a busy first day of the field trip.



Figure 11. Dinner at Thai Thai restaurant.

Day 2 involved three stops. The first was at the “White Rabbit” area (named by Don Swanson and Dick Fiske after a popular song from 1967), the second at Devil’s Throat pit crater, and the last at a pit chain along the Devastation Trail near Pu’u Pua’i spatter cone (Figure 1). These stops provide an interesting contrast with the stops of Day 1.

The White Rabbit area contains a series of grabens. Prodigious ground fissures there split the *downthrown* sides of the faults (Figure 12), in sharp contrast to the Kulanaokuaiki fault and Ohale fault, where the main fissures split the *upthrown* sides of the faults (Figure 10). The deep fissures probably dominate the hydrology along the faults, so the hydrology within the grabens probably differs substantially from that along isolated normal faults.

At Devil’s Throat (Figure 13A), the students prepared sketch maps of the region around the 50 m-deep pit crater to help test whether various fractures preceded the pit crater, or the pit crater preceded the fractures.

A sketch map (Figure 13, right) shows two sets of vertical fractures; (1) a concentric set near the pit crater edge; and (2) a set of two long belts of fractures that strike east-northeast and form a pattern akin to a bow tie. The concentric set developed as the crater walls collapsed. To address the straight set, we simulated the



Figure 12. Fissure below a White Rabbit scarp site.

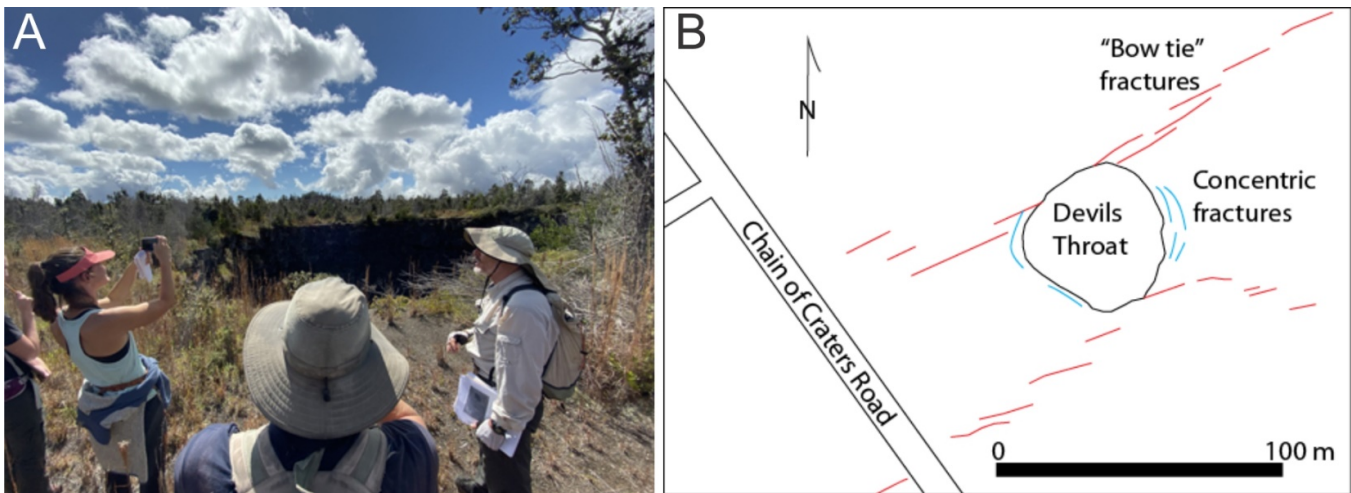


Figure 13. Devil’s Throat pit crater. Left: view to the southwest across the pit crater. Right: sketch map of some fissures near Devils Throat.

northwest- southeast stretching of Kīlauea’s south flank using some polka-dotted fabric with a hole cut in it (Figure 14). This experiment illustrated that if the fractures formed after the pit formed, they should intersect the crater at $\sim 90^\circ$. The pattern of deformation shown by the fabric is inconsistent with the actual pattern of the fractures (they are tangential to the crater), indicating that they had to have preceded the pit crater, and in fact, probably contributed to its formation (Okubo & Martel 1998, *J Volcanol Geotherm Res* **86**:1-18).

The final stop before heading home was at a chain of collapse pits near Pu’u Pua’i (Figure 1), famous for its towering fire fountains during the eruption of 1959. Tephra from that eruption mantles an old normal fault bounding Kīlauea caldera. The collapse pits (Figure 15) are aligned parallel to the top of the scarp. The tephra is draining into the underlying discontinuous fissures on the upthrown side of the normal fault, analogous to the fissures in Figures 8-10, to produce the collapse pits.

The field trip packs a lot into a day and a half. Students see world-class exposures of geologic structures as the structures are forming. Students see the importance of field measurements, maps, and cross sections in understanding how the Earth deforms in three spatial dimensions, as well as how deformation progresses through time. Students see

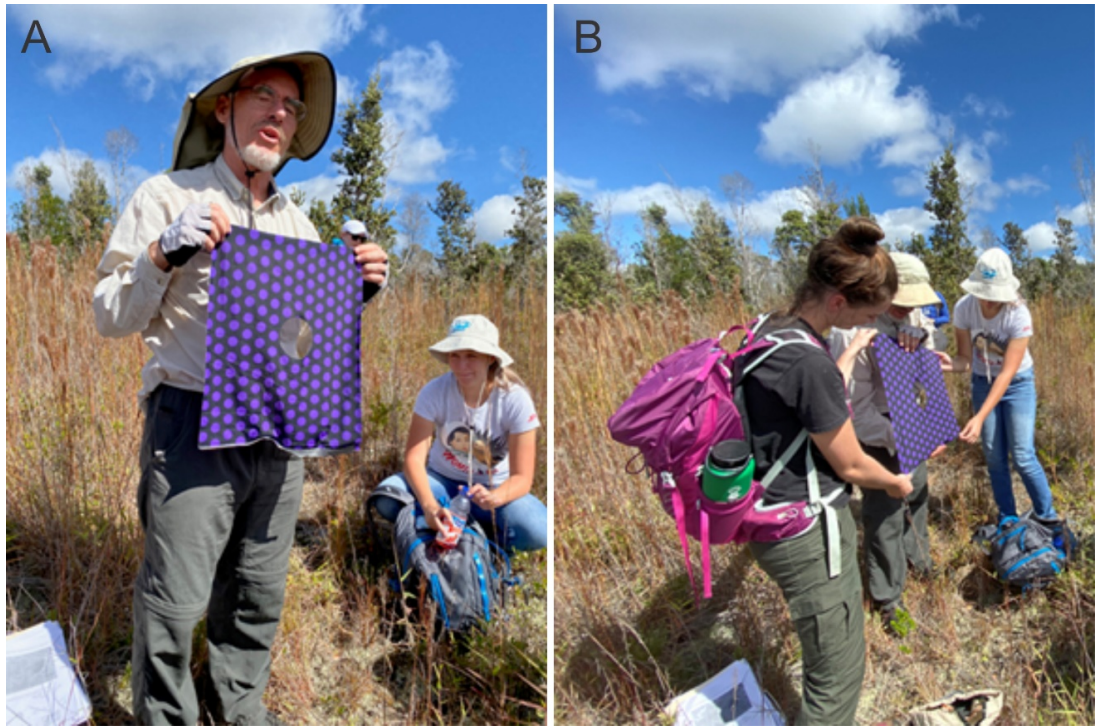


Figure 14. Field experiment with a sheet of fabric to simulate deformation around a pit crater before and after being stretched.

how the theoretical models discussed in the classroom play a central role in understanding features in the field. They also see how field observations help rule out, or improve, theoretical models. Students devise hypotheses and test them. Stimulated by what they see, students ask good questions they would not ask in a classroom, including questions the instructor cannot answer. We have fun and appreciate each other. All these activities are important in developing earth scientists.

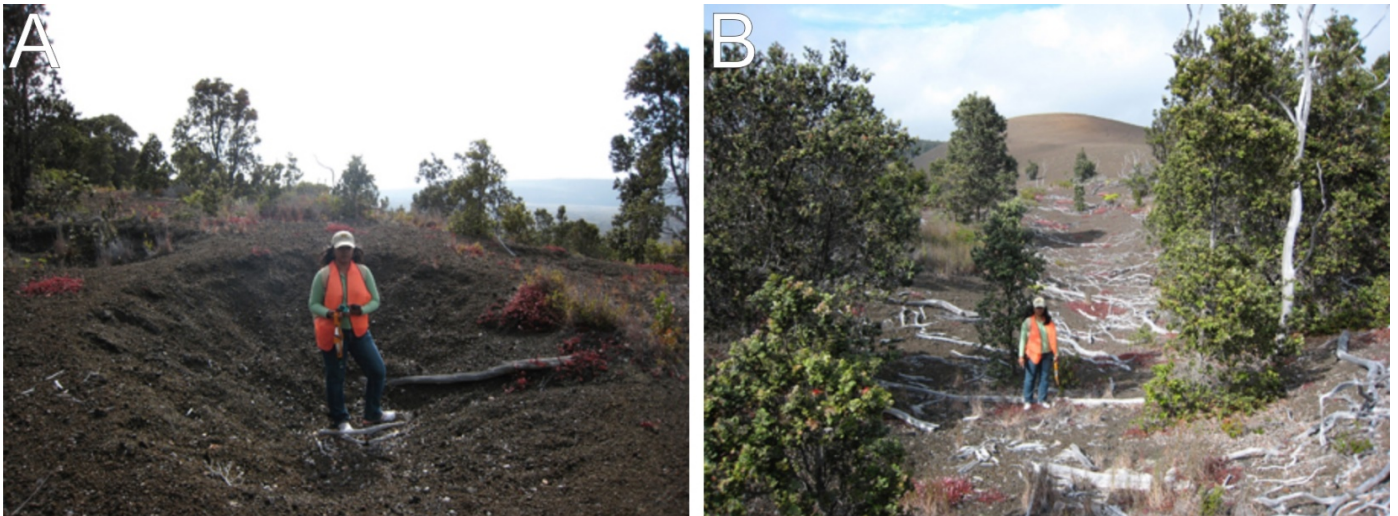


Figure 15. Photographs from 2009 of collapse pits near Pu'u Pua'i at the top of an old fault scarp of Kīlauea. The view on the left is to the west, with Kīlauea caldera, visible in the background. The view on the right is to the east along a trough formed by coalescing pits, with Pua Pua'i in the background.

* * *

Breaking News: 5 Frenetic Years – Tina Neal bids farewell to HVO

By Bruce Houghton

On 19 June, Tina Neal flew back to Anchorage after five extraordinary years as Scientist-in-Charge at HVO. In that time, Tina led the observatory through the last chapter of the 1983–2018 Pu‘u ‘Ō‘ō eruptions, the once-in-the-lifetime 2018 lower East Rift Zone eruption and Kīlauea summit collapse, the evacuation of the now abandoned, observatory buildings at the summit, and the first stage of the new Corona virus pandemic. Ironically, Tina also played a key role as a volcanologist in the very opening high-fountaining phases at Pu‘u ‘Ō‘ō in her previous period at HVO.

Tina was the heart and soul of the massive USGS response to the \$1B volcanic crisis in 2018. She coped with a 3-fold expansion of the observatory team to nearly 100 individuals drawn from the USGS observatories on the mainland and two UH campuses, and with a sustained period of 24/7 operations in the field and in the laboratories. Tina had tireless energy throughout 2018, as a public face for the response but also in endless meetings and conference calls with the key government agencies and response teams, and making difficult choices often with negligible lead time. During this crisis, she and Gail lived out of boxes, coping with numerous shifts of home, following the evacuation of their house in the Park village. She was never outwardly stressed or impatient and was a poised, perfect role model for her expanded group of workers.

After 2018, Tina has led the process of planning for a new observatory building and field stations. Preliminary plans for this state-of-the-art facility are now complete. She has also completed a major new hiring phase which leaves an expanded HVO in its best health in many decades.

I have never met a more professional research scientist. Tina will be sorely missed by everyone she worked with in Hawai‘i.



A slightly younger Tina Neal (left) and Ed Wolfe (with shield) in the early 1980s, measuring the temperature of a pāhoehoe flow. (USGS HVO photo by Jim Griggs)

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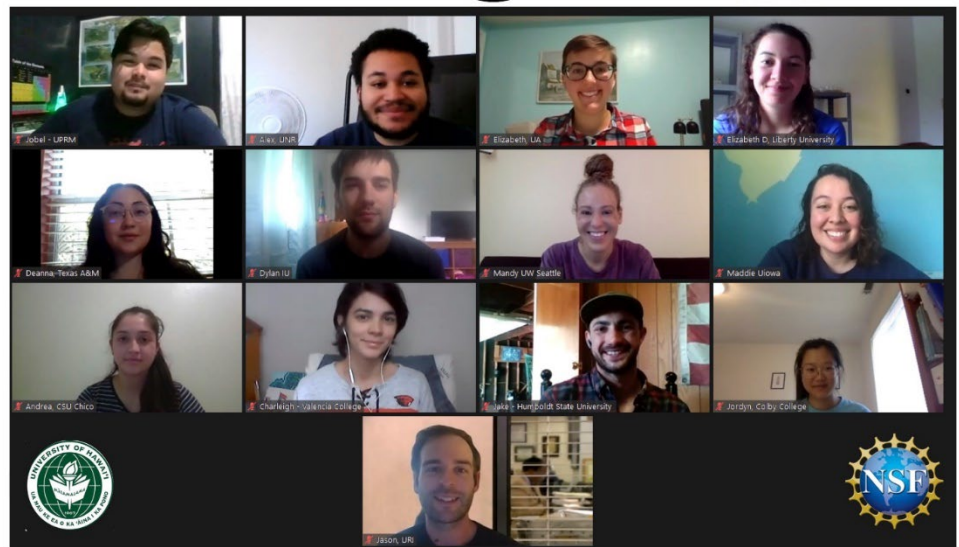
Earth Science on Volcanic Islands (ESVI) REU 2020

The **Earth Science on Volcanic Islands (ESVI) REU Program** offers undergraduate students a unique 9-week summer research experience at the University of Hawai'i at Mānoa. Over the past 3 years (2017-2019), the ESVI REU has helped shape the academic careers of a diverse cohort of 30 students from across the nation. Personally mentored by 20 UHM faculty, these students pursued scientific research on a diverse range of Earth science sub-disciplines (volcanology, environmental science, (bio)geochemistry, geophysics, etc.). **Bridget Smith-Konter** took over as PI of the REU project when **Paul Wessel** became department chair. Earlier this year, we learned that our NSF proposal to renew the ESVI REU for an additional 3 years was successful! We began recruiting applicants for the 2020 season and selected 13 students for our 2020 cohort in early March. Of course, we all know what happened next.... Due to COVID-19 restrictions, we were forced to reinvent the ESVI REU for 2020, which kicked off its first week in June. In lieu of a traditional mentored research experience, this year's REU cohort is participating remotely in an online series of professional development workshops and ESVI-themed science talks provided by our generous faculty and graduate students. And although we aren't able to fly them out to Hawai'i just yet, NSF has provided additional funds for an (eventual) cohort-gathering field trip to the Big Island. Congrats and well wishes go out to the 2020 ESVI REU cohort – welcome to the Earth 'ohana!

2020



Earth Science
on Volcanic Islands
REU



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EP'IK

This year we are very proud to announce the launch of **EP'IK (Earth-Planets-'Ike-Kuleana)**, an NSF-funded program to diversify and broaden participation in the geosciences through new partnership with local high schools, led by **Bridget Smith-Konter, Henrietta Dulai, Jenny Engels, Jasper Konter, and Scott Rowland**. EP'IK has three primary components: EP'IK Summer, EP'IK Day, and EP'IK Scholar. **EP'IK Summer** is a multi-day summer experience for both high school students and teachers (workshops and field trips), designed to promote exposure to the geosciences, careers pathways, and the importance of geoscience within our community. We are excited to offer our first EP'IK Summer camp in late July this year, albeit in an online environment due to COVID-19 restrictions. This summer's cohort will be provided several introductory Earth science curriculum presentations by several of our faculty and graduate students (**Garrett Ito, Tiffany Anderson, Brytne Okuhata, Kristian McDonald**), and will be given the opportunity to participate in online meet-n-greets with



faculty, a college prep session, and possibly a virtual field trip and/or a remote live dive on an upcoming R/V Kilo Moana cruise. We are also excited to announce the opening of **EP'IK Scholar**, a program for Hawai'i high school students to earn college course credit and tuition scholarships for introductory Earth Science courses offered through the **UHM Summer Scholar program**.

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Dept. of Earth Sciences Code of Conduct

After more than a year of hard work, mostly by **Garrett Apuzen-Ito** and **Paul Wessel**, the Department of Earth Sciences is proud to have established a code of conduct, formally called **The Department of Earth Sciences Guidelines for Ethical and Professional Conduct**. This document strives to promote work, learning, and social environments that all members enjoy being a part of, feel vested in, and are supported by, while engaged in the variety of endeavors we all pursue. This informal contract reflects our belief that excellence in research, education, service, and professional pursuits are fostered by effective relationships among, and the inclusion of, people of diverse backgrounds and perspectives regarding gender identity, sexual orientation, sex, age, ethnicity, culture, socio-economic background, and all other aspects of a person's identity. The code not only covers how we treat each other, but also how we treat and work with members of the public, landowners, and the 'āina itself. This is the first departmental code of conduct on campus, and is to be followed and affirmed by the soon-to-be-established SOEST code of conduct.

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Earth 'Ohana listserv

Are you missing those sometimes (OK, often) nerdy discussions with fellow students and/or colleagues about **the latest earthquake swarm in Iceland** or that **silly popular news article about lava**? Earlier this year, we set up the Earth 'Ohana listserv, which provides current students, faculty, staff, *and alumni* a platform to start and contribute to these kinds of discussions. If you'd like to sign up, send an e-mail message to **earth-dept@soest.hawaii.edu**. In your message, please introduce yourself ("Hello, I am Freida Yoshikawa and I received my Bachelors' degree from G&G in the Spring of 2004"), and request to be added to the Earth 'ohana e-mail list. Standard etiquette applies in the discussions – please don't talk stink about anybody; you can disagree, but don't be disagreeable. Keep in mind that current graduate and undergraduate students are on the list already.

* * *

Recent Retirements

This was the year to retire, apparently – maybe they all saw COVID-19 on the horizon? We are saying goodbye to faculty members **Mike Garcia**, **Kevin Johnson**, **Greg Moore**, **Steve Martel**, **Pete Mouginis-Mark** (HIGP) **Patty Fryer** (HIGP), Student Services Director **Leona Anthony**, and Administrative Assistant **Susan van Gorder**. Note that all the retiring faculty will be sticking around as emeriti, so they won't actually be "gone". Congratulations to all 7 of them for jobs and careers very well done!

Mike Garcia

This summary is written to give you a window into the past about academic life at UH. You will be spared the many silly things that I did in those early days as a rookie assistant professor. Times were very different back in the 1970's, especially the hiring process as well as the UHM research facilities. Here is a brief summary of how I got hired, my early years at UHM and some research highlights of major projects.

Ralph Moberly, GG Dept. Chair at the time, hired me based on a brief meeting at a national GSA meeting in 1975. I think he liked my 3-piece suit. I'm sure my grizzly beard did not endear me to him. He needed someone to teach structural geology and field methods. I was a field geologist, so he thought I could manage these courses. I had no publications and a very limited grantsmanship record; only GSA and AAPG student grants. I struggled that first semester to learn enough structure to stay a few steps ahead of the students. I never saw the campus or met any faculty. I had another job offer from an oil company but I thought I would try academia first so see if I would like it despite the \$12,000 starting salary. Little did I know there was virtually no facilities at UHM for doing my work. Only a wheel for grinding thin sections on the roof of HIG building. I had to fly to LA to use the microprobe at UCLA for 5 years until we got our own microprobe laboratory in 1982. However, I had the very good fortune to meet **Dave Muenow** who had a split appointment with HIG (before the "P" was added) and the Chemistry Department. His high temperature mass spec could analyze volatiles in glasses and minerals. Together we mentored several chemistry students and wrote many papers. This collaboration was largely responsible for me having a decent publication record that allowed me to get tenure. When I came to UH, I had NO papers. I was lucky to finish my dissertation the Friday before I packed on Saturday from my apartment in LA and flew to Honolulu on Sunday to start work at UHM on Monday. I was lucky to have a job in a recession period. I had no choice but to suck it up and jump into the fire.

When I arrived in August of 1976, **Gordon Macdonald** had just been forced to retired as he turned 65. It was mandatory back then. What a shame. He was still very active and the best-known faculty member in the Department. He stayed an extra semester to teach one last physical geology course (101) and he took me on an amazing field trip to Kaua'i. He had mapped the island in the 50s, so he knew it well. I later spent several field seasons on Kaua'i with two of my students (**Chris Gandy** and **Lisa Swinnard**) and one from Japan (**Hiroki Sano**). They all did MS theses there. Another professor, **Pow-Foong Fan**, took me along on his Geology of the Hawaiian Islands (103) trip in 1977 to see Maui. Another great trip but more tourist-like on a bus with lots of students. That introduction led to several field seasons working on the Hāna coast and papers on Haleakalā.

The USGS was cordial when I first arrived at UHM but they made it clear that I should stay away from the active volcanoes. That was their turf. So I worked on Mauna Kea for several years with a part-Hawaiian student, **Howard West**, working on the young summit volcanism, and with Fred Frey from MIT and Bill Wise from UC Santa Barbara along the Hāmākua coast. Luckily, in the early 1980s it was very dry and we could hike up the canyons to collect stratigraphic sections of lavas to evaluate the geochemical evolution of Mauna Kea. From 1976-1982, the active volcanoes were mostly quiet, with only a few eruptions. The most memorable was the



Mike Garcia reacts after locating a tiny lava flow in the jungle from the brief "uprift" Episode 56 of the Pu'u 'Ō'ō eruption (2007). Photo by Aaron Pietruszka

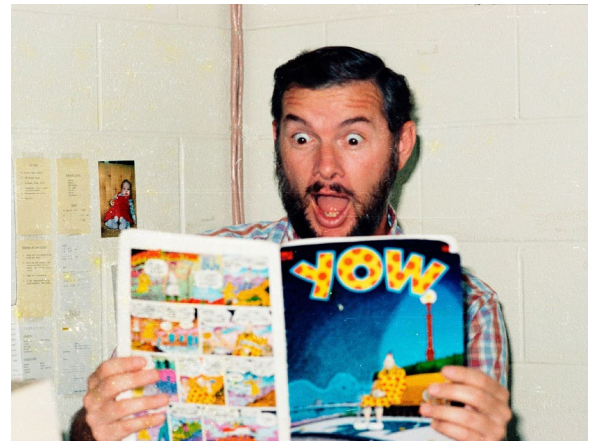
1977 middle east rift eruption of Kīlauea. A big group of students and faculty visited the eruption site. We had two days of glorious activity before it died. We then hiked out more than 25 km through the rainforest. We got caught out on the trail at night and had to hunker down in the rain and wait until morning to complete the last 6 km out to the road.

The major volcanological event in my career was the Pu‘u ‘Ō‘ō eruption. Wow, who knew it would last for 35 years? I was called by the new HVO staff geologist (Ed Wolfe) to provide rapid analyses of the lava so they could forecast whether the eruption would be long lasting or end in a few days or weeks like most rift eruptions. The key was the lava MgO content. Low values, <7, indicated that it was old stored magma. Higher values meant new magma had found its way to the vent and the eruption might continue, perhaps like the several years long Mauna Ulu eruption. The first few episodes of the Pu‘u ‘Ō‘ō eruption yielded

only lower MgO magma but starting with episode 4, the MgO started to get higher as the eruption shifted from fissures to a central vent, the so-called O vent, later renamed Pu‘u ‘Ō‘ō as a 100s of meters-high cone formed from repeated high fountains (up to 400 m). I was lucky enough to be asked to do night duty at Pu‘u ‘Ō‘ō to relieve the staff geologist for the longer than one day eruptions. These were great times to see a roaring torch 100s of meters high at night, with the smell of sulfur in the air and the ground shaking from the falling tephra.

The other major research project that I was involved with was the Hawai‘i Scientific Drilling Project, that was run by **Don Thomas** (UHM and Hilo), Don DePaolo (UC Berkeley) and Ed Stolper (Caltech). It started in the mid-1980s and continued for almost 20 years; papers are still emerging. I was asked to run the core logging operation. It started with a pilot hole near the Hilo airport to see if many 10s of scientists could work together on a major international project. It was hugely successful drilling to 1000 m with high recovery rate thanks to the careful planning of the Co-PI triad. We then moved on to phase two that went to 3.5 km. We found that petrologists with PhDs could not produce reproducible results with a paper checklist and it was a giant pain to enter it into a database afterwards. So we designed a logging scheme with the help of two of my students, **Steve Quane** and **Eric Haskins**, along with a core logging team of mostly volunteers from various universities around the world. They used pull-down menus to enter data directly as they examined the core. This was a major leap forward in the core logging enterprise. Thanks to their dedicated hard work often 10-12 hours a day, a remarkable database on the core was produced. This is documented in a 2007 paper that we wrote.

It has been an honor and a privilege to teach and do petrologic research at the University of Hawai‘i at Mānoa (UHM) for 43.5 years.



Mike always stressed keeping up with the literature, and here (ca 1986) he is seen practicing what he preaches. The photo was taken by **Julie Hood** (PhD 1990), who writes: *Congrats to Mike on a long and excellent career!*

The screenshot shows the Goldschmidt Virtual 2020 website interface. At the top, there are navigation links for 'Program', 'Registration', 'Exhibition', and 'My Goldschmidt'. Below the navigation is a 'Program by Theme' section. A session titled '05h: The Origin and Evolution of Hawaiian Volcanoes: A Celebration of the Scientific Contributions of Michael O. Garcia' is highlighted. The session is scheduled for Friday, June 26, 18:30 - 19:30 (Pacific/Honolulu) in Room 2. Below the session title, there are three speaker profiles: Penny Wieser, Dennis Geist, and Don Swanson. Each profile includes a small image and a brief description of their presentation topic.

*A special session in honor of Mike’s retirement was held at the Goldschmidt Virtual 2020 Conference in June. The session, "The Origin and Evolution of Hawaiian Volcanoes: A Celebration of the Scientific Contributions of Michael O. Garcia", attracted 20 presentations from scientists around the world and two hours of virtual discussion and debate. The session was organized by three of Mike’s former students (**Aaron Pietruszka**, **Kendra Lynn**, and **Dorsey Wanless**) and one of his long-time collaborators (**Marc Norman**).*

Steve Martel

Steve and **Linda Martel** arrived in Hawai'i with their two kids in 1992 after Steve had worked at UT Austin (1 year) and Lawrence Berkeley Laboratory (4 years) on multi-disciplinary nuclear waste disposal projects. Steve joined the GG department as an engineering geologist but volunteered to teach the undergraduate structural course starting in 1994 when **Brian Taylor** moved into the Dean's office. Linda joined HIGP in 1993 working on a NASA-funded teacher's guide for the Apollo lunar samples. She also became associated with the Hawai'i Space Grant Consortium as a public-outreach specialist and teacher-trainer, and produced **Exploring Planets in the Classroom**, the go-to site for anyone who wants planetary, geological, or volcanological teaching tools. Linda's largest NASA-funded educational project continues to be the award-winning website **Planetary Science Research Discoveries**, and she soon will be working at Oregon State University.



Steve at his retirement party.

Steve's experience and interests in applied geology are reflected in his teaching, research, and service. The structural geology class earned a reputation as a particularly challenging course, integrating multi-dimensional thinking, mechanical theory, computer programming, and field observations. The writing-intensive engineering geology class developed general approaches to problem solving in multi-disciplinary groups. Steve encouraged students to set high expectations for themselves and to help each other. He in turn helped students reach their potential via his enthusiasm and commitment to fairness; open-door policy (which students took advantage of!); in-class and in-field demonstrations; field trips to Kīlauea and around Manoa Valley; and online course notes. Except for the fall term of 2009, Steve taught the structural geology course every year from 1994 through 2019. Steve's research with his graduate students and colleagues at SOEST have addressed a broad range of topics: the growth and interaction of faults; fracturing of granites; the mechanics of landslides; the perturbation of stresses in the earth by faulting and topography; the formation of sheeting joints and their contribution to rockfall in Yosemite National Park; boundary element modeling; geothermal energy; and nuclear waste disposal. Steve also served the local and global community in many ways, such as: a conscientious reviewer of journal manuscripts; advisor to the state on the Sacred Falls rock avalanche of 1999; associate chair of the department (2002-2004); head of the Division of Geophysics and Tectonics (2005-2009); editorial board member of the *Journal of Engineering Geology* (2007-2010); co-chair of the 2017 GSA Cordilleran Section meeting in Honolulu; advisor to the Department of Transportation in the aftermath of the 2018 eruption of Kīlauea; and member of the Hawai'i Earthquake and Tsunami Advisory Committee (2015-2019). He also became a go-to person in Hawai'i for mass-wasting problems. Steve intends to keep up his research pursuits. The book [Structural Geology: A Quantitative Introduction](#), co-authored by Dave Pollard and Steve, has just been published.



*It just so happened that GG graduate **Mike Dahilig** was Acting Mayor of Kaua'i on Dec. 16, the day before Steve's retirement party. So Mike proclaimed Dec. 16 to be Steve Martel Day in the County of Kaua'i. Mike addressed the gathering via a pre-recorded video.*



People came from near and far, and from recent and not-so-recent, to wish Steve and Linda best wishes on their next steps, whatever and wherever those may happen to be.

Kevin Johnson

I retired from UH on Dec. 31, 2019 and am now a Program Director at NSF in the Marine Geology and Geophysics Program of the Division of Ocean Sciences, so I guess I am not retired from “the business”; now I provide grants for scientists rather than asking for money. I am still based in Honolulu and telework to DC for the most part. I was on the faculty of the Department of Geology and Geophysics from 2003-2019 and before that was the staff research geologist at the Bishop Museum from 1992-2003. I received my B.S. in Geology with minors in Marine Science and Philosophy from Penn State in 1977. Following Penn State, I joined the Peace Corps as a hydrologist in Western Samoa for 3 years and then worked for USGS in Alaska for a year until 1981 when I came to UH for my Master’s degree. I’ve been connected to the UH since I got my M.S. degree here in 1983 under Professor **John Sinton**. I did a “post-Master’s” studying active volcanoes in Hokkaido with Professor Yoshio Katsui at Hokkaido University from 1983-1985 and entered the M.I.T/Woods Hole Joint Program in Oceanography in 1985. After receiving my Ph.D. from M.I.T and Woods Hole Oceanographic Institution under Henry Dick, Fred Frey and Nobu Shimizu in 1990, I did a post-doc at University of Tokyo with Professor Ikuo Kushiro from 1990-1992. I’ve had a very rewarding and varied career collaborating with scientists from many different countries and being shipboard or chief scientist on 22 research cruises including 5 IODP expeditions and numerous submersible cruises. My wife, Laura Kong, is a seismologist and Director of the International Tsunami Information Center at NOAA and we have tried to get our 2 daughters, Noe, and Celia, to go into Earth Science, to no avail so far. Noe graduated with a degree in neuroscience from Princeton and Celia is a senior in high school, so there is still hope!



Left: (from top left) Noe, Celia, Kevin, and Laura. Right: Kevin.

Greg Moore

Wow! It's hard to believe that I'm retiring after 31 ½ years at UH. It has been a really great time because of the freedom and support that we have in SOEST to pursue our teaching and research endeavors. While a member of the SOEST faculty, I've mentored 6 PhD students (**Mary MacKay** 1994; **Zhiyong Zhao** 1998; **Toshihiro Ike** 2007; **Brian Boston** 2015; **Jason Lackey** 2019; **Hannah Tilley** 2021) and 6 MS students (**Stephen Leslie** 2001; **Melody Eckmier** 2006; **Ben Studer** 2006; **Jessica Barnes** 2013; **Katie Taladay** 2015; **Nipaporn Nakrong** 2019). I've been able to join 16 research cruises and 8 ODP/IODP Expeditions, and I have conducted 3 sessions of field work, studying mostly accretionary complexes offshore Barbados, Oregon, and Japan and onshore in western Myanmar, but also including marine investigations of landslides off Kīlauea and O'ahu and a site survey for future drilling on the Hawaiian arch NE of O'ahu.

I mostly owe the start of my UH career to **Ralph Moberly**, who was chair of the search committee that recommended hiring me back in 1988 – thanks, Ralph! I also owe a lot to **Brian Taylor**, who was a fellow graduate student back in the 1970s. We worked on different aspects of a big NSF program to study Southeast Asian Tectonics – he was at Lamont, I was at Cornell. As SOEST was becoming a reality, Brian, who had joined the UH faculty a few years earlier, encouraged me to apply for one of the positions in GG and has supported me in many ways since he became Assoc. Dean and then Dean – thanks, Brian!

Those 30+ years have gone by very quickly, primarily because of the great cooperative spirit of the GG/ES Department. I never suffered the emotional stress of having a “dysfunctional” department as did many of my friends in other institutions. Having great and always supportive colleagues has really made a difference – thanks to all GG/ES folks!

It seems rather strange to say that I am “retiring”, given that I just received a new 2-year NSF grant and still have a PhD student who is more than a year away from finishing...but, it did seem like the right time to give up my faculty position to make room for an early career person. However, the only thing I will be “giving up” is teaching, but that allows more time for research. I still have several “older” projects that need to be finished, so I plan to continue to be an active member of the Department for several more years.



Brian Taylor (left, SOEST Dean), **Greg Moore** (behind), **Julie Hood** (right, PhD 1990 and science teacher in Florida), and **Gloria Estafan** (singer) backstage after a concert of the Miami Sound Machine in Tokyo, 1987. Photo courtesy of Julie.

Leona Anthony

The integrated science course I took in the ninth grade was the best science class I took in high school. It was an earth sciences course that logically related science with the real world and was very hands on. When I enrolled at the University of Hawai'i at Mānoa and was looking for campus job, I was drawn to a student assistant position in the Department of Geology & Geophysics. When I got hired, I had no idea that the people and place was going to have such a positive lifelong impact on me. My husband, **Steve Anthony** (MS '87) and I met in the department and our son grew up to be a geologist too.

Soon after I graduated from UHM with my journalism degree, I landed a job with the third largest public relation agency in Hawai'i. Unfortunately, corporate PR was not my calling and I eventually left the agency without another job lined up.

Days after leaving the PR agency, **Frank Peterson**, who was the Geology & Geophysics department chair, called and asked if I was interested in managing the graduate admissions and records for the department. I accepted the position and the rest is history. I am grateful for opportunities that Frank provided nearly 32 years ago.

When I began my career in higher education, student services and academic advising were still being defined and developed as fields of study and careers in higher education. Thanks to my supervisors and students, I was granted a lot of flexibility to learn and develop my profession on the job. Going to work was something that I looked forward to every day. It provided me with many avenues to connect with people and to make a positive difference in at least one person's day. Student services and academic advising became passions and I eventually completed a graduate degree in Educational Administration. My most recent educational journey convinced me to tell my own stories to further connect and support others toward academic success in higher education.

Over the next year, I will be seeking new avenues to connect with people in Sun Valley, Idaho—my new home as of July. I hope to work with young people to encourage and support their journeys toward higher education by telling my stories. The Wood River Valley will also provide Steve and I with ample opportunities for hiking, biking, skiing, and time to enjoy the musical, cultural, artistic, and literary festivals that the resort town annually hosts. Post-COVID road trips and visits to national parks are also on the To-Do list as well as frequent visits with our son who lives in Seattle.



Leona and Steve.

Susan van Gorder

Long-time Department Manager Susan van Gorder retired at the end of 2019. Susan was hired in 2003 after a career at First Hawaiian Bank (she went from working at a place with lots of money to a place with almost none). In those 16 years, Susan kept the front office organized, managed purchasing, hired TAs, supervised the Geology Club finances, scheduled classes each semester, and kept the copy machine working!!

Susan writes: I am so happy to have worked in Geology and Geophysics/Earth Sciences Aug. 2003 – Dec. 2019. Being part of a student's education is more than just a job; it is always the career choice for me. Add the greatest faculty and staff made it our perfect 'ohana. Working in SOEST was awesome. Now, in 2020, I am so happy to have more time with family, and I can contribute to home schooling of my grandchildren.

Pete Mouginis-Mark

After more than 37 years at UH Mānoa, Pete Mouginis-Mark retired at the end of 2019, beating all of the university challenges that have subsequently developed with the Covid-19 virus.

Pete has had a checkered career at UHM, mixing field volcanology, remote sensing, and planetary geology with various administrative roles. In the mid-1980s, he was at NASA Headquarters running their terrestrial geology program, while back at UH he has served as both the Director of HIGP and Acting Associate Dean for Research within the College of Engineering, and served on the Faculty Senate Executive Committee. Along the way, he's had the privilege to mentor some of G&G's (now Earth Science's) stellar graduate students, including **Lisa Gaddis**, **Mark Robinson**, **Luke Flynn**, and **Bruce Campbell**, all of whom have gone on to be leaders in the planetary and space communities.

Fortunately (?), as an Emeritus Researcher, Pete plans to remain actively involved with the University. He is currently working on two books about landforms on Mars, and still has a long-term interest in producing geologic maps of the planets. His latest interests lie in making high resolution geologic maps of the polar regions of the Moon in preparation for landings there over the next few years.

But retirement is meant to offer some spare time as well. Along with his wife Ada, Pete is trying to rekindle his old interests in photography and painting. Pete and Ada also have a 2-year old grandson in Seattle who needs to be visited as often as possible. And more time for swimming and walking is also on the schedule too!



Ada and Pete at one of their Chinese New Year dinner events.

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Jeff Bell

We are sad to report that Jeff Bell, GG alumnus and retired HIGP Researcher, passed away in March after a long battle with cancer. The following remembrance is by **Dave Blewett** (PhD 1997) of the Johns Hopkins University Applied Physics Lab.

When I arrived in Honolulu in August of 1990 as a new grad student, **Chris Peterson** and Jeff Bell picked me up at the airport (Chris's car - Jeff didn't drive). Jeff gave me a copy of *Bryan's Sectional Maps - Oahu* that he bought for the occasion, which was a tremendously useful thing for a just-arrived malihini.

I had arranged to stay at Jeff's house in Pālolo Valley (La`i Rd.) for the first month or two. That house had been occupied by PGD/IfA students going back a decade or more. **James Granahan** had moved out not long before and I had the room that had been his. The other housemate was Joe Piscatelli, an IfA grad student. Having just moved from Pennsylvania, I was shocked when I saw a live lizard scurrying around my room. (I soon learned that it was a gecko.) I thought "Wow, what a place Hawai'i is!"

Jeff Bell was on my Master's and Ph.D. committees. I loved hearing his stories about obscure military history. He could tell you why Soviet submarine captains wore a certain kind of braid on their uniforms. And I will always remember the seminar he gave about the amazing life of Bobrovnikoff, who made the first real color studies of asteroids.

In the asteroids class that Jeff taught (GG669), one assignment was to critique one of Van Flandern's papers about the "exploded planet" hypothesis for the origin of asteroids. Carl Sagan was editor of *Icarus* when those Van Flandern papers were published, and we wondered how they passed review.

Jeff and **B. Ray Hawke** had done key telescopic observations of lunar dark-halo impact craters (DHCs: Bell and Hawke, *JGR* 89, 6899–6910, 1984) using the PGD infrared circular-variable-filter spectrometer (IRCVF). For my master's, I did follow-up work on DHCs using additional IRCVF spectra for features in the Schiller-Schickard cryptomare, and with telescopic CCD images.

Other major papers from Jeff and B. Ray dealt with the Reiner Gamma swirl (Bell and Hawke *Proc. LPSC* 12, 679–694, 1981; Bell and Hawke, *Publ. ASP* 99, 862–867, 1987). Like the DHC work, the Reiner Gamma study came from Jeff's Ph.D. dissertation ("A Search for Ultraprimitive Material in the Solar System"). Those Reiner Gamma papers sparked my interest in lunar swirls, something that I am still studying today. Jeff kindly shared notes that he had made about possible swirls on Mercury, based on images in the NASA Mariner 10 *Atlas of Mercury*. A number of years later, I mentioned studies of possible swirls on Mercury in the MESSENGER Participating Scientist proposal that I submitted. Fortunately, that proposal was selected, and I was able to publish a paper about the features that had appeared somewhat swirl-like in the low-resolution Mariner 10 images (Blewett et al. *Icarus* 209, 239–246 2010). I thanked Jeff Bell in the Acknowledgements of that paper.

Jeff Bell had done foundational work on asteroid spectroscopy (the 52-color asteroid survey). A specific paper on the survey was never published, but the DPS and LPSC abstracts (e.g., Bell, Hawke, Owensby, and Gaffey, *LPSC* 19, p. 57, 1988) were widely cited by others. His chapter "Asteroids: The Big Picture" (written with Don Davis, William K. Hartmann, and Mike Gaffey) in the 1989 University of Arizona Press book *Asteroids II* was extremely influential.



Planetary Geosciences in the early 1990s with (left to right): Joan Hayashi, Mark Rongstad, Bob Brown (behind sensor), Jeff Bell, Ted Rousch, and Pam Owensby. Photo by Peter Mouginis-Mark.

Jeff Bell was not a jokester, but I found him to be incredibly funny. This was especially true when listening to him talk about quack science, conspiracy theories, or the state of NASA.

Thanksgivings at Jeff's house (not the one in Palolo, the one near Sinclair Library - on a street up from Metcalf) were a nice tradition, especially for new students. The dinners were hosted by Jeff along with **Jeff Taylor** and Twyla Thomas.

Unfortunately, Jeff had a chronic health problem that appeared in the late 1990s and prevented him from being able to work regularly. He was variously diagnosed with chronic fatigue syndrome and pituitary problems. I think planetary science (especially the field of asteroid studies) has really missed Jeff these past couple decades when he wasn't active. Here are two quotes from current asteroid researchers:

"He was a contrarian in a lot of ways, but his contrariness seemed to me to serve the field well." - Andy Rivkin, JHU Applied Physics Lab

"He was such a huge figure in asteroids when I entered the field." - Tom Burbine, Mount Holyoke College.

From **Bruce Campbell** (PhD 1991): What sad news. Some great memories sharing that house with him and Joe Piscatelli at the back of Pālolo Valley. The van Flandern project was fun, and his immense knowledge of history with a dry sense of humor made him a great teacher. Iapetus and Vesta had it pretty good as well - he loved his cats.

From **Jim Bell** (Arizona State U; MS 1989, PhD 1992): Indeed, I'm very sorry to hear about Jeff's passing as well. Thanks, Scott, for posting this, and thanks Dave, for circulating. I was also a housemate of Jeff's in the late 80s in that delightful Pālolo Valley home (the walls were made out of tissue paper and geckos), and thus for a time there were two "J.F. Bell's" at the same residence. Of course, having two "J.F. Bell's" in the field, both working at Univ. Hawai'i, and me occasionally working on asteroids, was a constant source of confusion for the community. It's actually why I use "J.F. Bell III" on my formal publications, and perhaps the only reason I'm grateful that my parents stuck that "III" on my birth certificate. Jeff was constantly amused at the Mars spectroscopy questions he would get, and I was constantly amused at the L5 Society questions I would get. I started adopting the phrase that he came up with first when explaining the confusion to colleagues or others: "Well, if you actually KNEW both of us, you'd NEVER get us confused again!" What a character -- I will miss his dry wit and deep asteroid science wisdom.

From **Tim McCoy** (Smithsonian Institution; PhD 1994): Really sorry to hear this news. Jeff was, of course, Clark Chapman's main nemesis in the great S asteroid-ordinary chondrite debate of the early 90s, when their abstract titles nearly devolved into "your full of horse(*&^". He was quite a character and his synthesis chapter from Asteroids shaped much of the debate for decades. My favorite memory was Thanksgiving at Jeff's house ever year. Jeff had one of those rolling dishwashers you hooked up to the sink faucet. Jeff Taylor and Twyla Thomas decided to use it, but, of course, since Jeff never ate in, he didn't have any dish detergent. Jeff Taylor and Twyla thought that powdered laundry detergent would be a good substitute. Next thing you know, the dishwasher is being rolled through the living room, soap suds pouring forth, out onto the patio. Sorry to hear of his passing.

From **Beth Ellen Clark** (Ithaca College; PhD 1993): I remember cat-sitting for Jeff, when he lived in Mānoa valley, which was on my bike path home after a long day in the PGD basement. His cats were named Vesta and Pallas, of course. Jeff had great stories about the exploits of Vesta and Pallas. During my visits at Jeff's house, I would sit on the floor, as Jeff often did, and give the kitties some love and attention, and I would read the titles of Jeff's extensive book collection. I marveled at the number of volumes he owned on military history and science fiction. He kept the two collections widely apart from each other, of course. But Jeff was a truly great reader. Jeff never drove a car, he walked everywhere. One of my favorite memories is of a time after a happy hour together, when Mark Robinson gave Jeff a ride home and jumped out of the car to give Jeff a big hug – ha ha! Jeff reeled back in horror and turned and ran away. (Mark then attempted to give Fraser a goodbye hug, but Fraser stepped back and said, "a hearty handshake will do!!"). It was always amusing to attend a happy hour with Jeff and BRay – Jeff never drank anything but juice, and BRay compensated – ordering a double super rita!! Very fun conversations ensued. Happy happy memories – of an impossibly beautiful grad school experience. Jeff influenced my thinking, and he left us too soon.

From **Chris Peterson** (HIGP; PhD 1999): Back when Jeff (Frederick) Bell was on the faculty and Jim (Francis) Bell was a grad student, they both showed up as J.F. Bell from UH on abstracts and papers. Fortunately, Jimbo was a "3rd" and could distinguish himself as J.F. Bell III. I always thought of Jeff, in contrast, as J.F. Bell the ONLY.

From **Tom Giguere** (current grad. student): I recall the beginning of every GG669 class (Formation of the Solar System) that Jeff taught. He took inspiration from B. Ray, who had been presenting "Helpful Hints" in the first 5 minutes of his Moon classes as a way to get distracted students into class on time. These Hints were based on B. Ray's past military experiences in an overseas skirmish and were aimed at providing students ("tongue in cheek") with alternative career opportunities (foreign legion, mercenary, etc.) if the planetary scientist track didn't work out. Jeff put his own spin on the 5 min opening remarks and discussed conspiracy theories and hoaxes down through history. Of course, Jeff did loads of research for each five-minute session, often reading several books. The topics were fascinating and ranged from Piltdown Man in England, the lost dutchman's gold mine, buried treasure on Oak Island, and Amelia Earhart's ill-fated flight, etc. Great stuff, very creative spirit!

From **Paul Lucey** (HIGP; PhD 1986): I remember at a DPS meeting in the early '80s while Voyager was wending its way through the solar system, Jeff gave a talk armed only with a publicity photo of Saturn's moon Iapetus, proposing that the dark side of Iapetus was colored by particles coming off of the dark moon Phoebe. The Voyager team publicly grumped about Jeff doing science with a press photo, but Carl Sagan stood up and defended him.

From **Barbara Bruno** (HIGP; PhD 1994): Thanks so much Dave for sharing these fond memories of Jeff Bell. Reading them was an amazing walk down memory lane, transporting me back to the land of purple pipes, where one could wander into a broom closet and find the only coke machine in town where inserting fifty cents and selecting "non-dairy creamer" would get you a beer. Jeff was an integral part of the cast of characters back then, and (fast forward 20 years) we became neighbors in Mānoa. What I especially appreciate about Jeff was his unwavering loyalty, especially to B.Ray.

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Alumni Days!!

Sadly, because of the COVID-19 pandemic, we had to scrap plans for the 2020 Alumni Days events. A small and far-flung group of alumni (**Brandee Pang-Brookman**, **Lynne Rogers-Miller**, **Brian Iwatake**, and **Steve Spengler**) were working on plans for various events when everything was put on hold indefinitely. Please stay tuned for 2021 alumni events, and if you are of that persuasion, there is an [alumni Facebook page](#) to join.

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Degrees, Awards & Honors

UNDERGRADUATES

Katherine Ackerman	<i>BS (Research Track) Spring 2020</i>
Rachel Bellah	<i>BA Fall 2019</i>
Max Bourne	<i>BA Summer 2019</i>
Ted Brennis	<i>BS Summer 2019</i>
Carrie Brooks	<i>BS Spring 2020</i>
Maxime Cadiat	<i>BS Spring 2020</i>
Benjamin Gochenouer	<i>BA Spring 2020</i>
Kelly Ann Ines	<i>BA Spring 2020</i>
Katelyn Jalomo	<i>BA Spring 2020</i>
Kaila Lockwood	<i>BA Spring 2020</i>
Jonah Magnenat	<i>BA Spring 2020</i>
Marin McGhee	<i>BA Spring 2020</i>
Madison Pancake	<i>BA Spring 2020</i>
Sierra Stammer	<i>BA Spring 2020</i>
Ingrid Suter	<i>BS Spring 2020</i>

MASTERS OF SCIENCE – PLAN A (THESIS)

- Jonathan Avery – *Analysis of Smartphone Earthquake Early Warning Networks in Chile and Costa Rica*
(Advisor: J. Foster, Spring 2020)
- Krista Evans – *Precursory Volcanic Activity and Cultural Response to the Late Bronze Age Eruption of Santorini (Thera), Greece* (Advisor: F. McCoy, Spring 2020)
- Andrew Foerder – *Chemical Alteration and Soil Provenance of Polar Desert Sediments from the McMurdo Dry Valleys, Antarctica: An Analog for Alteration Processes on Mars* (Advisor: P. Englert, Spring 2020)
- Charu Lata – *Upper Crustal Structure Across the Eastern Lau Spreading Center Using P-to-S Converted Seismic Waves* (Advisor: R. Dunn, Fall 2019)
- Taylor Viti – *Electromagnetic methods for groundwater studies* (Advisor: N. Grobbe, Fall 2019)

MASTERS OF SCIENCE – PLAN B (NON-THESIS)

- Liliane Burkhard – *4D stress evolution of the San Andreas fault system: Investigating stress over multiple earthquake cycles* (Advisor: B. Smith-Konter, Fall 2019)
- Olliander Beucler – *Laser-Induced Breakdown Spectroscopy (LIBS) for Investigating Surficial Condensation of Semi-volatiles on Volcanic Spatter* (Advisor: J. Konter, Spring 2020)
- Angelo Genabe – *Particle Background and Methods for Cosmic Dust Collection at Mauna Loa Observatory*
(Advisor: H. Ishii, Spring 2020)
- Lauren Ward – *Crustal Deformation of the San Andreas Fault System* (Advisor: B. Smith-Konter, Fall 2019)

DOCTOR OF PHILOSOPHY

- Alyssa Anderson – *Kīlauea Deformation and Lava Flow Dynamics* (Advisor: J. Foster, Fall 2019)
- Laura Corley – *Understanding the Composition and Evolution of the Lunar Surface Through Laboratory Space Weathering Simulations and Remote Sensing* (Advisor: J. Gillis-Davis, Fall 2019)
- Emily Costello – *Impact Impacts on the Moon, Mercury, and Europa* (Advisor: P. Lucey, Spring 2020)

Shellie Habel – *Sea-level rise flooding and related impacts: Primary urban core, Honolulu, Hawai'i* (Advisor: C. Fletcher, Fall 2019)

Casey Honniball – *Infrared Sensing of Volatile Components on the Earth and Moon* (Advisor: P. Lucey, Fall 2019)

STUDENT AWARDS

AGATIN ABBOTT MEMORIAL AWARD

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

Ingrid Suter

ARCS AWARD

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

Trista McKenzie

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.

Trista McKenzie and Lauren Ward

J. WATUMULL MERIT SCHOLARSHIP

Awarded to an outstanding Earth Sciences graduate student by the Watumull Foundation.

Chiara Ferrari-Wong

OTHER FELLOWSHIP, SCHOLARSHIPS & AWARDS

2019 GSA ON TO THE FUTURE (OTF) GRANT

Geological Society of America (GSA; Travel support to the annual GSA meeting)

Trista McKenzie

2019 GSO MERIT AWARD FOR RESEARCH

Graduate Student Organization (GSO), University of Hawai'i at Mānoa

Merit-based award for one PhD student at the University of Hawai'i

Trista McKenzie

2019 GRADUATE STUDENT RESEARCH GRANT WITH OUTSTANDING MENTION

Geological Society of America (GSA), One of the top 10 proposals submitted out of 748 in 2019

Trista McKenzie

2019 GeoPRISMS STUDENT PRIZE ORAL PRESENTATION WINNER

Geodynamic Processes at Rifting and Subducting Margins (GeoPRISMS), AGU Fall Meeting

Hannah Tilley

2020 MONITORING, VERIFICATION, TECHNOLOGY CONSORTIUM WORKSHOP

Best Poster Presentation

Kelly Truax

2019 UNDERGRADUATE PRIZE FOR OUTSTANDING CONTRIBUTIONS TO MINERALOGY

American Mineralogical Society

Hunter Polhemus

* * *



The 2019 SOEST Open House was a huge success and as usual, Earth Sciences students, staff, and faculty played a large part, with CO2 explosions, solar systems for young scientists, rocks, rocks, and more rocks (including thin sections) and the always-cool augmented-reality sandbox. Photos are from the SOEST Facebook page.

2019-2020 Earth Sciences Faculty Research & Teaching Highlights

Garrett Apuzen-Ito and **Neils Grobbe** (HIGP) are co-advising **Kenzie Lach** (MS) who is studying the structure of Martian volcanos. **Daniel Douglas** (MS) is now working with Garrett to produce dynamic models of lithospheric flexure beneath the Hawaiian Islands as part of the project led by **Robert Dunn** and in collaboration with **Paul Wessel**, and scientists from the University of Oxford and Lamont-Doherty Earth Observatory, including **Brian Boston** (2015).



A Zoom alumni TG's beer hour is captured at left (starting from the top row, left to right): **Geoff Garrison** (2002), **Tara Hicks Johnson** (2002) and, **Paul Johnson** (2006), **Nathan Becker** (2005), Garrett, **Jim (Jamshid) Gharib** (2006), **Jordan Muller** (1999); **Jackie Caplan-Auerbach** (2001), **Zoe Norcross-Nu'u** (2001), **Susannah Mistr** (1999), **Todd Erickson** (1998), and **Stephen Leslie** (2001). **Steve Quane** (1999) was also there but lost internet connectivity.

Sloan Coats joined the department in November from the Woods Hole Oceanographic Institution (WHOI) where he was on the faculty following a postdoctoral appointment at the National Center for Atmospheric Research (NCAR). Over the last year he was excited to teach for the first time during the Spring semester and has continued his research program focused on combining state-of-the-art statistical techniques and climate models with observed and paleoclimatic data to better understand the climate system. A particular focus has been two NSF-funded projects with collaborators at NCAR, Texas A&M, University of Southern California, University of California, Santa Barbara, WHOI and Washington University using a new suite of climate model simulations with the NCAR climate model, called the last millennium ensemble (LME). Critically, the NCAR LME contains 30 simulations of every volcanic eruption known to have occurred over the last ~1200 years, with each of the 30 eruptions occurring with a different state of the atmosphere and ocean. This wealth of data allows us to better understand how climate components that are external to the system, like volcanic eruptions, interact with those that are internal to the system, like the El Niño Southern Oscillation (ENSO) phenomenon. The first paper from this work, focused on Mesoamerican and Caribbean droughts in the paleoclimate record, was published this June in *Geophysical Research Letters*.

Henrietta Dulai began the academic year by spending 32 days at sea aboard the R/V Falkor in August 2019. The cruise led by project PI Les Watling from UH Biology focused on the biogeography of deep-sea corals along the Emperor Seamount Chain in the western north Pacific. The group performed over 10 ROV dives and collected many hours of video footage and broadcasted live web casts. Dulai processed 1,500 gallons of seawater and her sampling focused on geochemical tracer characterization of water masses.

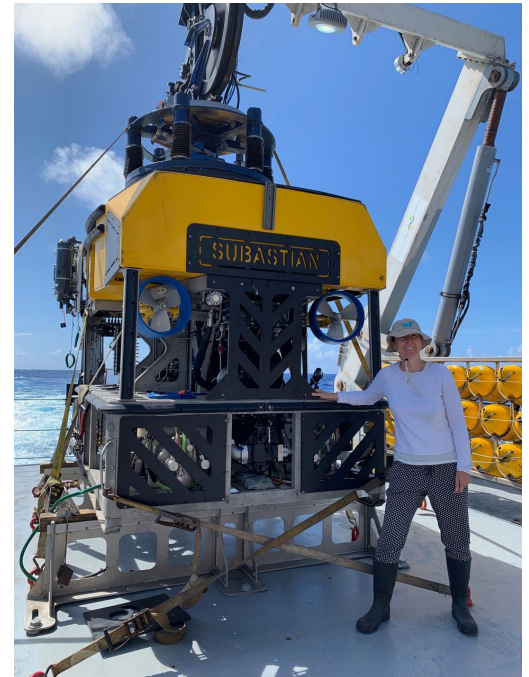
With her involvement in the NSF EPSCoR funded Ike Wai project Dulai and PhD student **Trista McKenzie** continued working on submarine groundwater discharge (SGD) characterization in West Hawai'i and improving understating the driving forces of SGD. Tied to this project is also the study of the Kualauao Spring complex fed by the Pearl Harbor aquifer led by PI **Jenny Engels**. The springs feed one of the few existing watercress farms, which is now surrounded by a highly urbanized setting, the farm is literally surrounded by shopping malls and restaurants. The Sumida family graciously agreed to collaborate and let us study the hydrological context of the springs and its effects on watercress crop yields.



Every year students in EARTH106 Humans and the Environment class work on a project to map out the distribution of pharmaceuticals in Manoa Stream. The stream is modified significantly, in many places access is not possible so samples have to be collected from bridges.

characterization of synthetic estrogen, ethinylestradiol, in the Ala Wai Canal and its sorption to soils and sediments in the Ala Wai watershed; and Trista McKenzie's projects on assessing the effects of groundwater inundation during spring and king tides on contaminant fluxes into the Ala Wai canal and coastlines focusing on areas with high cesspool density. We are proud of

Dulai and her group are also working on mapping out the distribution of contaminants of emerging concern such as pharmaceuticals that leak from wastewater infrastructure into groundwater and surface water bodies. Among others, projects include a yearly assessment of the distribution of pharmaceuticals leaking from cesspools into Manoa Stream with her class EARTH106 Humans and the Environment; continued collaboration with Iolani High School on science projects on



Dulai participated on a 32-day cruise in the North Pacific aboard RV Falkor and used the ROV SUBASTIAN to collect chemical samples around the Emperor Seamounts.



*Faculty **EI-Kadi** and Dulai as well as students **Diamond Tachera**, **Trista Mckenzie** and **Brytne Okuhata** are part of Ike Wai, an NSF EPSCoR funded project to study water resources. The team set up multiple exhibits at the 2019 SOEST Open House.*

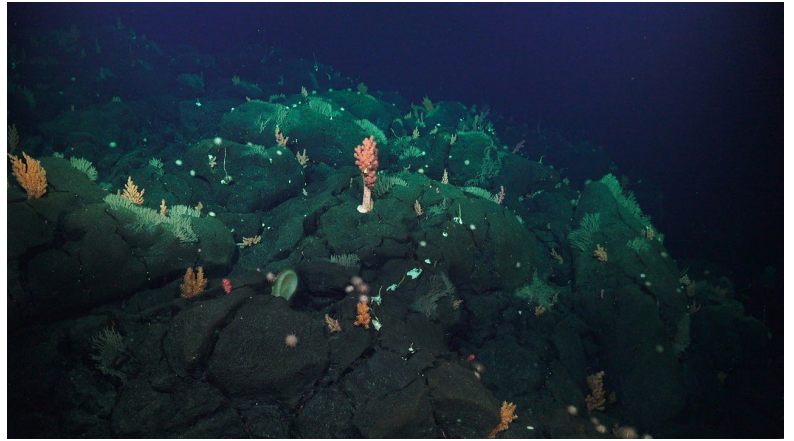


The fall 2019 SOEST Open House was a great success. Many attendees visited the virtual reality augmented sandbox which is used to simulate watershed processes. Our latest edition is improved by a 3-D printed Manoa watershed.

stressed from exposure to metals and nuclear materials. Kelly won Best Poster presentation at the most recent MTV Workshop. This project is a collaboration with HIGP faculty **Anupam Misra** and Wendy Kuhne from the Savannah River National Laboratory.

Earth Sciences undergraduate **Sierra Stammer** worked with the group throughout this year and we are grateful for all her help. Sierra graduated this semester - congratulations!

The Dulai lab has other ongoing projects and unfortunately, multiple trips had to be cancelled and project objectives modified due to COVID restrictions. But we are proud of Trista and Kelly who switched gears and are making progress on their research through data analysis and other tasks not restricted by social distancing.



Imagery from ROV SUBASTIAN dives at the Emperor Seamounts Chain in 2019 showed fascinating geology - manganese crusted rocks, and coral colonies, sponges and other organisms living 1000 - 2000 m deep on top of the seamounts.

PhD student Trista McKenzie who advanced to candidacy and received multiple department and national awards for the work they are doing on these projects.

The Dulai lab is also involved in a Department of Energy and National Nuclear Security Administration funded Consortium for Monitoring, Technology and Verification in collaboration with UH PI HIGP faculty **Milton Garces**. Within this project, graduate student **Kelly Truax** is working on developing remote sensing techniques to identify biota



Students in EARTH106 Humans and the Environment class are collecting water samples from Mānoa Stream. Their results show cesspool leakage into the stream...not good news.

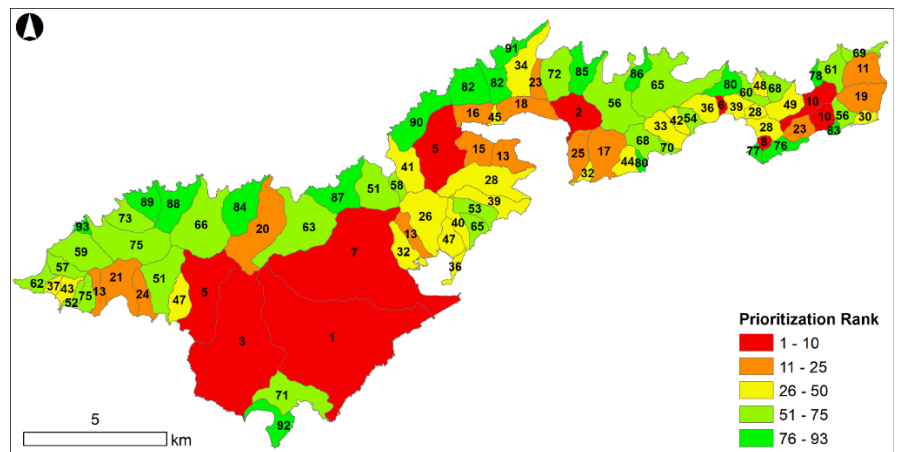


At the SOEST Open House graduate students **Kei Takazawa**, **Jonathan Tobin** and **Kelly Truax** prepared exhibits about nuclear safeguards and monitoring that is the topic of their NNSA and DOE funded projects.

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. Congratulations to **Charu Lata** for completing her Master's degree and submitting a manuscript of her work on the Eastern Lau Spreading Center. Robert and graduate students **Brandon MacGregor** and Chong Xu are working hard to process data from seismic lines collected over the past two years along the Hawaiian-Emperor chain. These studies are part of a larger NSF-funded collaboration between UH scientists and scientists at Lamont-Doherty Earth Observatory, Oxford University, the USGS, and GEOMAR. **Deborah Eason** is wrapping up her data collection (over 500,000 seismic picks!) and analysis of crustal and upper mantle structure in the Lau backarc area. Robert's group, along with Earth 304/450 students continued mapping the

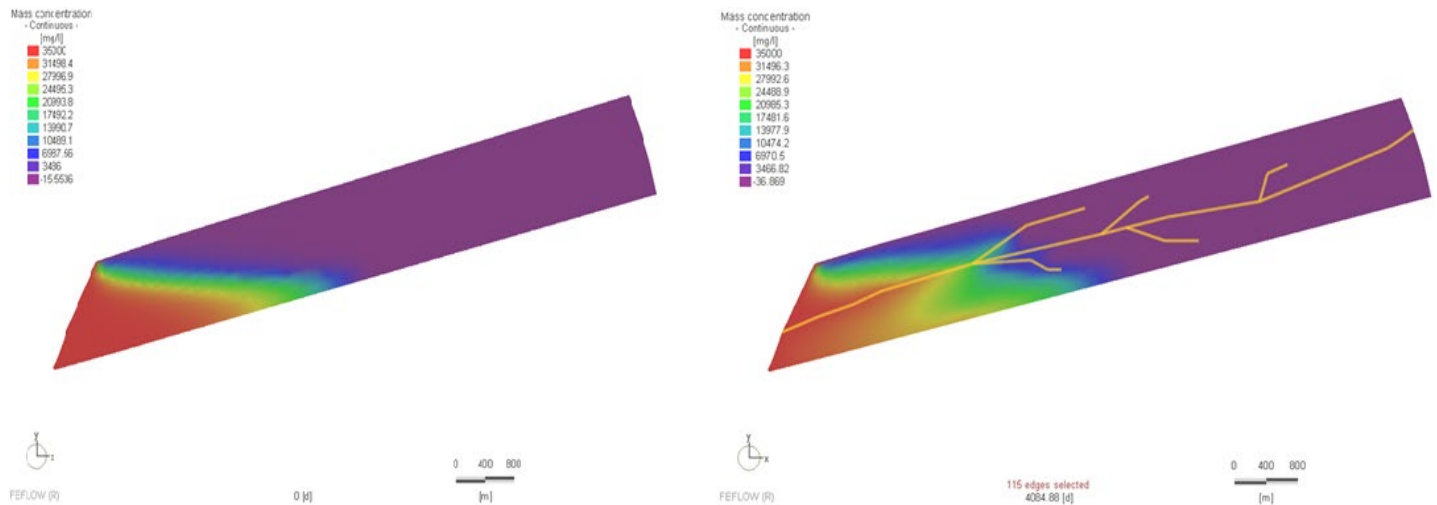
gravitational field of the southeastern portion of O'ahu. Robert's sabbatical at Oxford has been postponed due to "global, extenuating circumstances".

Aly El-Kadi: The Hydrology group, led by Aly El-Kadi, continued to work on projects in American Samoa and the Big Island of Hawai'i. The group currently includes **Chris Shuler** (a postdoctoral fellow) and **Brytne Okuhata** (a doctorate student candidate). With Chris leading, our most recent publication was just accepted this month (June, 2020) in the journal Environmental Management. The manuscript titled: Ridge to Reef Management Implications for the Development of an Open-Source Dissolved Inorganic Nitrogen Loading Model in American Samoa, detailed a collaborative project between our group at the Water Resources Research Center and the American Samoa Environmental Protection Agency (AS-EPA). In this project, we developed a user-friendly tool to estimate dissolved inorganic nitrogen (DIN) loads to coastal zones for the entire island of Tutuila, the main island in the U.S. Territory of American Samoa. The new method helps coastal resource managers target the most impactful human activities in the most vulnerable locations by easily and simply communicating to land-use managers and regulators where coastal nitrogen loading management is most needed. We implemented the modeling process using an open-source platform and interactive Jupyter Notebooks to make the results as accessible and reproducible as possible (<http://doi.org/10.5281/zenodo.3462869>).



Map showing impact prioritization ranking for each watershed on Tutuila American Samoa. The measure of impact uses coastal loading of dissolved inorganic nitrogen (DIN) rates calculated as an index score based on DIN released by all known nutrient, watershed area, and coastline length. Each watershed was with the highest ranked watersheds (1 to 10) being those with the greatest amount of anthropogenic impacts.

Brytne continues to work for 'Ike Wai as a graduate student on the groundwater modeling team. She completed her field work and is currently analyzing groundwater age tracers for the West Hawai'i aquifer systems. She is also developing a numerical groundwater model for the Keauhou aquifer, in collaboration with economists and resource managers on the 'Ike Wai team, to assess nutrient transport under various land use changes and groundwater pumping scenarios.



The group is also exploring the effects of preferential flow, such as that due to major fractures or lava tubes, on aquifer's saltwater and other contamination. This figure illustrates the simulated effects of a lava tube on salinity distribution in a hypothetical hillslope (left image = no lava tube; right image = with lava tube.) The colors show the range of salinity from fresh (purple) to seawater (red). It is clear that saltwater contamination is enhanced by preferential flow in the lava tubes. The flow within these "conduits" is not laminar and the research clearly demonstrates the invalidity of the conventional porous media approach, which adopts such an assumption.

Neil Frazer continues his work with **Rhett Butler** (HIGP) on probabilistic earthquake prediction algorithms, as well as work with friends at the University of Toronto concerning virus transmission from farmed salmon to wild salmon. When not thinking about research, or his duties as chair of the Graduate Student Committee, 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.



Neil (on left in red vest) rushing viral water samples to the lab to be filtered and preserved for DNA analysis

Bruce Houghton: Here are highlights from the physical volcanology group. A sizeable block of Bruce Houghton's time (2 months) was given over to the National Academies' 'Earth in Time' vision for Earth Science Research and the NSF-funded Community Network for Volcanic Eruption Response initiative. **Caroline Tisdale** and Bruce utilized a University of Tasmania Visiting Scholarship to work on studies of Tarawera volcano with alumnus **Rebecca Carey**. **Wendy Cockshell** began her MS studies in the department; her project focuses on pyroclastic products of the 2018 LERZ eruption. **Brett Walker** and Caroline presented papers at Fall AGU on

explosive eruptions during the 2018 eruption and Brett successfully defended the proposal for her dissertation. In January-February, Bruce visited Durham and Cambridge to collaborate with UK co-workers.

In Spring 2020, the COVID-19 restrictions coincided with a period when the group had already settled down to write up a batch of research linked to the 2018 LERZ eruption of Kīlauea. We have made a smooth transition to working off campus, with a Monday group meeting via Zoom and one-on-one zoom meetings every day. We have taken the lead on four manuscripts and co-authored five others with submissions to Nature, Science, Geology, and Geophysical Research Letters.

Helen Janiszewski: I started as a new faculty member in the department this past November, and I am excited to start building a new research program at UH. I moved from Washington, DC where I was a postdoc at Carnegie Science. My research interests include using seismic imaging tools to better understand magmatic systems beneath volcanoes, and subduction zone structure. Prior to arriving at UH, I was a science party member on the *R/V Sikuliaq* this past summer; the cruise retrieved ocean bottom seismometers deployed off the coast of Alaska as part of the Alaska Amphibious Community Seismic Experiment. I am now anxiously awaiting the arrivals of several Raspberry Shake seismometers, which will be used for undergraduate research and outreach; they are now finally en route to Hawai'i after COVID-19 related delays!



The ROV Jason being recovered onto the deck of the *R/V Sikuliaq* with an ocean bottom seismometer beneath it.

Jasper Konter's research has focused on several topics related to the geochemistry and age-dating of hotspot volcanoes. A number of things have changed in the isotope lab, in terms of people, and soon, equipment. We welcomed **Dr. Aaron Pietruszka** into the Isotope Lab group at the end of the summer, as a new faculty member in the department, and the lab manager for the Isotope Lab. He was already part of the group working on new instrumentation: We just received word that a new mass spectrometer (TIMS) will be funded by NSF (to Konter, Pietruszka, Rubin). This will be a great new tool in the lab to improve current work, and allow us to work on a range of very small-scale samples such as melt inclusions and crystal zoning or fragments, as well as very tiny layers in corals or carbonates. In addition, Konter was funded (NSF) to geochemically analyze seamounts located on the Hawaiian "arch", north of Gardner Pinnacles (Pūhāhonu), in collaboration with Andrea Balbas (Oregon State U), and alum **Dorsey Wanless** (Boise State U). These seamounts were recently sampled by ROV to investigate whether they are an expression of Hawaiian arch volcanism, and the funded project will investigate this. Konter was also funded (with **Paul Wessel**, and Anthony Koppers [Oregon State U], Matt Jackson [UC Santa Barbara]) to investigate seamounts in the Western Pacific; these may be the Cretaceous expression of Cook-Austral volcanism, and if so, imply that plate motion models around 100 Ma will need an important update that also will affect the possible connection between Ontong-Java Plateau and the Louisville Seamount chain. Konter was also involved in publications on the western-most Cook-Austral islands that investigated the previously suggested Rarotonga hotspot, and in a paper investigating mantle samples (xenoliths) from Samoa, showing traces of both carbonatitic and hydrous fluid overprinting. This year, MS student **Olli Beucler** defended her thesis studying spatter from Kīlauea volcano, with the laser-induced breakdown spectroscopy (LIBS) system. We developed a LIBS approach to sampling the spatter surfaces, layer-

by-layer into the sample's interior. The results suggest condensation of volatile metals occurs on the sample surfaces, during eruption. Konter also continues to participate in the REU program (2019 summer, with undergraduate Molly Cunningham; 2020, with a presentation in the virtual program), and he is part of the EP`IK (Earth, Planets, `Ike, Kuleana) project with **Bridget Smith-Konter, Henrietta Dulai, Scott Rowland, and Jenny Engels**. EP`IK aims to create enthusiastic, Earth-Science-interested high school students who will eventually come to UH Mānoa and join our department.

Greg Moore's group continued work on both Nankai (Japan) and Hikurangi (New Zealand) subduction zones. Graduate student **Hannah Tilley** has been working on a 3D seismic dataset offshore Hikurangi that she helped collect in early 2018. Hannah presented this work at the Fall AGU meeting where she won the GeoPRISMS oral presentation prize. Hannah then continued her work on the Nankai accretionary prism, finishing a paper about development of the initial thrust faults at the deformation front. This study utilized high-resolution seismic reflection data collected by our Japanese (JAMSTEC) colleagues.

Greg was able to join a week-long field trip to the Andaman Islands (eastern Indian Ocean, north of Sumatra, Indonesia and south of Myanmar) just before India was completely close for travel in March. Having worked on the islands offshore Sumatra for his Ph.D. dissertation and having recently studied the islands offshore western Myanmar, this trip fulfilled a long-time wish to "fill in the gap" between those two areas of the Sunda subduction zone – the site of the deadly 2004 Sumatra-Andaman tsunami.



Left: Greg with Indian and British colleagues sitting on an exposure of the Andaman Ophiolite. Right: pillow basalts of the ophiolite.

Aaron Pietruszka joined the ES department as a new faculty member last summer, a full 20 years after he graduated with his PhD from the old Department of Geology & Geophysics. He is currently working with **Jasper Konter** and **Ken Rubin** on revitalizing the SOEST Isotope Lab with a new thermal ionization mass spectrometer that was recently funded by the NSF program for Major Research Instrumentation. Aaron will be using this instrument for his new NSF-supported project to decipher the mantle controls on the magmatic processes of the 2018 Leilani eruption on Kīlauea's lower East Rift Zone.

Brian Popp continues his isotope biogeochemical research focusing on nitrogen cycling in marine environments, marine food web studies and the marine mercury cycle. Two new Oceanography graduate students joined the laboratory in Fall 2019. Elizabeth Miller is a PhD student current working on particle degradation in the deep ocean and Connor Shea is a MS student who is working on the isotope biogeochemistry of zooplankton as part of the large EXPORTS program. In Fall 2020, we will welcome new graduate students Ching-Tsun "Joyce" Chang (OCEAN), Michael Dowd (EARTH) and Mario Kaluhiokalani (OCEAN) to the laboratory.

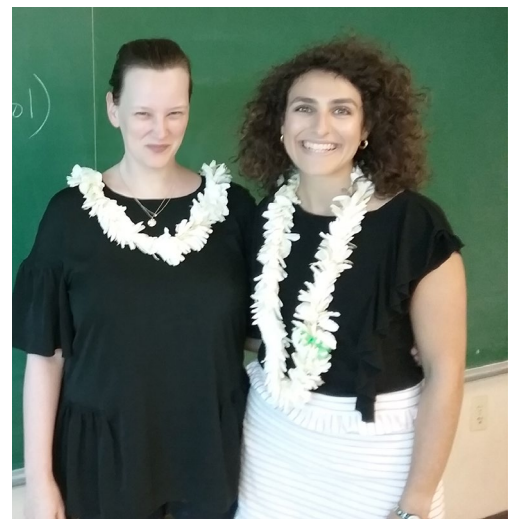
Tamara Allen joined the laboratory full time after graduating with a B.S. in chemistry from UH-Mānoa. Tamara has worked as student help in the laboratory since she was a freshman. Unfortunately, our Marie Curie Postdoctoral Fellow Sonia Romero-Romero's tenure is ending and she will move back to Spain this summer. We continue our outreach efforts with Kanesa Duncan Seraphin (UH Sea Grant Center for Marine Science Education) and recently produced two **award-winning episodes** of *Voice of the Sea*, a local television show that highlights marine research. Both episodes were on our EXPORTS research won Telly Awards (Gold and Bronze). Telly Awards honor the very best in local, regional and cable television, as well as online commercials, videos and films.

Scott Rowland: For a while it was a pretty normal academic year. Fall semester included organizing the EARTH 101 labs and teaching EARTH 104, 306, and 461. It was an honor to be invited over to Hawai'i Volcanoes National Park to give an After-Dark-In-The-Park presentation about the 1919-1920 Mauna Iki eruption. I started the presentation by mentioning some of the other things that were going on 100 years ago, including a pandemic. Little did I know... Not realizing what was on the horizon, I (along with everybody else) started the Spring semester with high hopes. Again, it was EARTH 101L, but also EARTH 305 and 460 (with Rob Wright). Unfortunately...well, you know what happened – classes went on-line and all field trips were canceled. I really feel for the Field Methods students – two days before we were to fly to the Mojave, all University travel was called off. We made a mad scramble to cancel flights, lodgings, rental vans, etc. UH allowed us to go on a couple of 1-day field trips to Wai'anae, which were fun, but they were a pretty poor substitute for a week in the Mojave. Never-the-less, the students were troopers and although I could read the disappointment on their faces and in their voices, they stayed positive. This is a really good group of field methods students who have gone through a lot of adversity, so if any of you are hiring...



Scott, Bob, Kaila, and some freshly-exposed lava flows in Hālawā quarry.

Interspersed between classes and occasional Mars-Rover duty, I've also been working with a couple of alumni, **Kaila Lockwood** (recent) and **Bob Whittier** (not so recent). We're funded by the State Dept. of Health to provide geological inputs to hydrological models of the Moanalua-Hālawā area. It has been a fun mix of field mapping and analog lab work.



Liliane Burkhard (BS 2017; EARTH PhD student with Bridget Smith-Konter) and Bianca Mintz (BS 2015, MS 2017; AECOM).

Liliane Burkhard and **Bianca Mintz** were kind enough to come talk to the current undergraduates about their lives out in the real world – mahalo for taking time out of your busy schedules! Mahalo also to the EARTH 101L TAs this year – the Spring 2020 group in particular, had to adapt quickly along with the rest of us to make the labs completely digital. Fall 2019: **Liliane Burkhard, Rebecca deGraffenried, Olli Beucler, and Kenzie Lach**. Spring 2020: **Gwen Brouwer, Colin Ferguson, Jordan Mason, and Adrien Mourey**.

Ken Rubin spent the Fall 2019 semester on sabbatical in New York city, working on manuscripts of past work and enjoying the change of venue. Like the rest of us, he spent the Spring semester mostly working from home because of the ongoing pandemic, and planning for the International Geochemical Goldschmidt 2020 conference, as part of the organizing and science committees. The 4000-5000-person conference was supposed to be in Honolulu in June, but has moved online and vowed to return to Honolulu in 2022. In March 2020, Ken also had an opportunity to participate in the UNs International Labour Organization's Office for the United States (ILO USA) photographic initiative, "Dignity at Work: The American Experience.", which is a series of images and essays about the workplace. He discusses the joy of working on volcanoes, and the importance of our science, in: **First Person: Humankind's 'modern mentality to tame' the environment: A volcanologist's view.**



Ken discussing climate and volcano interactions on a windy outcrop of the Koko Rift Zone this March, as part of a UH ILO project on the dignity of work in the USA.

Tom Shea continues to work on various volcanological projects, including the lavas erupted during the 2018 eruption at the Lower East Rift Zone (LERZ) of Kīlauea Volcano. Led by PhD student **Adrien Mourey** and numerous USGS and other academic collaborators, they are examining the geochemical traits of minerals (olivine, plagioclase, clinopyroxene) and pockets of melt trapped within them (melt inclusions). Led by PhD student **Rebecca deGraffenried**, Tom is also



The EARTH-605 (Lava Flow Rheology) class within a 'master tube' at Medicine Lake Volcano (California) in Fall 2019.

investigating the use of novel petrological tools - modeling diffusive smearing of H₂O concentrations in unsealed melt inclusions during magma ascent to obtain magma decompression rates – using state of the art 3D numerical models incorporating realistic crystal/inclusion geometries. Co-advised by **Julia Hammer**, Rebecca is also testing the use of analog-derived lava flow propagation models to predict the length of LERZ lava flows. A new PhD student (**Kelly McCartney**) arrived last fall to work with Tom and Julia to the influence of tiny Fe-Ti oxide crystals on the vesiculation of viscous magma. She will evaluate, via characterization of textures and magnetic properties of natural pumice, the possibility that oxides are the key to allowing gas exsolution and, ultimately, controlling magma explosivity. She'll also explore the underlying physical chemistry of crystal-mediated bubble formation by running experiments in the experimental lab. Tom is also working with PhD

student **Will Nelson** (also co-advised by Julia) to determine the maximum allowable time for cooling of an important suite of lunar rocks by examining samples brought back by the Apollo 17 mission. William is numerically modeling the concentration profiles preserved in the igneous crystals in the samples, applying an emerging method in petrology: diffusion chronometry. Tom just received a new NSF grant to study the depth and longevity of rift zone magma that resides under towns like Leilani Estates after eruptions of various sizes and compositions. Finally, one of the most fun experiences of the Fall was bringing the Lava Flow Rheology (ERTH-605) students to the Cascades to inspect the remarkable diversity of lava flow and domes from Mt. Shasta and Medicine Lake Volcano.



The 605 team built developed an insatiable desire to dig pits in pumice from a 1100AD eruption at Medicine Lake to characterize the stratigraphy.

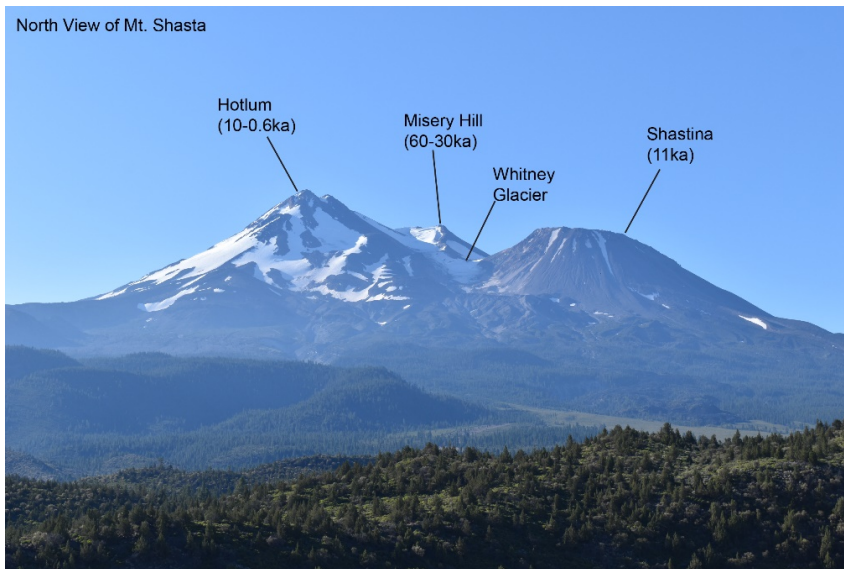
Julia Hammer received a collaborative award to the continue research on the rheology of the LERZ lava begun under the auspices of an NSF-Rapid award to **Ken Rubin** that also involved **Mike Garcia** and **Tom Shea**. Undergraduate **Alex Marshall** accompanied Rebecca, Julia, and mainland collaborators into the field at Kīlauea in January. They spent a few rainy days in Puna, struggling to hike over fresh ‘a‘ā, marveling at the scope of the eruption, and collecting additional samples for petrographic and compositional analysis. Julia hosted University of Chile graduate student, Camila Pineda, for a few weeks in March to continue resolving the magma storage conditions underlying a large-volume caldera forming eruption that occurred near Santiago ~150 ka. In addition to co-advising Rebecca, Kelly, and Will with Tom (on projects outlined above), Julia continues to operate the experimental petrology lab; she also assumed



The 605 team looks small in front of this ~40m rhyolite obsidian flow margin.



The group on the rim of the Medicine Lake Volcano Caldera, with part of a pancake-shaped dacite flow on the center-right.



The ERTH605 Cascades Field Trip started out at beautiful Mt. Shasta (California), the largest complex stratovolcano in the Quaternary Cascades Volcanic chain. The volcano was built through cycles of cone building and collapse stages.



the reins of operation of the electron microprobe facility from retiring faculty Mike Garcia in January and is excited to introduce its capabilities to new users.

ERTH 301 (Mineralogy) student **Hunter Polhemus** is receiving the American Mineralogical Society's Undergraduate Prize for his outstanding

contributions to Mineralogy Fall 2019. Hunter epitomizes the characteristics we encourage in undergraduates: capable of critical thinking, consistently self-evaluating, helpful to peers, and thirsty for scholarly challenge. In recognition of these achievements, Hunter is receiving a certificate from the Society and also the monograph Care and Documentation of Mineral Collections by Jean F. DeMouthe. This award was last bestowed to a UHM student in 2015.

Bridget Smith-Konter and her crustal deformation research group had productive and fun year monitoring postseismic earthquake deformation in California, developing codes to better study crustal motions, and contemplating tectonics on Titan (Saturn's largest moon). Graduate students **Lauren Ward** and **Liliane Burkhard** successfully defended their dissertation proposals this past year and have been making large strides on their way to investigating deformation of the San Andreas Fault System and tidal stresses of icy moons. Congratulations to Lauren as a recipient of the Bullard Fellowship for continuing students this year! Additionally, congratulations to Liliane for winning a JPL Visiting Scholar award to travel to NASA's Jet Propulsion Laboratory for collaborative research on Titan tidal stress modeling with Earth alum **Dr. Marissa Cameron!** We also welcomed postdoc **Dr. Kyle Murray** to our group in late spring – Kyle received his Ph.D. from Cornell this past May and is now settling in as a GeoPRISMS Postdoctoral Scholar at UHM where he will be integrating GPS and InSAR data to study crustal motions of the East African Rift Zone. Together, our group presented at four international conferences (Southern California Earthquake Center, AGU, LPSC, and Goldschmidt) with 9 submitted abstracts. We also published three papers, in topics ranging from last summer's M7.1 Ridgecrest earthquake (*Xu et al., 2019; Ponti et al., 2020*) to tidal stresses of Ganymede (*Cameron et al., 2020*) and have two more papers in review (*Xu et al., 2020; Dawson et al., 2020*). We also have three mature manuscripts about to be submitted for peer review on seismic moment accumulation rates (*Ward et al., 2020a*), crustal rigidity effects on surface deformation (*Ward et al., 2020b*), and earthquake cycle stress rates (*Burkhard et al., 2020*) of the San Andreas Fault System. Bridget continues to serve on the Southern California Earthquake Center (SCEC) Science Planning Committee and is stepping into the role of program director for our renewed **Earth Sciences on Volcanic Islands (ESVI) Research Experience for Undergraduates (REU)** program (see more in the **ESVI REU**

article).

On the educational front, Bridget served as academic advisor to EARTH majors and taught two semesters of Dynamic Earth (ERTH101 online). Also this year, we launched the NSF-funded **EP'IK (Earth-Planets-'Ike-Kuleana) Program**, which is aimed at diversifying and broadening participation in the geosciences amongst Hawai'i high school students and teachers (see more in the **EP'IK article**). We also had a busy year keeping *The Earth Moves Me!* Program active within Hawai'i's K-12 educational community. 15 undergraduate students (**Sophia Cleek, Nicky Cluff, Catherine Creadick, Haley Cremer, Tiana Hughes, Tina Huynh, Schelin Ireland, Nicole Lang, Eleanore Law, Oshaiah Long, Tehani Malterre, Caleb Mantanona, Alex Marshall, Theo Nguyen-Phuoc, and Britt Seifert**) served as Earth Moves Me! ambassadors this year, providing interactive geoscience educational activities at 15 different events (to local classrooms, at science recruiting events, and for visiting school groups on the UHM campus). Undergraduate student **Catherine Creadick** also presented a poster on the *Earth Moves Me!* initiative at the Fall 2019 AGU meeting (*Creadick et al.*, 2019). 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), which has grown to include over 450 UH students, faculty, and staff.

Paul Wessel continues to find spare time in between his Chair duties to work on projects on absolute plate motions (with new MS student **Andrew Chase** and with support from a recently funded NSF grant with collaborators at the University of Oslo, including former UH colleague **Clinton Conrad**). He also continues his work on the **Generic Mapping Tools**. Last summer we had a weeklong GMT summit with developers, the steering committee, and NSF program managers, after which we wrote another proposal to ensure that this key piece of research infrastructure will continue to see development and maintenance. Luckily, we were successful in securing a sizeable NSF grant to develop sustainable plans for GMT. While all this is going on we just managed to release the latest and greatest GMT version (6.1) on the 4th of July. While the work-from-home arrangement has numerous downsides, for Paul it has nevertheless saved 2 hours of commuting per day so productivity is way up. Unfortunately, because of COVID-19 the start of his 12-month sabbatical at the University of Oxford (initially planned for August 1) has now been delayed for 6 months, and will be reassessed in the late fall semester.

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Distinguished Alumnus

Buffy Cushman-Patz (MS 2003 in Geology & Geophysics), Founder and Head of School: SEEQS, The School for Examining Essential Questions of Sustainability

Our distinguished alumnus for 2020 is Buffy Cushman-Patz, one of Hawai'i's most outstanding and innovative educators. In 2013, Buffy founded the School for Examining Essential Questions of Sustainability (SEEQS), a STEM-oriented charter school in Honolulu. Buffy has emerged as a recognized leader in education both within Hawai'i and beyond. She was honored as a 2015 Pacific Business News 40 Under 40 selection in 2015, and recently SEEQS was one of 39 schools in the nation named as a 2020 Green Ribbon School by the U.S. Department of Education. We are proud to recognize Mrs. BCP (as she is known to her students) as the EARTH Sciences Distinguished Alumnus of 2020. The following is by Buffy and **John Sinton**, her Masters-degree advisor.



Buffy (aka Mrs. BCP) at work (from the SEEQS homepage).

John writes: Buffy began graduate studies in Hawai'i in autumn of 1999 following completion of her B.S. at the University of Florida. She had already participated in two major mid-ocean ridge oceanographic expeditions by this time, and arrived with an appreciation for science as something one actively did, not just something to learn. Her thesis studies in Hawai'i were part of the G-PRIME multi-disciplinary study of the Galápagos Spreading Center, which she supplemented with trips to Iceland for field work, symposia, and a RIDGE-sponsored summer school. She was on a field trip in south Iceland on September 11, 2001, the aftermath of which caused a delay in returning to Hawai'i and her duties as Teaching Assistant that fall.

Buffy was a productive student, completing a large number of glass analyses of Galápagos rocks, including travel to Florida to obtain volatile analyses on many of them. She was an active participant in department affairs, serving on at least one faculty search committee, and helping in the creation of the SOEST open house exhibit on Hawaiian Rocks – not so much in selecting the samples but in asking the question that resonated with the visiting school kids, “Why is it cool?” She completed her M.S. thesis Glass Compositions along the Galápagos Spreading Center, and a Hydrous Melting Model in 2003. Buffy left the department with a renewed commitment to education and set about obtaining the experience and credentials for her future career.

Buffy writes: My first full-time teaching role was as a summer school Algebra teacher at Kaimukī High School; I spent a portion of the following year as a part-time teaching at KHS before joining the Sea Education Association's Semester at Sea program as an Assistant Scientist on a sailing vessel that traveled from Hawai'i to Alaska to the Pacific Northwest. Upon returning to Hawai'i, I spent a year as the science specialist for a K-12 Hawai'i-focused charter school, before settling into a role as a math and science teacher at La Pietra Hawai'i School for Girls in 2005, where I taught middle school math, Chemistry, Physics (and one semester of Geology!).

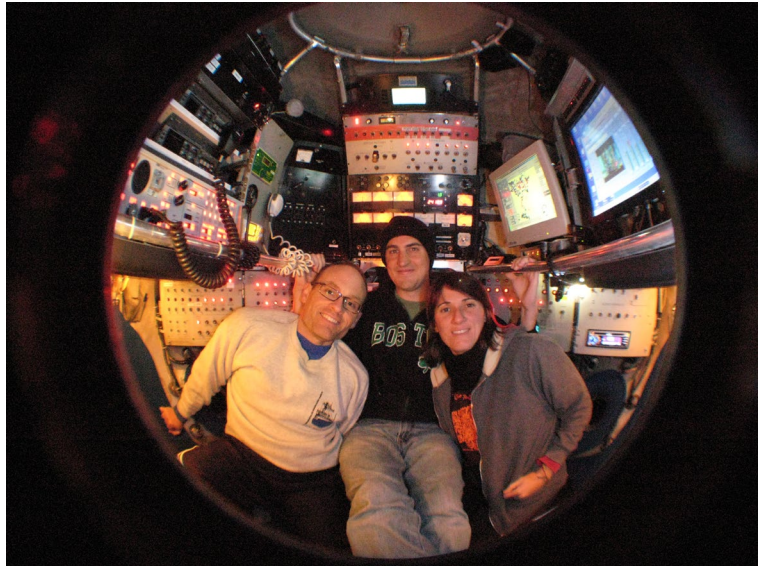
In 2010, I served as the “teacher at sea” for the GRUVEE cruise, in a collaboration with John Sinton and other colleagues, writing an in-depth blog for students on shore, and including a ship-to-shore call from the Alvin submersible to my students at La Pietra!

I was selected as an Albert Einstein Distinguished Educator Fellow with the National Science Foundation, Office of Legislative and Public Affairs, which took me to Washington D.C. for the 2010-2011 School Year. After the completion of my Einstein Fellowship in 2011, I moved on to Harvard Graduate School of Education, completing a Master of Education (Ed.M) in School Leadership with a concentration in school development. During that time, I also served as a principal-resident at a Boston-area public charter school, earning my principal's license.

Many of the papers I wrote at Harvard became the founding documents for **SEEQS: the School for Examining Essential Questions of Sustainability**, the STEM-oriented charter school I founded in Honolulu that opened its doors to its founding classes of 6th and 7th graders in 2013.

SEEQS has been extremely successful, reaching capacity enrollment of 180 middle schoolers with a waiting list, with plans to expand eventually to high school ages. The school is designed around examination of questions essential to Hawai'i's future -- through both disciplinary content courses and interdisciplinary project-based learning -- with a goal of producing graduates who will be *"stewards of planet Earth and healthy, effective citizens of the world."*

In 2015, I added "Mom" to my list of roles. My husband Ari Patz and I now have two daughters, Maddy (5) and Avery (2), both of whom are naturally drawn to climbing on rock outcrops. :) We live on the slopes of Puowaina (Punchbowl) crater.



Buffy (right) in the ALVIN submersible.



Buffy, Maddy, Ari, and Avery.

* * *

Alumni News

Kimi Artita (BS 2003): Here's my update: Hey y'all (LOL). Not sure when I checked in last. I was born and raised on O'ahu, but for the last 8 years we've been living in Clemson, SC where my husband is an associate professor in the Biological Sciences. After completing my undergrad at UH in G&G, I crossed over to the dark side: engineering. In 2012, I completed a PhD in Engineering Science from Southern Illinois University with a focus on maximizing hydrological ecosystem services by linking evolutionary algorithms with physically-based numerical models of agricultural and urban systems. For the past few years, I've been working remotely full-time as a consulting water resources engineer (currently with CDM Smith) for the Philadelphia Water Department. As a non-traditional engineer, I was finally able to take and pass the Professional Engineering exam here in SC last year (Yay more letters after my name!). Our boys are growing up: Aidan is starting high school and Brendan is starting middle school next year. I really miss Hawai'i and hope we can get back home soon now that the boys are old enough to go on longer hikes and enjoy the ocean. Definitely miss the food, places, people, and culture. To all the current faculty/students: please keep up the community outreach. It would be nice to see more local kids majoring in Earth Sciences!

Sebastien Biass (2016–2018 Postdoctoral Fellow) is a Research Fellow at the Earth Observatory of Singapore specializing in the dynamics of surface processes aimed at hazard assessment and quantitative assessment of volcanic impacts. Seb continues an intense collaboration on modern eruptions of Kīlauea volcano and is a recipient of the George Walker Award from IAVCEI.

Costanza Bonadonna (2002–2004 SOEST Young Investigator) is a Professor in Earth and Environmental Sciences at University of Geneva, Vice-dean of the Faculty of Sciences, and Director of the Certificate Program for Assessment and Management of Geological and Climate-related Risk. In April she was the European Platform of Woman Scientists' *Woman Scientist of the Month*.

Rebecca Carey (BS 2002, PhD 2008, current UH Affiliate Faculty) is a Senior Lecturer in Earth Sciences at University of Tasmania. Rebecca was the lead on UH's recently completed NSF award to study the 2012 submarine eruption of Havre volcano which generated 10 papers in international journals and 23 conference presentations. Rebecca has just returned from maternity leave after the birth of her second child, Mica.

Laura Corley (BS 2013, PhD 2019): I graduated in December with my PhD and moved to the mainland in January with my husband Michael and daughter Hazel (2 years). I am a stay-at-home mom for the time being, and Michael is an assistant professor at Weill Cornell Medicine in New York City. Michael has been doing all Covid-19 research since this all began, but all his work is from home (data analysis). Right as the coronavirus outbreak began in



Laura, Michael, and Hazel at Makapu`u (before the big move to the mainland).

that area, we rented a townhome in Greenwich, CT. We moved most of our things there, but returned to my parents' house in rural Bellefonte, Pennsylvania to ride out the pandemic. We are enjoying family time but looking forward to starting our new life in CT. I am also excited to be part of the team examining the unopened Apollo 17 samples at NASA's Johnson Space Center later this year for the Apollo Next Generation Sample Analysis (ANGSA) Program.

Bill Cutler (PhD 2011): After 10 wonderful years in Hawai'i, my wife Arlene and I moved to Boulder, CO in 2012, where I continue to work as a Principal Geologist for Integral Consulting. My consulting practice is mostly in the area of environmental site assessment and remediation, focusing on contaminated soil and groundwater issues. However, I continue to provide support to an international lithium producer at their "mine" in the high Andes (Altiplano) of Argentina. The lithium resource is in brine, in a dry salt lake (salar) at 14,000 ft elevation. This area of the Altiplano, straddling Argentina, Bolivia and Chile, is the epicenter of global lithium production. With support of my Integral colleague, Sean Kosinski, we've developed a numerical reservoir model to aid in brine extraction, and are supporting exploratory drilling to further define the lithium resource. I get back to Hawai'i occasionally (although not lately due to COVID) to work with our Integral Hawai'i staff on various projects on O'ahu and Big Island. Stay safe everyone.



Sean Kosinski (left) and Bill Cutler (right), exploring geology and water resources in the Altiplano of Argentina at 14,000 ft elevation.

Julia Eychenne (2013-2016 SOEST Post-doctoral researcher) I am currently a Research Fellow at University Clermont Auvergne in France, working on the formation and dispersion of volcanic ash, and its impact on human health. I am part of an interdisciplinary project involving volcanologists, biologists and medical practitioners.

Emily First (PhD 2017): **Benoit** and I were overjoyed to welcome our son, Gabriel, this past December! He is a giggly, chubby little ray of light in these difficult times. In other exciting news, Benoit is a newly-minted American citizen! While he works as PI of his own NSF grants, Emily is finishing up a post-doc at Brown University. At the end of this year, we will move to upstate New York to continue our academic adventures at Cornell University. Emily will be extending her focus to exoplanets, funded by the 51 Pegasi b Fellowship in Planetary Astronomy, awarded by the Heising-Simons Foundation. We look forward to the waterfalls in Ithaca, but not so much the long, cold winters. We hope



Benoit, Gabriel, and Emily.

to take Gabriel to visit his French family on Reunion Island as soon as the world calms... Second generation volcanologist, perhaps?!

Christian Gandy (MS 2006): Here's the latest from my end. We moved back from Wiesbaden, Germany in 2016, where I was working as the resident Geologist for the US Army Corp of Engineers, Europe District. I got to participate in a number of exciting environmental projects including working with state and federal regulators in the state of Rheinland-Phalz on many sites related to legacy Army contamination. Additionally, I was part of an American team which traveled to Gyndnia, Poland to negotiate the environmental sections of our SOFA treaty with Polish Government officials. Of course, we visited lots of cool places while there (Rome, Luxembourg, the Alps, Austria, etc.). After the Europe experience we landed in Baltimore, where I continue to work for the USACE Baltimore District as a Geologist/Project Manager. My focus is primarily large-scale environmental remediation of soil and groundwater on federal facilities. We now live in beautiful and old Ellicott City, MD. You may remember the town from the floods we've had the last couple years. It was in the news a lot. Neat fact: Ellicott City is the site of the first railroad station in this country, as part of the B&O Railroad (Baltimore-Ohio). Additionally, EC is where the National Pike starts. This the original road from east to west. I currently live right off this historic highway! I miss the islands dearly and hope return one day.

Helge Gonnermann (2006–2008 SOEST Young Investigator) is an Associate Professor in the Department of Earth Science at Rice University. He is a specialist in geological fluid mechanics and magmatic/volcanic processes and PI for the Rice Geofluids Laboratory. Helge has several ongoing projects with both UH and HVO.

Chris Gregg (PhD 2004 and current UH Affiliate Faculty) is a Professor in the Geosciences Department at Eastern Tennessee State University. Chris has extended his study of the human response to the 2014–2015 lava flow crisis at Pāhoā into parallel studies of the 2018 eruption.

Lucia Gurioli (Post-Doctoral Researcher 2001, research faculty 2002-2008): I moved from Hawai'i to Clermont Ferrand in France, with my husband Andrew Harris (previously faculty with HIGP), in 2009. We have both been in positions as full professors in Volcanology at the Laboratoire Magmas et Volcans (LMV) ever since. We moved from Honolulu with our first child, Thomas, who is now 13. Our second, Daniel, was born in Clermont Ferrand during our first summer here, meaning that we now have four nationalities and three languages in the household: Italian, English, Hawaiian and French.

I am a "Physicienne", which is equivalent to full professor. However, the specialty of the position means that my teaching duties are reduced to one-third. Another one-third of my time is dedicated to routine measurements and observations of the active French volcanoes in the Indian Ocean (Piton de La Fournaise and the submarine volcano, 50 km at east of Mayotte) through the Observation System **DynVolc**. This supports on-site observatory response to eruptive crises, where we typically have three or four a year on Piton de La Fournaise, so I am always busy! The remaining third is devoted to research. To support this, during my ten years in France I have enjoyed setting up, developing and managing a magnificent, state-of-the-art textural lab at LMV. The laboratory is currently configured to allow a full physical and textural characterization of volcanic products.

I am currently vice-director of OPGC (Observatoire de Physique du Globe de Clermont Ferrand), and am a member of the steering committee for the French national volcanology observation system (SNOV), which is a part of the monitoring network for the on-going Mayotte eruptive crisis (ReVoSiMa). I teach volcanology from the first year through Masters levels, as well as the local and regional geology to first year students. My research interests have become increasingly focused away from pyroclastic density currents and Plinian explosions

(which was my focus at G&G), and onto deciphering the complex mechanisms determining the conduit ascent of magmas and their fragmentation/effusive conditions during eruptions. To do this, I have developed an integrated approach that combines textural, petro-geochemical and geophysical data of the products emitted (pyroclasts and lavas). I have also experimented with new devices to collect and measure particles and their properties. The current evolution of my monitoring and research direction is that, recently, I have set up a consortium of volcanologists, doctors, biologists and chemists to study the physical characterization and chemistry of volcanic ash and its impact on human health. I am involved in several other regional, national and European projects, and I typically supervise one masters student (sometimes two), one PhD and one PostDoc every year.

Samuel Howell (PhD 2016) is an "Ocean World Scientist" at the Jet Propulsion Laboratory (Pasadena CA), where he is working on convection in icy planetary bodies and helping design concepts for future missions to Jupiter's icy satellite, Europa. Sam and **Marissa Cameron** (PhD 2018) visited UH and gave the department TGIF Seminar in February.



Samuel Howell

Samantha Isgett (BS 2010, PhD 2017) My update is pretty simple: Shelley and I welcomed a baby girl, named Maya, on August 31, 2019. We are currently looking for jobs and planning to move to North Carolina this summer. Before Maya arrived, I worked for the Hawai'i Emergency Management Agency, but have since decided to stay home with Maya for now. I have a little paper in the works on the summit ash erupted during the 2018 eruption of Kīlauea - a product of my time volunteering at HVO during the eruption response. We shall see what North Carolina brings!

Isaac Ishihara (BS 2013) and **Kendra Lynn** (PhD 2017) are wrapping up their time on the east coast, where Isaac continues to excel as an Environmental Scientist with Acer Associates in NJ. Kendra is working on her newly funded NSF proposal on Kīlauea's explosive eruptions as a Research Associate at the University of Delaware. They are both looking forward to moving back to Hawai'i in July because Kendra accepted a Research Geologist/Petrologist position at the USGS Hawaiian Volcano Observatory.



Isaac and Kendra

Samantha Jacob (BS 2012, MS 2015): My PhD (at Arizona State U) thus far has allowed me to study minerals on Mars with multispectral data from the Curiosity rover, model magma oceans on hypothetical exoplanets, and help prepare the Mastcam-Z camera for launch on the Perseverance rover. The 2020 spring semester was a crazy one for many reasons, one of them being studying for & passing my PhD qualifying exam. I presented the results of two of my projects to five ASU faculty members over Zoom and convinced them that I was on the right track to getting my PhD. I am currently writing up the results of my first

two PhD projects and hoping to have them published this summer. Also happening this summer (July, 2020), I will be celebrating my 30th birthday and a week later watching the Mars 2020 Perseverance rover launch (a rocket launch is a pretty cool birthday present). Personally, I'm feeling a bit of wanderlust because of the restrictions of quarantine this year. But I spent a couple weeks in Italy and Germany last summer, and of course got to see many Hawai'i friends at AGU in December. I'm excited to continue my work with Mars rovers that I started during my time in Hawai'i and continue having friend reunions in various places around the country (when travel resumes). Aloha from Mars!

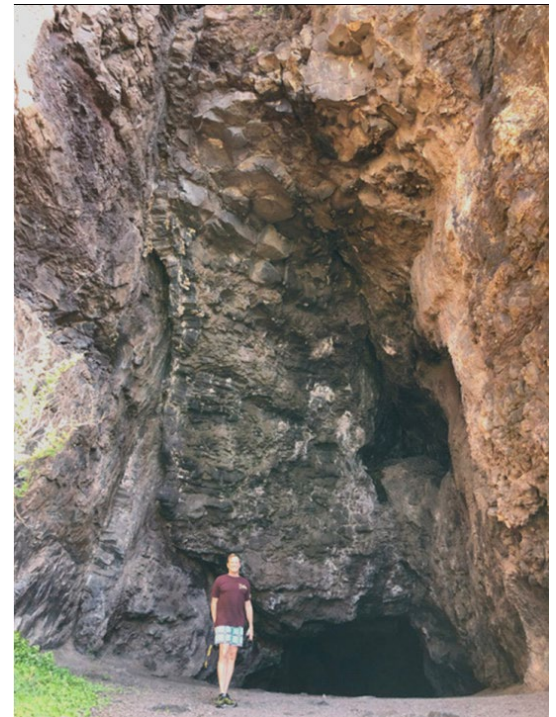
Jacque Kelly (PhD 2012): Patrick and I are enjoying life in Georgia. We welcomed Naomi Anne into our family in May 2019. During the 2019-2020 academic year, I served as Assistant Department Chair to the Department of Geology and Geography at Georgia Southern University and was awarded the University's award for Excellence in Teaching. I will be Interim Department Chair during the 2020-2021 academic year. Our family is looking forward to many great adventures this coming year!

Michael Knight (PhD 1988): I've been working the last 2+ years to develop a Geology Field Guide for O'ahu for visitors interested in geology and hiking. The guidebook will include 39 of my favorite geology spots around the island of O'ahu.

Xiaoqing Lai (PhD 2019): I hope this email finds everyone well. I returned to China and now I am a tenure-track junior professor in the Gemological Institute at the China University of Geosciences (Wuhan). I miss Hawai'i, especially the people there, and hope to visit Hawai'i in the future!



Samantha Jacob and a model of the Curiosity rover.



Mike Knight at Kāneana, stop #38 of the field guide.



Elise picked Canada Day, 2019 to cross the border and establish residency.

Elise Leroux (MGeo 2018). After many years working in the geotechnical field here in Hawai'i, Elise has moved back to her hometown of Toronto, Canada. She is now working with the Nuclear Waste Management Organization (NWMO) and

has been reconnecting with family, friends, as well as the diverse activities, avenues, and happenings offered by the Greater Toronto Area.

Floyd McCoy (BS 1962, MS 1965): Another excellent year of teaching and research from a base at Windward CC in Kāneʻohe, and attempting to provide the department with good undergraduate students, despite perturbations consequent of the pandemic affair. Research culminated in advising (with **Bruce Houghton** and Robert Littman) Ms. **Krista Evans** to successfully finish her MS work studying the precursory eruption that preceded the huge Plinian eruption of Santorini (Thera), Greece, in the Late Bronze Age, 3600 years ago. Krista researched not only eruptive mechanics and tephra dispersal patterns of the precursor eruption, but also cultural impacts of this eruption on the Minoan inhabitants of the island – archaeologists have excavated a city buried beneath the tephra, but no casualties from this catastrophe have been found. Archaeological data indicates they took the warning from the precursory activity and evacuated, but to where? There is little evidence in the Aegean at settlements to suggest new arrivals as refugees following the eruption. Combining eruptive behavior of both precursory and Plinian phases of the disaster, Krista concluded that the inhabitants escaped by sea and were likely annihilated there by pyroclastic flows transiting the sea-surface during the main phase of the eruption.

Tim McCoy (PhD 1994): I'm now in my 24th year at the Smithsonian's National Museum of Natural History in Washington, DC, where I'm the Curator-in-Charge of the National Meteorite Collection and Chair of the Dept. of Mineral Sciences. I've now been studying meteorites for more than 30 years. I have the good fortune to actively collaborate with alum **Gretchen Benedix** and have continued writing papers with my former advisor **Klaus Keil**, the most recent only a year ago. I've worked on or am working on six robotic spacecraft missions from NEAR to Psyche and collaborated with alumni **Dave Blewett**, **Beth Clark**, and **Jim Bell III**, among



Floyd (in SOEST shirt), his wife Ann (red shirt) and recent MS graduate Krista Evans (far right) within the archaeological excavation at Akrotiri.



Ann, and Krista looking at a fragment of a lithic bomb thrown into Akrotiri during the third phase of the eruption. This is only part of the bomb because was broken into thirds by the archaeologist so they could move it.



Tim McCoy at a White House astronomy night, during the Obama administration.



Catherine Morgan: Happiness is hiding in my car to write up my reports with a hot cup of coffee (it's cold in NJ).

others. I'm still married to Darlene and our two sons, Josh and Zach, are both enrolled at Miami University in Oxford, Ohio, studying computer hardware engineering and biology, respectively.

Catherine Morgan (BA 2018) I'm currently working two jobs in New Jersey. The main job is with a company called Alpha EMC and I perform stormwater pollution inspections on construction sites. The other job is part time with Home Depot working freight overnight or during the day in the garden center. I've also been looking at some jobs that are involved with site remediation and also autocad technicians. We bought a house(!) and it feels so nice to finally have a place of our own. I'd like to mention that I've learned how to survive through the winter comfortably. It was an adjustment.

Sebastian Mueller (2027–2018 Postdoctoral Fellow) left the department in November 2018 to become an associate editor in the Earth team at Nature Communications based in Berlin. His volcanology interest remains intense and he has edited a number of papers arising out of the 2018 LERZ eruption of Kīlauea.

Tim Orr (PhD 2015 and current UH Affiliate Faculty) accepted a research geology position at the Alaska Volcano Observatory (AVO) in Anchorage in 2017 but returned briefly to join the response team at HVO during the 2018 eruption at Kīlauea. Field work plans at Mount Douglas and Fourpeaked Volcano on the Alaska Peninsula are on hold, given ongoing Covid concerns. Likewise with fieldwork at the Klawasi Group mud volcanoes at the northern end of the Wrangell mountains. Mostly he has just been continuing to plug away at Hawai'i based projects, including a paper highlighting the 2007 perched lava channel, as well as a short paper correcting the historical record about the 1832, 1868, and 1877 summit eruptions.

Alexandra Pleus (MS 2018) is having a great time as a physics teacher and robotics coach at Iolani High School. Congratulations to Alexandra for her M.S. on the "Rheology and Thermal Structure of the Hawaiian Ridge Inferred from Gravity Data and Models of Plate Flexure" being published in Geophysical J. International in April!

Kolja Rotzol (PhD 2007): Not much has changed in the past 13 years since graduation. I am finally officially employed by the USGS Pacific Islands Water Science Center as a Hydrologist and (still) focus on groundwater modeling. Our son Nanuq is 2.5 years old and enjoys hiking, mountain biking on a shotgun seat, and of course the ocean. Our "zoo" is growing with the addition of a goat to the 3 cats, 2 dogs, and 3 chickens.

Elise Rumpf (PhD 2014): I recently accepted a permanent position as a Research Geologist with the USGS Astrogeology Science Center in Flagstaff, AZ. "Astro" was founded in the 1960s to help train the Apollo astronauts how to do fieldwork on the Moon! I've been a Mendenhall Postdoc at Astro for the past 3 years and I am very excited to continue my career at such an amazing science center. I mostly conduct terrestrial analog studies - looking at volcanic features here on Earth and comparing them to similar features on other planets. It's great having the San Francisco Volcanic Field in my backyard for fieldwork and I still make it back to the Big Island sometimes to look at recent lava flows. I also help develop some really cool out-of-school time planetary science curriculum for NASA. Check out planets-stem.org to see it! Outside of work, my boyfriend, Chuck, and I just bought a house and adopted a puppy, Ripley. We are definitely keeping busy!



This is fieldwork at the rim of SP Crater in the San Francisco Volcanic Field, AZ. You can see the SP lava flow and the Painted Desert behind me.

Clark Sherman (PhD 2000; Professor, University of Puerto Rico, Mayagüez): How's it going everybody? Here...earthquakes, a pandemic, now it's hurricane season – the fun never stops! Not much to report other than I'm still here, doing mostly reef stuff. I was part of a book chapter that came out last year (Puerto Rico, in Mesophotic Coral Ecosystems, Coral Reefs of the World vol. 12, Loya, Puglise, Bridge, Eds). I'm not sure that is alumni newsworthy, but some might find the chapter interesting. Hope you are all doing well.

Wendy Stovall (PhD 2009) is Deputy Scientist-in-Charge of the Yellowstone Volcano Observatory and Science Communicator for the USGS Volcano Hazards Program based at CVO. She played a major communications and liaison role in the 2018 volcanic crisis at Kīlauea.

Nick Turner (MS 2018) Since graduating in 2018, I moved to the State of Washington just outside of Seattle with my fiancée Josephine. Mount Rainier is only a two-hour drive away and Mount St. Helens is only a few hours away. I currently work at Amazon



Nick in Mt. Rainier National Park.

Web Services (AWS) as a software engineer focused on cloud computing. AWS dominates the cloud market and is the primary cloud provider for the USGS and NASA. I have been enjoying all of the outdoor activities that Washington has to offer, from paddle boarding down a river to snow camping.

Ryan Twigg-Smith (BA 2018): I am stationed in Germany and before COVID hit, had the opportunity to visit a lot of neighboring countries.



Second Lieutenant Ryan Twigg-Smith.



One of the places that Ryan Twigg-Smith visited is called Franconian Switzerland. The area has lots of limestone and very steep terrain, and it is great for hiking.

Loyc Vanderkluyzen (PhD 2008) and **Meryl McDowell** (PhD 2009) still live in Philadelphia, where they recently bought their first house! Loyc is thrilled to share that he was granted tenure at Drexel University, where



Meryl and Loyc in front of the Borgund stave church in September 2019, the last time we traveled anywhere really.

has been a geoscience professor since 2014. Meryl works for a small company located in Bryn Mawr (PA), where she develops algorithms for radar data analysis.

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Field Trips

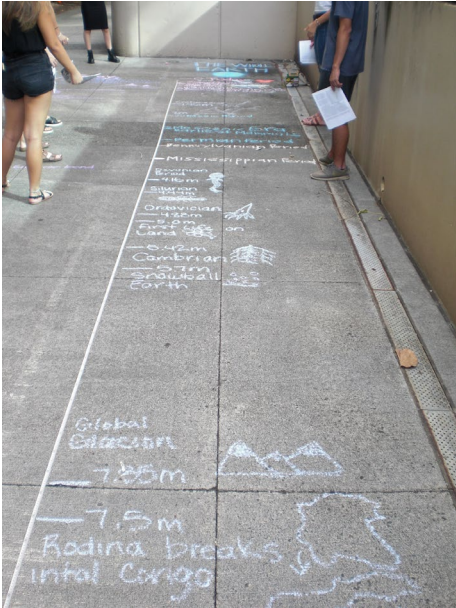
ERTH 101L & 104



ERTH 101L Learning to navigate with GPS and maps, Fall 2019.



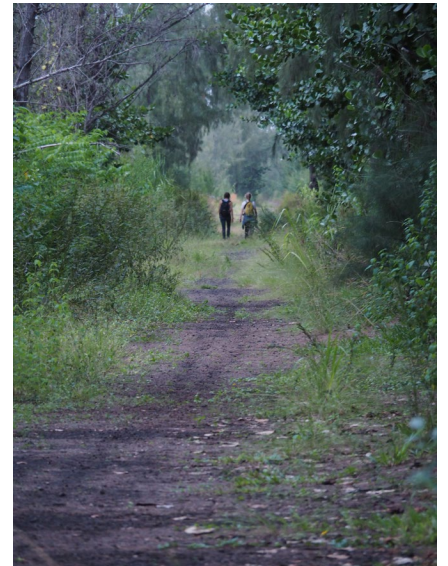
Earthquake!!, EARTH 101L



ERTH 101L beautifying campus with a geologic timeline, Fall 2019.



ERTH101L students constructing a beach profile at Wai'alaie beach park, Fall 2019.



ERTH 101L and 104 students hiking to Kapoho lighthouse.



ERTH101L and 104 students at Kilauea Iki vent, Fall, 2019. Almost exactly 60 years earlier, this would not have been a good place to stand.



ERTH101L and 104 students examining a brand-new, and in places >200°C outcrop cut through the 2018 Kilauea lava flows, near the 4-Corners area of Kapoho. A year earlier, this would not have been a good place to stand, either.



ERTH101L and 104 students creating geologic maps along the coast of Lē`ahi, Fall 2019.



ERTH104 students learn about growing kalo in a dry place from Eric Enos of Ka`ala Farms, Fall 2019.



Service learning at its best: ERTH101L and 104 students after clearing a spring of invasive Job's tears, Waipao, Fall 2019.



ERTH101L and 104 students at Kalalau overlook, Fall 2019.



TA Kaimana Kawaha offering praise to the ERTH104 students and their final-project pōhaku, Fall 2019.



To jump or not to jump, Ahukini landing, Kaua`i.



Olokele plateau, photo by Haley Cremer, Fall 2019.



ERTH305 students putting happy faces on Wai`anae mapping that was supposed to be in the Mojave desert.



First day in the "field", learning how to collect bearings with a Brunton, measuring distances by pace, etc.



Rhyodacite at Mauna Kūwale: amphibole has water in its structure, water means the magma source was hydrous; more than one student was heard to say "...now it's all coming together..."



Examining the mineralogy, and measuring the orientation of, a real dike at Makapu`u.



All ready to map at Hanauma Bay.



Mapping at Hanauma Bay.



Hand lens + cell phone = macrophotography! Smart, these students nowadays.

ERTH 306



Groundwater dripping out of the ceiling: EARTH306 students at Waihe'e tunnel, Fall 2019.



Hydrology includes learning some of the traditional methods of capturing and using water. Mahalo to Mahi LaPierre for giving us an excellent tour of Waipao.



Streamflow measurements, in Mānoa stream, behind the dorms.



Good ol' Darcy gets two thumbs up.

ERTH 455



ERTH 455 (Hydrogeology) during a visit to the Waihe'e Tunnel.



Students in ERTH 455 (Hydrogeology) preparing for a groundwater laboratory experiment.

ERTH 461



Students in ERTH461 (Geospatial Information) spent a hot sooty day gathering real GPS data round and within a brushfire scar to get practice with importing real data to GIS software.



All kinds of treasures are revealed when the weeds are burned away.

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.

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