# GeoGram

*A publication of* The University of Maryland Department of Geology

2018

Photo credit: Dr. Thomas Holtz

## INSIDE THIS ISSUE



## LETTER FROM THE CHAIR

As always seems to be the case, the past year was busy and eventful for the Department of Geology. One big change that occurred is that **Phil Candela** retired over the summer. Phil began his career at Maryland back in 1982. As many of you know, Phil taught ever-popular courses in economic geology and thermodynamics. Phil had also taken over the reins of the Senior Thesis course (GEOL 393-394) when **Peter Stifel** retired in 1996. He ably ran the course for 20 years and I am sure many of you recall working with Phil to select and advance your projects. With his departure, **Phil Piccoli** has assumed the leadership role for Senior Thesis. We currently have no plans to make having the name "Phil" a requirement for the leadership of the course, but given how well the Phils have worked out, maybe we should.

Although we don't have "faculty lines" that automatically get re-filled when someone departs, we were fortunate to be permitted to search for a new assistant professor last spring. We received applications from a large number of accomplished scientists, interviewed six, and settled on **Dr. Megan Newcombe**, who will join our Department in Fall 2019. Megan is both a volcanologist and an experimental petrologist. I'll provide you with more details about Megan's research interests in next years' *Geogram*. With respect to other personnel matters, I am also very pleased to announce that in the past year, **Dr. Laurent Montesi** was promoted from Associate to Full Professor, and **Dr. Vedran Lekic** was promoted from Assistant to Associate Professor. Congratulations to both!

In other news, in October we hosted the first annual *Helz Lecture* by **Dr. Gene Likens** of the Cary Institute. Dr. Likens presented a public lecture titled "Acid Rain: A long and unfinished journey from discovery to political action". Dr. Likens is famous for first recognizing the problem of acid rain way back in the 1960's, then providing major scientific input into political efforts to reduce the problem. The lecture drew a large crowd. As a reminder, the visit of the *Helz Lecturer* is supported by an endowment created by **Rosalind and George Helz**. The lecture by Dr. Likens got us off to a great start and we expect similarly great lectures to be presented annually. If you are in the area and see the announcement for the next *Helz Lecture*, please come. Thanks again to Roz and George for their generosity, and also to **Dr. Sujay Kaushal** for organizing this years' event!

Elsewhere in the *Geogram* you will find information about the many honors and awards bestowed upon our faculty and students in the past year. I hope you will be impressed with their accomplishments, and recognize that we are able to continue to attract to our program talented and innovative undergraduate and graduate students.

When possible, we try to have visiting alumni speak with our students. You may be able to provide valuable insights to our students regarding professional careers. For example, this year **Rick Zimmerman** (Class of 1975) spoke to students about opportunities in the oil and gas extraction industry. Student feedback indicates that they are very interested in hearing what career pathways you may have taken to get where you are today. So…. as I do every year, whenever you have the opportunity I encourage you to visit and renew your ties to the Department and University. We'll be happy to see you!

Richard J. Walker

# Faculty Highlight

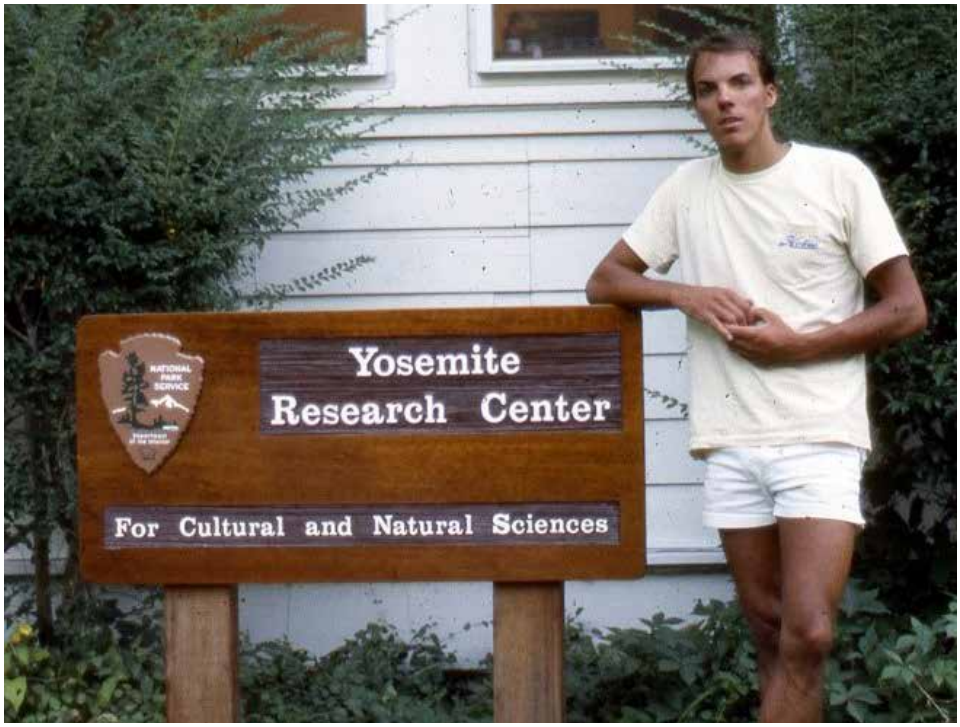
## Don't take him for Granite:

## Philip M. Piccoli

By
Professor Alan J. Kaufman

Over the past 30 years, **Phil Piccoli** has worn many hats for the Department of Geology – ranging from PhD student to Director of the Senior Thesis Program, and many mission-critical positions in-between. Arriving at the department in 1987, just a couple of years after the Graduate Program was initiated, Phil was attracted by the young, hungry, and untenured faculty at Maryland, including **Roger Nielson** and **Phil Candela**. Piccoli said, "*The first time I met Phil [Candela] he had an eye patch on. I thought he was a pirate.*" He acknowledged that Candela's knowledge of science was infectious, and the project they developed to look at minerals in granites that contain chlorine (as indicators of their metal fertility) would change his life and solidify his igneous foundation at the Department of Geology.

Piccoli had been interested in granites since his undergraduate days at the University of Montana working with **Don Hyndman**, a petrologist and leader in studies of the origin of granites. "*That experience provided an opportunity to perform a large-scale reconnaissance study…while exploring the interior of Idaho, and towns such as Stibnite and Yellow Pine. The combination of geology and travel hooked me for good*," said Piccoli. Phil completed a senior thesis at Montana that he says was "*transformational in my development,*" on the magnetite-ilmenite boundary in the Idaho Batholith. He presented the results of his study at the Cordilleran Section of the GSA in Boise, Idaho in 1985 – without telling his advisor – although they would ultimately publish the work together in the journal ***Northwest Geology***.




**PhD student Phil Piccoli back in 1989 at the Yosemite Research Center in Yosemite National Park, California.**

Traveling east, Piccoli continued with graduate studies at the University of Pittsburgh on a Masters project looking at the origin of the Old Rag granite in Shenandoah National Park, with advisor **Ed Lidiak**, a petrologist interested in the formation of spillites and keratophyres (forms of altered basalt that often co-occur with marine sediments). For his field-based PhD at the University of Maryland, Phil travelled to the Tuolumne Meadows in Yosemite National Park in California to collect samples, analyze the halogen contents of the minerals within them, and ultimately develop models of ore genesis. Along the way, Piccoli crystallized a permanent niche for himself at Maryland as the electron probe technician – after working long hours with Candela and **Ann Wylie** to come up with an analytical protocol for the instrument.

Armed with his PhD, technical expertise, and his wife Anne, Piccoli started looking for new mountains to climb, and was offered a position to run a laboratory at MIT. While the opportunity was intriguing, Phil said, "*The biggest drawback of the position was that I could not write grant proposals.*" The Department of Geology at Maryland offered a more open approach that provided a lot of flexibility for non-tenure track scientists, including the ability to write grants and sit around the faculty table. With these enticements on top of the field- and laboratory-based research agenda that Piccoli and Candela had forged – not to mention that his wife is from Maryland – Phil decided to stay on as a Post-doctoral Fellow, and subsequently as a Research Scientist. With five secure years of DOE funding, Phil found himself travelling back to California working on an exciting project on the hydrothermal energy potential of the Bishop Tuff system in Long Valley. While

**Phil Piccoli posing in his backyard with a ca. 1900 National Geographic photo from Overhanging Rock near Glacier Point at Yosemite National Park, California.**

Piccoli learned a lot about halogen contents in magmatic systems, the DOE project fizzled when drillers found less heat energy in the rocks than would be economically viable.

To supplement his salary, Piccoli became the department IT guru and started teaching a variety of different courses, including the high enrollment GEOL 100 Introductory Geology course. He also team taught graduate-level courses in Crustal Petrology with **Mike Brown**. Together they co-edited a book titled The Origin of Granites and Related Rocks that was published synonymously with the 3rd Hutton Symposium of the same name held at the University of Maryland in 1995, as well as the 1st Granulites and Granulites conference held in Brazil in 2006. Of Piccoli, Brown said, "*I have worked with Phil since I first came to Maryland because much of my research relies on imaging and the microanalysis of minerals in rocks. Our close co-supervision of several young scientists has led to co-authorship of around ten peer-reviewed scientific articles. He has been an important member of my research group for a long time, and our research could not have been done without him!*"

Phil Candela was equally effusive about Piccoli's critical and sustaining role in success of the Laboratory for Mineral Deposits Research (LMDR). For thirty years, Candela said, "*Phil and I work together seamlessly: we can sometimes anticipate each other's moves (and at other times be surprised, which is cool).*" The successful igneous team produced many students working in academia, government and industry; they enjoyed both academic success in students and publications, and funding success with governmental agencies. Candela concluded "*I think Phil and I have learned a lot from each other as we have gone along our journey through science. It has definitely been a lot of fun!*"

It was a natural progression then for the Senior Thesis Program coordinator position to be passed on from Candela (who had supervised the course and the program for the past 20 years) to Phil Piccoli. Notably, Piccoli started early with the Senior Thesis program at Maryland, co-advising two undergraduates while he was still a graduate student. Since then Phil has advised nearly 45 different students, including 1996 advisee **Katrin Kral** who wrote, "*Dr. Piccoli was a true mentor…The skills he taught me have been invaluable to me throughout my career as an environmental scientist.*" At the other end of the temporal spectrum, his 2017 advisee **Joe Browning** – currently a graduate student at Johns Hopkins University – said, "*As a senior thesis advisor, Phil always made himself available to discuss details of the project and personal struggles alike. Phil exemplifies the sort of academic I strive to be.*" With regard to the program he now coordinates (following in the footsteps of Candela and before him **Peter Stifel**), Piccoli suggests that designing a problem, collecting and interpreting data, and presenting it to others are important and rewarding life lessons.

With over 30 years of service, Phil Piccoli's deep igneous roots have stabilized both the students and the faculty. He has seen the Department of Geology weather great changes in difficult times, and with new hires and new disciplinary directions become multi-dimensional. He looks forward to new research opportunities with the recent hiring of experimental petrologist and volcanologist **Megan Newcombe**, and to leading the Senior Thesis Program well into the future.

**Phil Piccoli (left) in 2002 with Phil Candela, Bill Rember (University of Idaho), Adam Simon (UMD, now at the University of Michigan), and Jeff Huber (University of Idaho) near the crest of the Sawtooth Mountains.**

# Graduate Student Highlight

## Phillip Goodling

By
Associate Professor Karen Prestegaard

**Dr. Ved Lekic (left), Dakota Sparks (center), and Phillip Goodling (right) along NW Branch of the Anacostia river during seismic instrumentation deployment.**

When **Phillip Goodling** visited Maryland as a possible graduate student, **Dr. Ved Lekic** and I told him about a project that we were developing to use seismometers to study river hydraulics. Ved and I had done a preliminary project with our seismology and geomorphology classes in the spring of 2016; a project in which **Dr. Nick Schmerr** helped set up and run the experiment. The seismology graduate students produced some interesting results comparing the hydraulic and seismology data. We told Phillip about how excited we were by the results, but warned him that we had no additional experience doing this type of research and no funding for the project. Apparently, our enthusiasm for the project overwhelmed Phillip's good sense and he joined the department in the fall of 2016. He immediately took initiative to write proposals for small grants and mentored a Senior Thesis student, **Dakota Sparks**, as he picked sites along Northwest Branch to start monitoring river noise. Our proposal, *Listening to Rivers*, that we submitted to the Maryland Water Resources Center in January 2017 was funded along with Phillip's applications for a summer fellowship and a Cosmos Club grant.

In the winter of 2016-2017, the drought finally broke in California. Winter rains and snows were filling reservoirs to capacity and some reservoirs were filling beyond their capacity. At the Oroville dam in Northern California, engineers had to use the spillway to release water from the dam. The released discharges were quite high, which caused erosion of the concrete channel. During the crisis, water continued to erode the underlying soil and bedrock creating a deep chasm. Dam engineers diverted water to an emergency spillway and shut down the spillway for repairs. The Oroville dam, like most dams in California, had been monitored for earthquakes and induced seismicity since the 1970's. Phillip examined the seismic data along with the series of step-wise discharge changes to determine if the hydraulic noise changed in character due to the erosion of the spillway. He successfully determined the spillway seismic noise-hydraulic relationship using the data from the lone seismograph (it was a very noisy event). This analysis allowed him to detect the erosion of the spillway and to identify the source of the noise. He presented his work at an international conference on Environmental Seismology in the summer of 2017. The paper he wrote on the Oroville Dam Crisis "Seismic signature of turbulence during the 2017 Oroville Dam spillway erosion crisis was published in Earth Surface Dynamics in early 2018, and received the best student paper award from our Department. He also won an award for his graduate talk on the Oroville dam crisis in the spring of 2017.

The second half of Phillip's M.S. thesis involved a detailed study of both the hydraulics and seismic noise produced along a steep, boulder-cobble section of NW Branch. In this work, Phillip evaluated whether unit stream power or shear stress, which are measures of stream energy, should be used in the seismological-hydraulic evaluations rather than stream discharge. He presented this work at the AGU fall meeting along with another paper on stream dynamics at an urban stream confluence that he worked on with undergraduate student **Diego Burgos**, fellow graduate students, and I.

One of the Phillip's most impressive traits is his willingness and ability to mentor students, to help colleagues with field studies or analysis, and to do what needs to be done in order to keep research progressing. In addition to his assistance with other hydraulic-seismological studies, Phillip helped to set up and analyze seismometers in Delaware to monitor aftershocks from recent earthquakes. He served as a mentor to another undergraduate thesis student, **Peter Meehan**, who used seismometers to identify the source of booms in Cheverly, Maryland. (The noise is likely emanating from a recycling facility).

Phillip sets clear goals for himself that he achieves with great success ahead of schedule, which is an unusual trait for scientists and graduate students. His goal in graduate school was to obtain his master's degree and then work for the USGS. I introduced him to folks at the USGS shortly after he arrived at Maryland. They hired him through their Pathways program; a program designed to partially support graduate students and train future USGS employees at the same time. After successfully defending his thesis on "Sesimic Observations of Fluvial Energy Dissipation" in December of 2018, Phillip will become a full-time employee of the USGS. He is already deeply involved in projects on groundwater discharge to streams and its relationship to stream temperature regimes. He has also brought his seismo-hydro expertise to the USGS and he has set up instrumentation to monitor stream hydraulics with seismology in a dam removal study.

# Undergraduate Student Highlight

## Seismic Forensics: The Pete Meehan Story

By
Associate Professor Vedran Lekic


**Pete Meehan (center) accepts the reward for "Solving the Boom Mystery" from the Town of Cheverly. Phillip Goodling (left), a graduate student, and Ved Lekic (right), a professor in our department, assisted him in the sleuthing.**

In November of 2016, the Mayor of nearby town of Cheverly, MD, contacted the Geology department asking for input on an ongoing issue of concern for the community. The so-called "Cheverly Booms" had afflicted the community for fifteen years, garnering the attention of local and international media. Over the years, a lore came to be generated surrounding the mysterious origin of the booms, which have been reported as deafeningly loud, rattling objects in homes, and waking people up at night. Bewildered residents devised classification schemes, petitioned their government to investigate, and circulated rumors involving trains, industrial facilities, and even covert tunnel construction. After early efforts to identify their origin failed – at one point, the town installed gunshot detectors to pinpoint the origin of the Booms! – the town issued a financial reward to the first person who solves the mystery of the Cheverly Booms. In April of this year, **Peter Meehan**, having graduated with a degree in Geology a few months earlier, claimed the reward and solved the mystery, to the delight and relief of residents.

Throughout the 20th century, low frequency sounds of unidentified source have been reported along east coast. First described in New York State, along Lake Seneca, these sounds have been termed "Seneca Guns". Though these might be expected to result from anthropogenic noise such as explosions, recent instances of concentrated unidentified acoustic events have merited in-depth seismic investigation. Cases such as those in Moodus, Connecticut, in 1981, and Spokane, Washington, in 2001 were found to have resulted from shallow, low magnitude earthquakes. Because high frequency waves emitted by such shallow depth earthquakes are not attenuated by extended propagation through the ground, they can produce sounds that can be heard by residents.

Majoring in Geology was a natural choice for Pete, whose love for the outdoors evolved into a desire to understand the physical processes giving rise to mountains and valleys. Little wonder, then, that Pete couldn't resist the lure of a mystery in our own proverbial back yard. After learning of the Cheverly Booms while investigating potential topics for his Senior Thesis research, Pete dove right into the problem. With enthusiasm and gusto, he framed the mystery in terms of testable hypotheses, and set about designing a seismic experiment for determining the source of the Booms. He was not intimidated by the daunting challenges before him: programming and deploying the seismometers, "catching" a boom, and analyzing the data to determine its source, all had to be accomplished in two short semesters. Instead, he sought out input from **Phillip Goodling**, a graduate student in the seismology lab, and from **Prof. Nick Schmerr**, to learn how to use the seismic equipment and how to design an optimal arrangement for the seismic array. To demonstrate the feasibility of his project, Pete advocated a two-stage deployment with a small subset of stations being pulled out after two weeks to allow preliminary data analysis.

Recognizing that buy-in from residents of Cheverly would be crucial to ensuring the security and success of the seismic deployment, Pete worked with the Mayor to identify property owners and drafted a flier that explained in plain language how the seismometers worked and what their deployment would entail. He then went about organizing two teams of graduate students and postdocs in deploying the seismometers; five weeks later, he organized two more teams to physically collect the seismometers and set about analyzing the billions of data points collected by his instruments.

While the instruments were out in the field, Pete came up with quantitative diagnostics that would allow him to characterize the source of the Booms. First, he would

*(Continued on page 9)*

**Pete Meehan (left) assesses the status of a seismometer in Cheverly, Maryland, while graduate students Erin Cunningham (center) and Phillip Goodling (right) lend a helping hand. Photo by Tolulope Olugboji.**

# Research Focus

By
Assistant Professor Mong-Han Huang

Dr. Ling-Ho Chung (left) and Rebecca Butcher (right) are discussing fault shear zone and folding structure associated with the Chi-Chi earthquake fault slip at the Chelungpu Fault Museum in central Taiwan.

Our planet Earth is dynamic. Our landscape is a result of competitions between geologic, tectonic, and climatic forces throughout geologic time. On the other hand, earthquakes and landslides can dynamically modify Earth's surface in seconds to minutes. I grow up in Taiwan, an island with rapid (> 80 mm/yr) plate convergent rate that is more than two times faster than the San Andreas Fault is moving in California. Constantly feeling earthquakes and other natural hazards motivated me to become a geoscientist. My research interests mainly focus on using geodesy (measurement of Earth's geometric shape, orientation in space, and gravitational field) and seismology to study crustal deformation related to active plate tectonics. In the Active Tectonics Laboratory at the Department of Geology, University of Maryland, we use the techniques called "Interferometric Synthetic Aperture Radar (InSAR) and GPS to measure Earth's surface position and movement through time. We can use this technique to monitor surface movement before, during, and after earthquakes. We can also apply the same technique to monitor surface deformation related to volcanic activities, hydrologic cycles, landslide hazards, and land subsidence due to pumping of groundwater for human use. We attempt to understand the processes behind surface uplift, weathering and erosion, and how different components can shape our landscape and make Earth the way we see it today.

Rebecca Butcher is swinging a sledgehammer to generate active seismic source for a shallow seismic refraction survey in Williams, California.

Space geodesy is a very powerful tool for measuring crustal deformation related to earthquakes and plate movement. For example, earthquakes can move the Earth's surface from inches to yards. Depending on the magnitude and depth of the earthquake as well as the crustal rheologic condition, earthquake driven surface movement can continue for days or even for decades. This postseismic (after-earthquake) deformation can then serve as an ideal natural laboratory for probing lithospheric properties such as stress and temperature conditions, water content, friction and viscosity. Current Masters student, **Rebecca Butcher,** uses InSAR and GPS to monitor postseismic deformation following the 2016 Mw 6.4 MeiNong earthquake occurred in southwestern Taiwan. She processes four years of InSAR time series data to distinguish and quantify surface displacement before, during, and after the earthquake. She uses the postseismic measurements to constrain the location and the amount of fault slip that occurs after the main earthquake. With additional seismic evidence, she is able to apply physical models to explain the post-earthquake behavior. Current Senior Thesis student **Jeng Hann Chong** applies a related method to map coseismic displacement of the 2018 Mw 7.5 earthquake in Papua New Guinea. He is able to identify fault surface ruptures and earthquake induced landslides. A second Senior Thesis student **James Chen** studies coseismic stress change due to the 2018 Mw 6.4 Hualien earthquake in northeastern Taiwan. He compares correlation between regions with stress increase and aftershock locations, which has greater implication of future earthquake event potentials.

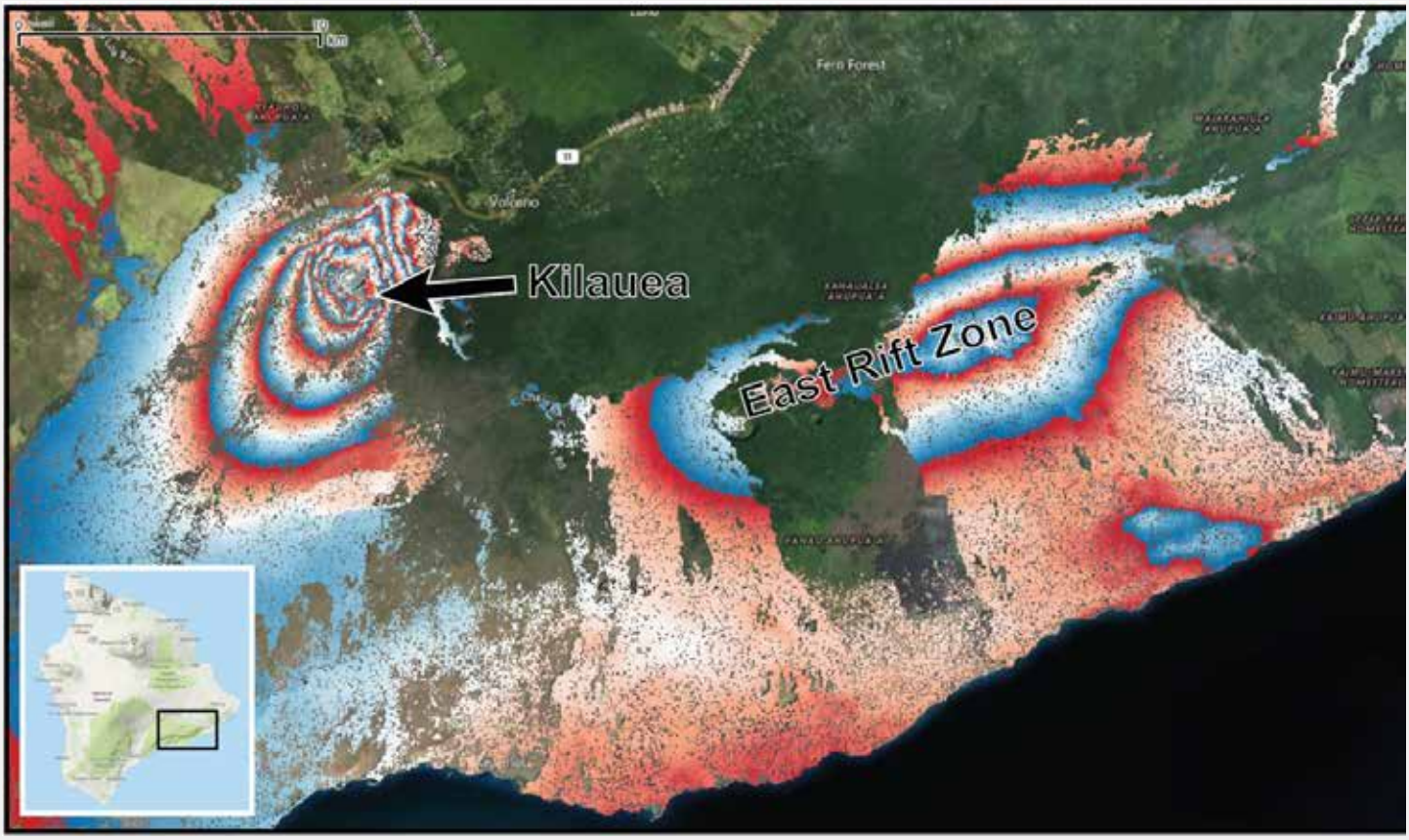
Landslides are one of the most pervasive global hazards, but they remain unpredictable. We use InSAR from freely-available satellite data to monitor ground surface deformation at several locations on Earth every 6 days. Current PhD student, **Jessica Schobelock,** uses InSAR to monitor crustal deformation due to slow-moving landslides and fault creep along the San Andreas Fault (SAF) in central California. She compares the volume of Earth moving from slow-moving landslides to the movement of the San Andreas Fault. This work allows her to assess the relations between landslide occurrence and faulting. We also utilize global and local meteorological for understanding how rainfall accelerates slow-moving landslides. Eventually we want to integrate our results into a global landslide inventory that can help facilitate hazard mitigation and transform our understanding of landslide mechanism by providing a wealth of landslide measurements. This work will ultimately lead us to develop a better landslide forecasting model, which will become increasingly important with the future

precipitation extremes that are predicted to occur in a warming climate.

Our landscape is a result of competitions between geologic, tectonic, and climatic forces. Rocks near the Earth's surface become weathered due to chemical, physical, and biological processes. The earth is thus covered with a porous and weathered "skin" where biota thrive and where water can be stored and released in different seasons. Besides monitoring Earth's surface from space, in our group we also conduct field surveys for detecting different properties of the Earth. We try to answer some landscape evolution questions relating to regional geology and river spacing by studying the landscape in northeastern California Coast Range. We use geophysical approaches including shallow seismic refraction to characterize the subsurface seismic velocity in different rock materials. We can then use these measurements to infer subsurface properties, such as the boundary between fresh and weathered bedrocks. We have been actively collaborating with researchers in different institutions on this effort. **Dr. Kristen Fauria** at Woods Hole Oceanographic Institution has been collecting samples to investigate long-term rock denudation rate and testing different numerical landscape evolution models to find similarity and differences between synthetic and real landscapes. **Prof. Daniella Rempe** at University of Texas, Austin is supporting in-situ measurements including borehole drillings and long-term soil-to-rock moisture measurements. Ultimately, we will combine field observations as well as numerical modeling tools to understand evolution from different kind of bedrock to soil and how they influence erosion and sediment transport that shapes landscapes to what it is like today.

A great part of what we do relies on collaboration between different departments, institutions, and even countries. Besides collaborations with institutions in the US, there is significant international collaborations with my home country, Taiwan. In summer 2018, Rebecca Butcher and I spent one month working with colleagues at Academia Sinica and National Central University in Taiwan for retrieving aftershock catalog, regional structural geology investigation, and interpretation of postseismic deformation mechanism. We also conducted field geology mapping in northwestern and southwestern Taiwan in order to confirm our findings from InSAR coseismic measurements.

In the future, I plan to use geodetic data to continuously measure crustal deformation and develop algorithms to train computers to identify hazards from a wealth of geodetic satellite datasets. I hope that this effort will elucidate the mechanisms of various geologic processes and probe our Earth's interior. In the meanwhile, we will continue field geophysics surveys to investigate the weathering process and the evolution of our landscape. Most of the work in our group involves a wide range of disciplines and institutional collaborations. We want to make significant contributions to the fundamental understanding of earthquake processes and to the monitoring of natural and anthropogenic hazards, particularly as they respond to a changing climate.




**The 2018 eruption event in Kilauea on Big Island, Hawaii. The fringes represent the density of surface uplift. One fringe represents 40 cm of displacement. There is about 80 cm surface subsidence along the east rift zone, and more than 2 m of surface subsidence near the Kilauea caldera.**

# Recognition & Awards

## Faculty & Staff

**Michael J. Evans** was awarded the AMS Editors' Award for serving as a reviewer for the Journal of Climate.

**Prof. Emeritus George Helz** is now a Fellow of the Geochemical Society.

**Laurent Montesi** was the recipient of a 2017 Editor's Citation for Excellence in Refereeing for Geochemistry, Geophysics, Geosystems.

## Students

**Grad Talk Award recipients (2018):** PhD Candidate: William Hoover *(Advisor: Penniston-Dorland)*, PhD pre-candidate: Connor Hilton *(Advisor: Walker)*, MS student: Rebecca Butcher (Advisor: Huang)

**Grad Paper Award (2018):** Phillip Goodling *(Advisors: Prestegaard/ Lekic)* received the 2018 award for the best student paper for your paper "Seismic signature of turbulence during the 2017 Oroville Dam spillway erosion crisis" which was published in Earth Surf. Dynam.

**Rebecca Butcher** *(Advisor: Huang)* was awarded an International Graduate Research Fellowship for conducting research on Post-Earthquake Deformation and Seismic Hazard at the Academia Sinica, Taiwan.

**Chao Gao** *(Advisor: Lekic)* received the Graduate School's Outstanding Graduate Assistant Award for 2018.

**Tyler Hicks, Alyssa Mills** and **Elizabeth Peters** were the recipients of the 2018 Undergraduate Field camp scholarships.

**Kayleigh Harvey** *(Advisor: Penniston-Dorland)* and **Will Hoover** *(Penniston-Dorland)* both received a Graduate Student Research Grant from the Geological Society of America.

**Anna Lowien** and **Jason Chase** who were awarded the 2018-19 Green Scholarship in Environmental Science and Restoration

**Angela Marusiak** *(Advisor: Schmerr)* received a 2018 NASA Earth and Space Science Fellowship (NESSF).

**Kevin Mei, Tyler Hicks, Emily Moy** and **Caroline Liegey** were the fall 2017 recipients of the Marc Lipella Memorial Scholarship.

**Morgan Adaire Nehring**, **Dashaun Horshaw, Ashely Fernandes** and **Jenna Reimer** were the fall 2018 recipients of the Marc Lipella Memorial Scholarship.

**2018-19 Green Scholarship in Environmental Science and Restoration awardees (L-R) Anna Lowien and Jason Chase.**

**Marc Lipella Memorial Scholarship awardees (L-R) Dashaun Horshaw Jenna Reimer, Adaire Nehring, Ashely Fernandes.**

**Alyssa Mills** was a recipient of a 2018 Summer Undergraduate Awards sponsored by the College of Computer, Mathematical, and Natural Sciences - Univ. of Maryland Alumni Network.

**Carol Morel** *(Advisor: Kaushal)*, **Phillip Goodling** *(Advisors: Lekic/Prestegaard)*, and **Joe Gallela** *(Advisor:Kaushal)* received the 2018-19 Green Fellowship in Global Climate Change.

**Karen Pearson** *(Advisor: Lekic)* received Seismological Society of America's Student Presentation Award for her presentation titled "Determining Periodicity in Non-Homogeneous Catalogs Using a Modified Schuster Test with Application to Induced Seismicity in Oklahoma" at Seismology of the Americas 2018 meeting in Miami, FL.

**Emily Worsham** *(former PhD Student, Advisor: Walker)* was named the winner for best student paper in planetary sciences at the 2018 Pellas-Ryder Award ceremony.

**Scott Wipperfurth** *(Advisor: McDonough)* received a Graduate School All-S.T.A.R. Fellowship.

**Tiange Xing** *(Advisor: Zhu)* received a Wylie Fellowship.

**2018-19 Green Fellowship in Global Climate Change awardees: Carol Morel, Phillip Goodling and Joe Gallela!**

## Underraduate Student Highlight

*(CONTINUED FROM PAGE 5)*

determine the frequency content of the energy recorded by the seismometers, in order to design a filter that maximized the signal and suppressed the noise. Then, he would determine the relative timing of the arrival of the boom-related ground vibrations; this information could be used to determine the location of the booms, including the depth; while anthropogenic sources of the booms would be located at or near the surface, earthquakes would typically be found at a depth of at least a couple of kilometers. Additionally, he would carry out polarization analyses, which would provide a secondary means of locating the source while also enabling an explosion to be distinguished from a fracture on a fault (i.e. an human-caused source to be distinguished from a natural earthquake).

Once his data were collected, Pete determined that the source of the Cheverly Booms as explosions at a metal recycling facility right outside the town limits. He also noticed that the waveforms of different booms were nearly indistinguishable one from another, allowing him to pinpoint the source with 10 meter uncertainty – an impressive feat! Finally, he used these waveforms as fingerprints to identify other Cheverly Booms that were not as widely reported by the public. Taken together, his undergraduate research – from the design, to the deployment and data collection phase, through the analysis and modeling – was a resounding success.

However, Pete did not stop there. Since graduating from Maryland in December, 2017, he has continued working on the project, setting up meetings with the town Mayor and presenting his findings. This past spring, he presented his findings to the owner and operators of the recycling plant that he identified as the source of the Booms. At the meeting, we learned that they will cease nighttime operations as a direct result of his findings! On April 26th, Pete presented his research at a town hall meeting in Cheverly, demonstrating an impressive ability to effectively communicate the key concepts behind sophisticated scientific analyses without getting bogged down with details. He displayed a similar talent for communication in his Senior Thesis presentations, during which he held both faculty and students in building suspense, awaiting his findings with anticipation. He made time for these efforts even while employed full time in The Stanley Black & Decker Leadership Program (SLP), which is designed to develop the next generation of company leaders, showing that Geology majors can be just as effective at finance as they are in fieldwork.

## Congratulations to our recent graduates & Post Docs!

**Doctoral Graduates**

**Nivea De Assis Magalheas**
Advisor: Penniston-Dorland, Winter 2018

**Alex Lopatka**
Advisor: Evans, Spring 2018

**Yadviga Zhekezinskaya**
Advisor: Farquhar/Kaufman, Spring 2018

**Masters Graduates**

**Shahan Haq**
Advisor:Kaushal, Fall 2018

**John Hollingsworth**
Advisor: Candela/Piccoli, Spring 2018

**Meng Guo**
Advisor: McDonough, Spring 2018

**Phillip Goodling**
Advisor: Lekic/Prestegaard, Fall 2018

**Postdoctoral Fellows**

**Tolulope M. Olugboji** has moved on to an Assistant Professorship at the University of Rochester. Advisor: Lekic.

**Andi Mundl** has moved on to a Postdoctoral Fellow at the University of Vienna. Advisor: Walker.

(L-R) Hope Tornabene, Diego Burgos, Gwen Sullivan, Kevin Mei, Liz Peters, Youchuan Huang, Maddy Turner

## Senior Thesis

The Department of Geology senior thesis program, coordinated by **Prof. Phil Candela** for 17 years has been a fixture of the Department of Geology since 1972. Senior thesis posters have enhanced the program since 2003; these represent one of the four presentations associated with the long established program, which is used as a model of success across campus. We wish each of our departing students, and newest alumni, the best of luck with their future endeavors.

Geology Senior Thesis Titles (GEOL 394): 2017/2018 Academic Year

**Adams, Jeffrey**. Strike Slip Faults on Jupiter's Moon Europa *(Advisor: Lekic);* **Burgos, Diego.** Sediment Transport into an Urban Tributary Junction (*Advisor: Prestegaard/Goodling);* **Liegey, Caroline.** Morphology and Formation Mechanisms of Cryovolcanoes in the Solar System (*Advisor:Prestegaard/Schmerr);* **Meehan, Peter.** Boom and Bust: Investigative Seismology in Cheverly, Maryland - Resolution of Booms by Use of a Seismic Nodal Array (*Advisor: Lekic);* **Mei, Kevin.** Diurnal variations in urban stream chemistry (*Advisor: Kaushal);* **Neuberger, Paul.** Emplacement of the Woodstock Granite In Granite, Maryland (*Advisor: Piccoli/Ash);* **Oliveros, Rhobeca.** Fractionation in a dike in the Tuolumne Batholith in California (*Advisor: Piccoli/Ash);* **Peters, Liz.** $\delta$34S variations in pyrite: An experimental study of sulfate reduction to evaluate the unusual S-isotope signature in Archean Pyrite (*Advisor: Farquhar/Dottin);* **Sullivan, Gwen.** Fluids in Subduction Zones: Production of Jadeite in Panoche Pass (*Advisor: Penniston-Dorland);* **Tornabene, Hope.** The Study of Siderophile Elements in Group IIC Iron Meteorites (*Advisor: Walker);* **Turner, Maddy.** Evidence for a polysulfane species in CM chondrites (*Advisor: Wu/Farquhar);* **Wang, Youchuan.** Thermal and compositional variations in the mantle inferred from the impedance contrast at the 410-km and 660-km discontinuities (*Advisor: Schmerr/Q. Huang);* **Williams, Benton.** Determination of the Modifying Effects of the Firn Aquifer in Helheim Glacier Using Reflection Seismology and Radar Surveys (*Advisor: Schmerr).*

To see the posters from this year's presentations and lists of theses over the past 40 years go to http://www.geol.umd.edu/seniorthesis.

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We are grateful for the generosity and continued commitment of our donors during the past several years, and we salute those of you who make annual gifts to support the department. We acknowledge the importance of each contribution in support of our education and research missions. Making available opportunities for students to be involved in the excitement of advancing knowledge is critical to the development of the next generation of scientists who will solve problems of societal relevance. In addition, for many of our undergraduates our ability to help with the costs of field camp and senior thesis research is critical to their success.

Your generosity benefits our students in many ways. Therefore, once again, we ask for your support. Tax-deductible gifts to the department can be made online through the UMCP Foundation website:

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Department of Geology
8000 Regents Drive
University of Maryland
College Park, MD 20742

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## GEOLOGY DEPARTMENT • FALL 2018

*Front Row, (l-r): Karen Prestegaard, William McDonough, Ann Wylie, Richard Walker, Mong-Han Huang, Laurent Montest, Philip Piccoli, Ricardo Arevalo, Alan Jay Kaufman, Michael Evans, Sarah Penniston-Dorland, Thomas Holtz, Sujay Kaushal, John Merck, Tracey Centorbi, Daniel Lathrop*

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## CONTACT US

Department of Geology
8000 Regents Drive
University of Maryland
College Park, MD 20742

301-405-4082 (p)
301-314-9661 (f)
geology@umd.edu

www.geol.umd.edu

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