



# The Geological Newsletter

NEWS OF THE GEOLOGICAL SOCIETY OF  
THE OREGON COUNTRY

January/February 2019  
Volume 85, Number 1

The Geological Society of the Oregon Country  
P.O. Box 907, Portland, OR 97207-0907  
[www.gsoc.org](http://www.gsoc.org)

## GSOC Earthquake Preparedness Outreach to Chinese Delegation

by Sheila Alfsen

In September 2018 Sheila Alfsen was contacted by Jessica Su, program director of MGC International and asked to design and conduct a training session for Chinese government delegates from the People's Republic of China. MGC International is a contractor of the State Administration of Foreign Experts Affairs of the P.R. China and they obtained contact information from the GSOC website.

*See Chinese Delegation, Page 4*



November's Huangshan Delegation Earthquake Preparedness Conference with Organizer GSOC Vice-President Sheila Alfsen, Dr. Scott Burns, Bill Burgel and Larry Kotan (not pictured).

## Calendar

### Friday Night Lecture

January 11, 2019, Cramer Hall, Portland State University

GSOC field trip leaders will present our "Year in Review" program with brief slide show summaries of their trips.

*see Year in Review, Page 2*

### Friday Night Lecture

February 8, 2019, Cramer Hall, Portland State University

Speaker Dr. Michael Cummings, emeritus PSU Professor of Geology, will present "Implementing Next Generation Science Standards in Oregon."

*see NGSS in Oregon, Page 2*

### GSOC 84<sup>th</sup> Annual Banquet

March 10, 2019

84<sup>th</sup> Annual Banquet at 12:30 – 3:45 p.m. at the Monarch Hotel, 12566 SE 93rd Ave., Clackamas, Oregon. Speaker will be Ian Madin, Earthquake Hazard Geologist, Oregon Department of Geology and Mineral Industries.

*see GSOC website, [www.gsoc.org](http://www.gsoc.org), for more information and sign-up*

**GSOC Friday Night Lectures** are held the second Friday evening of most months, 7:30 p.m., Rm. 53, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. Join GSOC members at Pizzicato Pizza, 1708 SW 6th Ave., at 6:00 p.m. before the lectures for an informal dinner and conversation. Check the GSOC website ([www.gsoc.org](http://www.gsoc.org)) for more information and updates to the calendar.

**Hourly rates** for parking are available in some parts of PSU parking structures. PSU Parking Structure #2, 1724 SW Broadway across from Cramer Hall is \$5.00 flat rate in the evening. Park in permit (NOT reserved) spaces and pay at the kiosk by entering your vehicle license number. There is also on street pay parking, and many mass transit options. Street parking is \$2.00 an hour, but free after 7:00 pm. More info available [here](#).

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**Year in Review**

*January 11, 2019, 7:30 to 9:00 pm, Cramer Hall*

This year's GSOC field trip leaders will present the "Year in Review" program with brief slide show summaries of their 2018 trips:

- Dave Olcott: "The Snake River Plain and Albion Mountains" June 2-8
- Paul Edison-Lahm: "Willamette East Bank Geological Bike Tour and Johnson Creek Van Tour," June 23, September 29
- Sheila Alfsen, "Mt. St. Helens Helicopter Tour," August 18
- Paul Edison-Lahm, "Camp Hancock and John Day Fossil Beds Field Trip," September 14-16

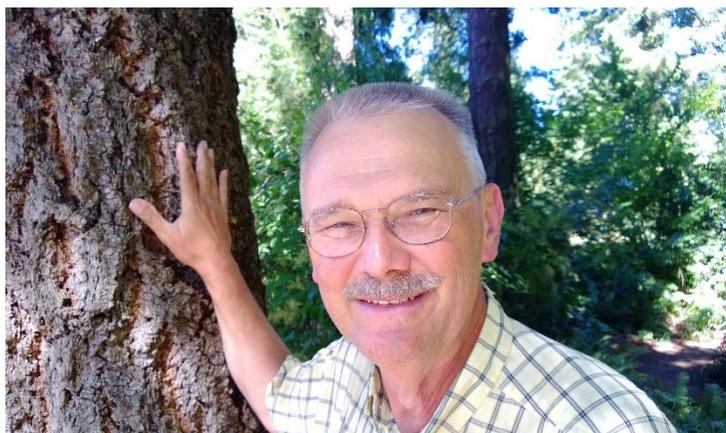
**NGSS in Oregon**

*February 8, 2019, 7:30 to 9:00 pm, Cramer Hall*

Dr. Michael Cummings will speak to GSOC at the February Friday night lecture about the advancement of science standards and professional development in Oregon public schools. In 2015, Oregon joined other states to adopt the Next Generation Science Standards (NGSS), which significantly changed the way science is taught in public schools. Supporting teachers as they made the shift from the old way of teaching science to the expectations of NGSS has been the focus of professional development since 2015. Cummings will describe three examples that illustrate how Oregon worked with teachers and districts to implement NGSS. These include: 1) Project based learning in the Mitchell School District, 2) Groundwater studies in Harney basin at Crane Union High School, and 3) Integration and implementation of NGSS in multi-grade classrooms.

Cummings grew up in Prentice, Wisconsin, a small, rural community in northern Wisconsin. His university degrees are from the University of Wisconsin-Eau Claire, University of Minnesota-Duluth and a Ph.D. from the University of Wisconsin-Madison. From 1979 he has been a faculty member of the Department of Geology,

Portland State University.



## GSOC Board Meeting Notes

December 14, 2018

In attendance board members Paul Edison-Lahm, Sheila Alfsen, Dawn Juliano, Carol Hasenberg, Rik Smoody, Bo Nonn, Larry Purchase, Julia Lanning. Also member Evelyn Bennett. Minutes of the October 2018 board meeting were approved.

The GSOC 2018 Nominating Committee was formed with members Dawn Juliano, Paul Edison-Lahm, Larry Purchase.

### EVENTS

Volunteer Recognition recap (Paul):

Thanks to Paul for organizing this event and board recommends a redo for next year. Board discussed need for a better connection between the board and club volunteers.

Earthquake Preparedness 10/29 & Chinese Delegation recap (Sheila)

- Other Earthquake Committee activities: Yumei Wang, OSSPAC
- Help from Scott Burns, Bill Burgel, Larry Koten. Net fees to GSOC were \$1500 less some expenses.
- OSSPAC meetings, Bill Burgel attending and updating us on state policy.

### Friday night lectures

Audio system – the board is taking steps to improve the quality of the audio system.

Upcoming speakers (Sheila) Speakers have been lined up through June.

Yumei Wang Le Val Lund Lecture (November 8, 2019) “Earthquakes, Disasters, and Resilience”. We will be co-hosting Yumei Wang’s award-winning lecture with the PSU Geology Department.

Nikki Miller will be our new snack coordinator for our Friday night meetings. Big thanks to Marty Muncie for performing these duties for so long!

### Field Trips and Other Events

RECAPS

FUTURE TRIPS

Mary’s Peak/Coast Range Trip: Sheila and Melanie Klym are working on this one-day trip. Board recommends date in early July.

Wallowas Trip June 19-24: Carol, Julia, and Evelyn Bennett on trip committee. Discussed including group campsite and Wednesday meeting space in fee structure.

Metro trips Downtown (May, Oct), Eastside Bike (June 29), Johnson Creek (Sept.) (Paul): all a go for 2019.

John Day raft trip: Board is currently exploring a geology and rafting trip down the John Day River in May. Decision whether to do this trip as a GSOC event in 2019 will happen in February.

Lewis River: Rik to determine date. Trip will be a one-day event.

Annual Banquet:

GSA Cordillera 2019: Tabled for next meeting.

### Other Old and New Business

Treasurer’s Report submitted by Dawn and approved by board.

Nomination Committee: Welcome Barb Stroud and Dennis Chamberlin to our nominations roster!

- President - Sheila Alfsen
- VP - Dennis Chamberlin
- Secretary - Barbara Stroud
- Treasurer - Dawn Juliano
- Director, 1 year - Carol Hasenberg
- Director, 2 years - Megan Faust
- Director, 3 years - Julia Lanning

Nominating Committee members Paul Edison-Lahm, Dawn Juliano, Larry Purchase. Thank you for your work!

## BOARD MEETING NOTES

*continued from Page 3*

### Other Old and New Business

Next board meeting will be on February 9, 2019, 10:00 a.m. at Paul's house.

Notes compiled by GSOC Secretary Carol Hasenberg.

## Chinese Delegation, *cont. from pg. 1*

*GSOC's Earthquake Preparedness Committee produces a presentation for Chinese officials*

The delegation consisted of officials from the Department of Land and Resources of Anhui Province and they wanted to learn specifically about earthquakes, landslides and floods that are prevalent in their country. The group was interested in knowing about precautionary measures that the United States has adopted, including early warning systems, emergency responses and data analysis to identify future events.

Sheila coordinated the two day program, held on November 5 and November 9th in Cramer Hall at Portland State University. She gave a preliminary lecture on the basics of all three geologic hazards and their causes and mitigation procedures. Bill Burgel of GSOC talked about seismic and lahar early warning systems and flood control measures for the Columbia and Willamette Rivers.

Scott Burns discussed urban landslides and methods to identify hazards and prepare assessment and risk maps. He included the technology of LIDAR and many images of mass movement locally. GSOC member Larry Kotan gave a presentation of Portland's NET program; Neighborhood Emergency Teams of Portland residents that are trained to be first responders by the Portland Bureau of Emergency Management.

During their visit to the Portland area, the delegates talked to emergency management officials in Clackamas County and Salem. Their primary reason for visiting the Portland area was to attend the workshop put on by GSOC members. GSOC is proud to be able to respond to such requests!



## Development of Earthquake Early Warning Systems

synopsis of the GSOC Friday night lecture given on September 21, 2018, with speaker William Burgel, retired employee and consultant of Union Pacific Railroad

by Carol Hasenberg

Recently joined GSOC member William Burgel, retired from working for and consulting with the Union Pacific Railroad, spoke to GSOC in September 2018 about his experiences in preparing the railroad system for earthquakes. His expertise stretches back to the 1960's, and along with performing his job for the railroad company, helped organize and deploy early warning systems for earthquake shaking applicable to government and industrial participants.



*Typical track deformation due to ground surface motion in an earthquake.*

After graduating from the University of Michigan in the 1960's, Burgel went to work for the Union Pacific Railroad in Pocatello, Idaho. In 1968, the Borah Peak earthquake made him concerned for the safety of railroad bridges, and this led him to develop an early warning system for shaking on the Union Pacific system.

His first warning system was to request that the National Earthquake Information Center (NEIC) in Golden, Colorado, telephone a warning to the railroad whenever larger events occurred. Then this system was replaced in 1983 with a fax system that worked rather well from 1983-1991. Magnitude 5 and over (M5.0+) earthquakes were targeted in this system. Stations at 2 mile increments called "blocks" signaled whether they received an electrical signal that passed through the rails or not. Problems were that track separation in cold weather changed the block's response to positive, but track offset due to earthquakes didn't affect the signal, since the track segments would still be touching.

Burgel arrived in Portland in 1986 when the dispatch center for UPRR moved there. He liked living in Portland and in 1989, when the UPRR moved the dispatch center to Omaha, Nebraska, far from earthquake country, Burgel opted to stay in Portland and work as a consultant for the company.

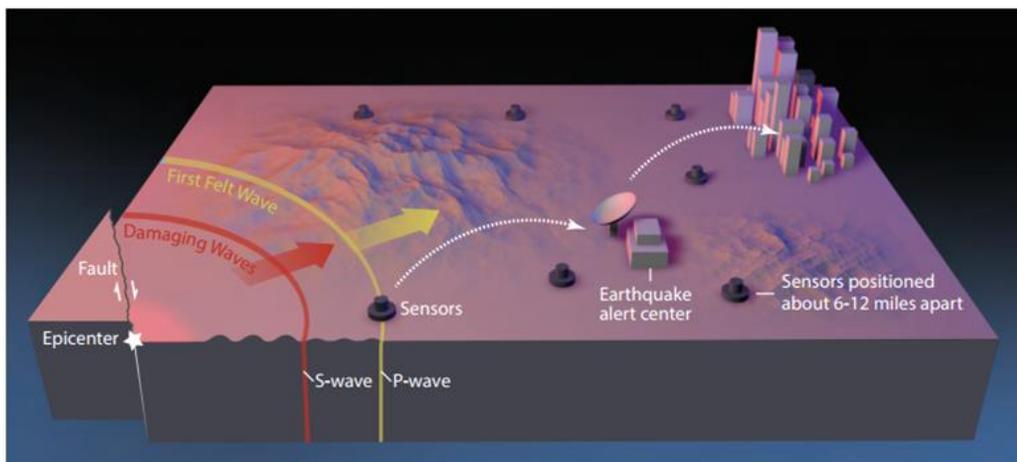
An important event driving the development of more sophisticated systems occurred on June 28, 1992, when the Landers earthquake occurred in the southern California desert. It was the strongest California earthquake in 40 years and it derailed a train from track offsets. As a result UPRR held meetings with the USGS researchers in Menlo Park, California, and researchers at 33 universities to discuss a new system. All the academics were excited that someone was really going to use their system. UPRR also invested a sizable amount in research donations to promote the development of the system.

As the algorithms for the new railroad warning system were developed, the USGS expressed concerns about false alerts coming up with a bogus earthquake and/or missing an event. But UPRR convinced the techs that they preferred erring on the side of caution. The Spring Break Quake, or the Scotts Mills Earthquake in Oregon, 1993, gave a successful test of the new system.

So the plan that was developed in early 1990s was to build a system of broad band seismographs to monitor earthquakes all over the country, which was released by the USGS as Early Notification System (ENS). UPRR was quite pleased with this system and wanted to make sure the research continued, so they continued funding grants of \$100,000 per year, spread out to ten universities, including a couple in the St. Louis area (the nearby New Madrid fault produced a series of very intense earthquakes in 1811-1812). This system is still in use today.

The current early warning system in development,

## ShakeAlert—An Earthquake Early Warning System for the United States West Coast

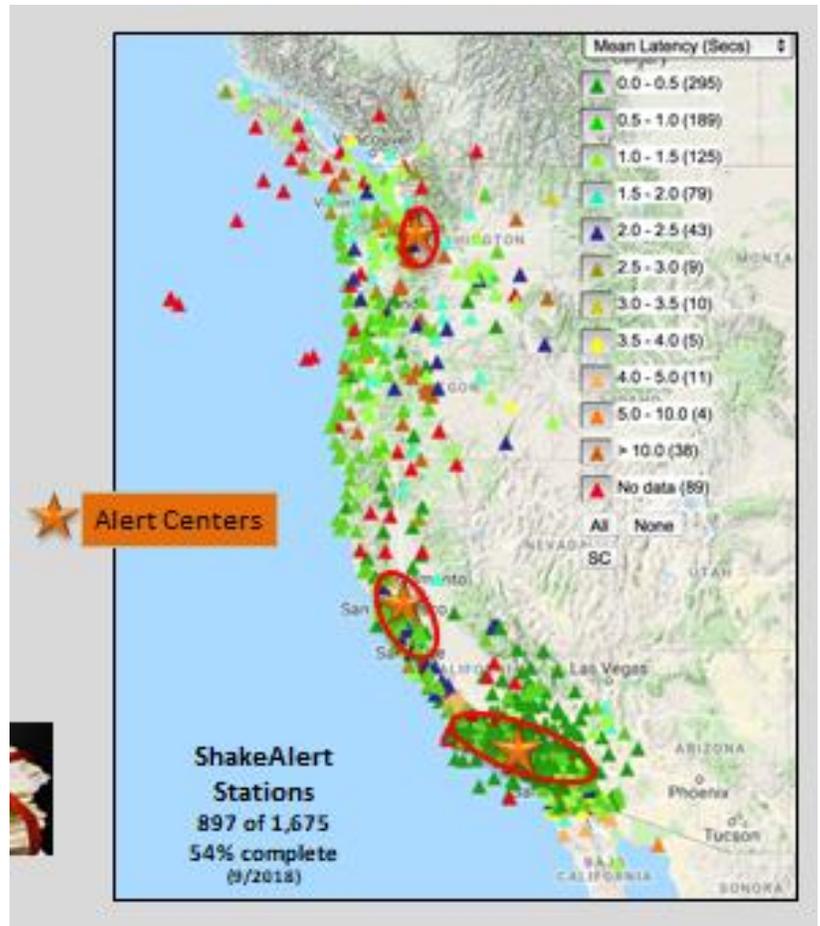


ShakeAlert, has evolved from a Japanese system, Shinkansen, which worked directly from sensors on the track to the train. ShakeAlert sends a signal from a sensor to an earthquake alert center. The center can broadcast the warning to multiple clients. At UPRR a trip wire alerts the trains. The system is designed to beat

the S waves to the sites of potential damage. There is a gap of time between the propagation of the initial P (pressure) waves and the S (shear) waves, which cause most of the damage. There is generally a bit of time to figure out the epicenter and territory affected by the quake and stop the trains in that area. This system has had limited operation in California since 2012 and has been used in several earthquake events.

Oregon will be in the PNW section of the ShakeAlert system, being built in a phased approach. Burgel's wish list is for Oregon to get this system operational. The funding is not all there and \$2M is still needed for the network sensors. If the reader is like minded, he suggests you contact your legislators. One problem Burgel foresees on the Oregon coast is that the sensors are there on the coast and not out in the ocean. So, there would not be much warning, in the event of a Cascadia Subduction Zone quake, for coastal clients. There would be about a minute of warning in Portland. Although if the propagation of rupture is from south to north along the Cascadia Subduction Zone Fault, then Portland may have up to 3 minutes of warning prior to damaging shaking.

You the reader can also be a part of the USGS ENS early warning system. What to do if you get a warning? Avoid injury! Stay in wood frame houses, don't get in an elevator, get out of and away from unreinforced masonry buildings (they can throw bricks quite a distance from the parapets), don't stand under power poles. Other resources for seismic preparedness include the Cascadia Playbook Overview produced by the state office of Emergency Management. Also available online is The Oregon Resilience Plan put out by OSSPAC. It might be a good idea to check out some of these resources and prepare, because basically you'll be on your own for quite awhile in the event of a major earthquake.



*Proposed ShakeAlert buildout showing station locations and time between warning and commencement of shaking.*



## In Memoriam: Connie Battaile

Connie Battaile of Portland was a retired librarian, author, botany and geology enthusiast. She was a mother and a grandmother.

Connie was born in West Virginia and raised in Waldport, Oregon. She held a psychology degree from Oregon State College.

She lived for a time in Ashland, Oregon, and was involved with public service and policy organizations, including the League of Women Voters, the Ashland Citizens Budget Committee, and the Jackson County Planning Commission.

According to her official obituary, she “received her Masters in Library Science from the University of Hawaii and worked as a librarian at the Medford Public Library, Southern Oregon State College (now SOU) library, and Colgate University library (Hamilton, NY).”

Connie held a variety of interests and did a wide variety of projects in her life, including authoring two books on library science, being a hospice volunteer and instructor for classes on making final arrangements, an interest in gardening, plant identification and preservation, an interest in Buddhist meditation and an interest in geology. The latter led her to become a GSOC member.

Memorial contributions may be made to the Oregon Community Foundation.

### WELCOME NEW MEMBERS!

Robert Jackson                      LaVon Murphy  
 Alan Hull  
 Lisa & Greg Johnson

...and Sebastian Faust, our youngest member, was born December 2018!

### NOMINATING COMMITTEE RESULTS

The following slate of officers has been selected by this year’s nominating committee:

- President..... Sheila Alfsen
- Vice President ..... Dennis Chamberlin
- Secretary ..... Barbara Stroud
- Treasurer..... Dawn Juliano
- Director, 3 years..... Julia Lanning
- Director, 2 years..... Megan Faust
- Director, 1 year ..... Carol Hasenberg

Nominations are closed for this year’s slate of officers. The slate of officers will be voted on and approved at the February monthly meeting.

The Nominating Committee members were Paul Edison-Lahm, Dawn Juliano, and Larry Purchase. Our thanks to the selected members and members of the Nominating Committee!

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Volume 84, 2018

compiled by Carol Hasenberg

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**The Geological Society of the Oregon Country** (GSOC) is a non-profit organization based in Portland, Oregon. The society is dedicated to the study of geology in the Pacific northwest and is open to persons with all levels of education and professional backgrounds. GSOC was formed in 1935.

In addition to Friday Night Lectures, GSOC offers field trips. Schedules vary year to year for the field trips. You must be a GSOC member or guest of a member to attend most GSOC field trips.

Schedules for all GSOC events are available on the GSOC website, [www.gsoc.org](http://www.gsoc.org). Online payment is also available for most activities and membership.

GSOC also maintains a library at Rm. 69, Cramer Hall, Portland State University. Open 7:00 p.m. prior to meetings.

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Geologic Interests and Hobbies \_\_\_\_\_

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## Kilauea's 2018 Eruption

by Carol Hasenberg

This article has been written to 'peak' your interest in the 2018 Kilauea eruption on the 'Big Island' of Hawaii in the Hawaiian Islands. USGS researchers have recently released a summary of the events of 2018 and their importance to the study of shield volcano eruptions in an article in *Science* on January 25, 2019, entitled 'The 2018 Rift Eruption and Summit Collapse of Kilauea Volcano.'

*See 2018 Kilauea Eruption, Page 14*



*A recent photo by the author from near the south side of the Halemau mau caldera on the peak of the Kilauea volcano. This is as close of an approach to the caldera as the USGS will allow these days. Before the eruptions in 2008, you used to be able to drive around the caldera, park your car and walk right up to the edge and look in. That parking lot and viewpoint have fallen into the current caldera. Most of the caldera rim drive has also been closed, and pedestrians may walk down a section to this viewpoint..*

## Calendar

### GSOC 84<sup>th</sup> Annual Banquet

March 10, 2019

84<sup>nd</sup> Annual Banquet at 12:30 – 3:45 p.m. at the Monarch Hotel, 12566 SE 93rd Ave., Clackamas, Oregon. Speaker Ian Madin, Earthquake Hazard Geologist, Oregon Department of Geology and Mineral Industries, will present "Three Newly Discovered Fault Systems in Oregon."

*see GSOC website, [www.gsoc.org](http://www.gsoc.org), for more information*

### Friday Night Lecture

April 12, 2019, Cramer Hall, Portland State University

Guest speaker Jon Krier, MA Archeology at University of Oregon, will present "20,000 Years of Pacific Northwest Coastlines."

*see PacNW Coastlines, Page 12*

### Friday Night Lecture

May 10, 2019, Cramer Hall, Portland State University

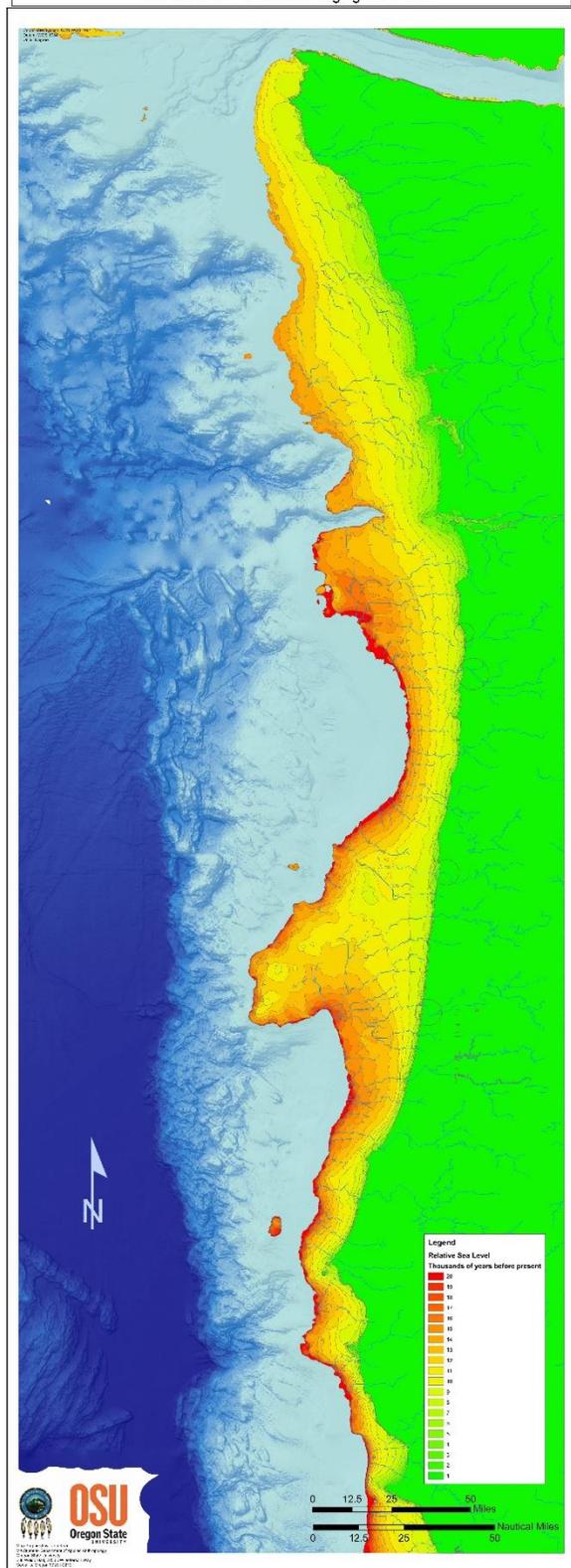
Guest speaker Dr. Seth Moran, Scientist-in-Charge, USGS Cascades Volcano Observatory, will present "The Relevance of the 2018 Kilauea Eruption to Volcanism in the Pacific Northwest."

*see GSOC website, [www.gsoc.org](http://www.gsoc.org), for more information*

**GSOC Friday Night Lectures** are held the second Friday evening of most months, 7:30 p.m., Rm. 53, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. Join GSOC members at Pizzicato Pizza, 1708 SW 6th Ave., at 6:00 p.m. before the lectures for an informal dinner and conversation. Check the GSOC website ([www.gsoc.org](http://www.gsoc.org)) for more information and updates to the calendar.

**Hourly rates** for parking are available in some parts of PSU parking structures. PSU Parking Structure #2, 1724 SW Broadway across from Cramer Hall is \$5.00 flat rate in the evening. Park in permit (NOT reserved) spaces and pay at the kiosk by entering your vehicle license number. There is also on street pay parking, and many mass transit options. Street parking is \$2.00 an hour, but free after 7:00 pm. More info available [here](#).

Isostatically Adjusted Paleoshorelines for Washington and Oregon:  
20 Thousand Years of Changing Shorelines



20,000 years of Pacific NW Coastlines. Illustration by Jon Krier, who did his master's work at Oregon State University.

## GSOC 84<sup>th</sup> Annual Banquet

*Sunday, March 10, 2019, 12:30 – 3:45 p.m. at the Monarch Hotel, Clackamas, Oregon*

The Geological Society of the Oregon Country invites you to its 84th Annual Banquet. Speaker Ian Madin will discuss three recently discovered fault systems: Mt Hood, The White Branch of The McKenzie, and the John Day fault.

Ian Madin has worked for the Oregon Department of Geology and Mineral Industries since 1987. His activities have included geologic mapping, investigations of potentially active faults and the development of detailed geologic models for improved hazard mapping, and supervision of the Geologic Survey and Mineral Land Reclamation and Regulation programs. Since 2007 he has managed the activities of the Oregon Lidar Consortium.

## PacNW Coastlines

*February 8, 2019, 7:30 to 9:00 pm, Cramer Hall*

As an archaeologist at the Museum of Natural and Cultural History at UO, Jon Krier's research has focused on predictive modeling of submerged sites in Beringia and the Pacific Northwest. Originally from Nome, Alaska, issues of Native sovereignty, traditional histories, and ecological knowledge have been of key importance for his research, which has sought to show that traditional knowledge can be used to complement scientific inquiry.

In 2016, Jon collaborated with the Confederated Tribes of Grand Ronde to apply his Beringian techniques to the Pacific Northwest coast using newly developed elevation models (DEM's) that accounted for the weight of continental ice sheets during over the last 20,000 years. The goal of the project was twofold: First, to get a clearer picture of how the Oregon and Washington coastlines had changed since the Last Glacial Maximum in light of newly developed DEM's that incorporated isostatic adjustments; Second, these models were further examined for culturally significant landscape features and compared and related to traditional histories of the Nehalem Tillamook. The analyses revealed a coastal landscape that was very different from the modern coastline, with peninsulas, bays, and a large coastal plain that has disappeared beneath the sea as sea levels rose after the end of the Pleistocene.

## GSOC Board Meeting Notes

February 16, 2019

President Paul Edison-Lahm called the meeting to order at his home. Other board members in attendance constituting quorum were Dawn Juliano, Sheila Alfsen, Rik Smoody, Larry Purchase, and Megan Faust (appearing remotely). Minutes of the December 2018 board meeting were approved.

### EVENTS

#### Friday night lectures

Audio system – in order to resolve our continuing Friday night lecture audio problems, we have ordered the brand of wireless lavalier microphone used by PSU through the PSU Geology Department.

The old digital projector given up for dead last year has been completely revived thanks to Patty Hyatt and her electronically-inclined husband! Discussion of what to do with what is now our second operating projector was tabled for now, but in the meantime we will order an HDMI converter to make the projector useful for all modern computers.

The board discussed the format of the annual 'Our Year in the Field' lecture and whether it should occur in December or January.

Sheila and Paul have speakers planned for April, May, June, and July. The decision about our August speaker was tabled to coincide with discussion about our August Annual Picnic venue.

Yumei Wang Le Val Lund Lecture (November 8, 2019) "Earthquakes, Disasters, and Resilience". Plans are continuing for this event.

### Field Trips and Other Events

#### FUTURE TRIPS

Mary's Peak/Coast Range Trip: The reconnaissance has been completed for this trip and it will occur in July.

Wallowas Trip June 19-24: The board approved the designation of this trip as the "President's Trip." Discussion of our registration policy and limits to field trip attendance was tabled.

Metro trips Downtown (May, Oct), Eastside Bike (June 29), Johnson Creek (Sept.) (Paul): Paul will be setting a May date for the Spring Downtown trip to avoid colliding with June events.

Lewis River: Rik determined a date for this one-day trip to be August 17.

#### OTHER EVENTS

Annual Banquet: The board has offered complimentary banquet tickets to Geology Department Office Manager Alisa Humphrey and guest and to geology faculty members as well.

Annual Picnic: Date set at August 11.

GSA Cordillera Meeting May 15-17, 2019; Sheila will be presenting on Puerto Rico at the AWG breakfast May 17.

#### Other Old and New Business

Treasurer's Report submitted by Dawn and approved by board.

Earthquake Committee: Paul will be writing an article on recent developments in Cascadia earthquake policy, including Oregon SB 95 (Critical Energy Infrastructure), Portland's URM controversy, Rep. DeFazio's Pacific Northwest Earthquake Preparedness Act, and other OSSPAC developments.

## BOARD MEETING NOTES

continued from Page 3

### Other Old and New Business

Newsletter: Since we understand that Carol will be transitioning toward focusing more on her in-depth article writing rather than editing the newsletter, we will want to consider the prospect of ending the print version. While some form of printed version will continue to be needed by the handful of members who require it, we discussed notifying and terminating the printed newsletter for our institutional subscribers. Discussion tabled for now.

Next board meeting will be on April 13, 2019, 10:00 a.m. at Barbara Stroud's house.

Notes compiled by GSOC Secretary Carol Hasenberg from minutes written by Paul Edison-Lahm.

## 2018 Kilauea Eruption, *cont. from pg. 11*

*Recap on 2018 eruption events and other Hawaiian volcano musings*

The public can access the *Science* article through the [USGS HVO website](#), free of charge. Just follow the link under HVO News.

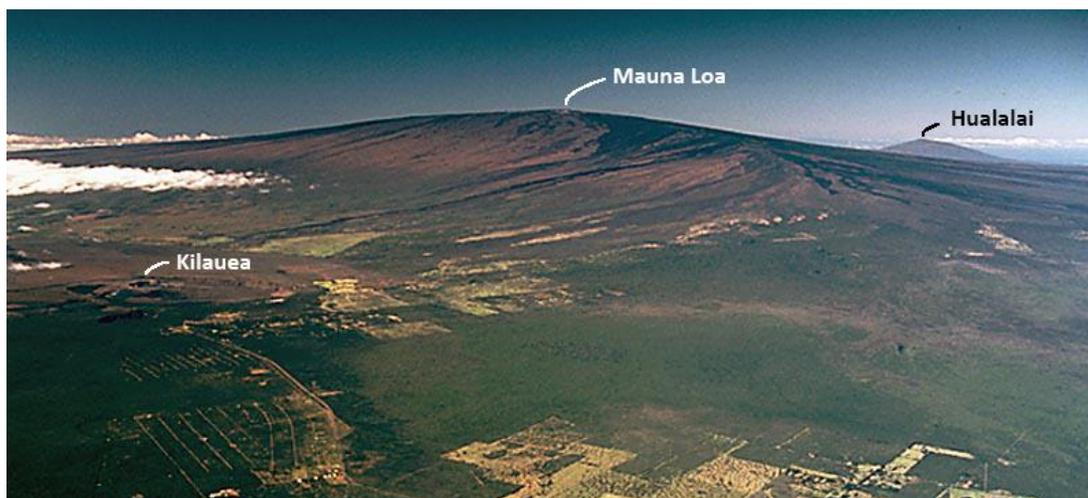
Perhaps 'peak' is not the right word when referring to Kilauea. Travelling up Hwy 11 around the South Point area to the Kilauea caldera, you cannot even see the summits of Mauna Loa on the left and much smaller Kilauea on the right. These young Hawaiian shield volcanoes are massive and wide. Between Na'alehu and Pahala there are some weird looking slump blocks on the slope of Mauna Loa to the left. And as you approach the summit of Kilauea, there is a small canyon formed in the crease between the two volcanoes on the left. But once you see the Kilauea caldera you won't mistake this for anything less than an active volcano.

Not that it's so easy to get a view of the caldera these days. It's about twice the area as it was last year and five times deeper. Access is restricted to the Jaggar Museum and HVO Observatory, which is now perched much closer to the edge. But if you visit the volcano, you can get a view from the Steaming Bluff near the entrance to the park, and if you're willing to walk about a mile on a paved road, you can get a better view from the southeast side near the junction of Crater Rim Drive and Chain of Craters Road.

But let's get back to the *Science* article. It covers the buildup to the 2018 eruption, the M6.9 earthquake caused from volcano flank slippage, the transport of magma from the summit caldera and Pu'u O'o cone to the Lower East

Rift Zone (LERZ), the LERZ eruptions, the summit collapse, the use of emerging technologies in documenting the various aspects of the eruption, and lessons learned by the geologic community from the eruption.

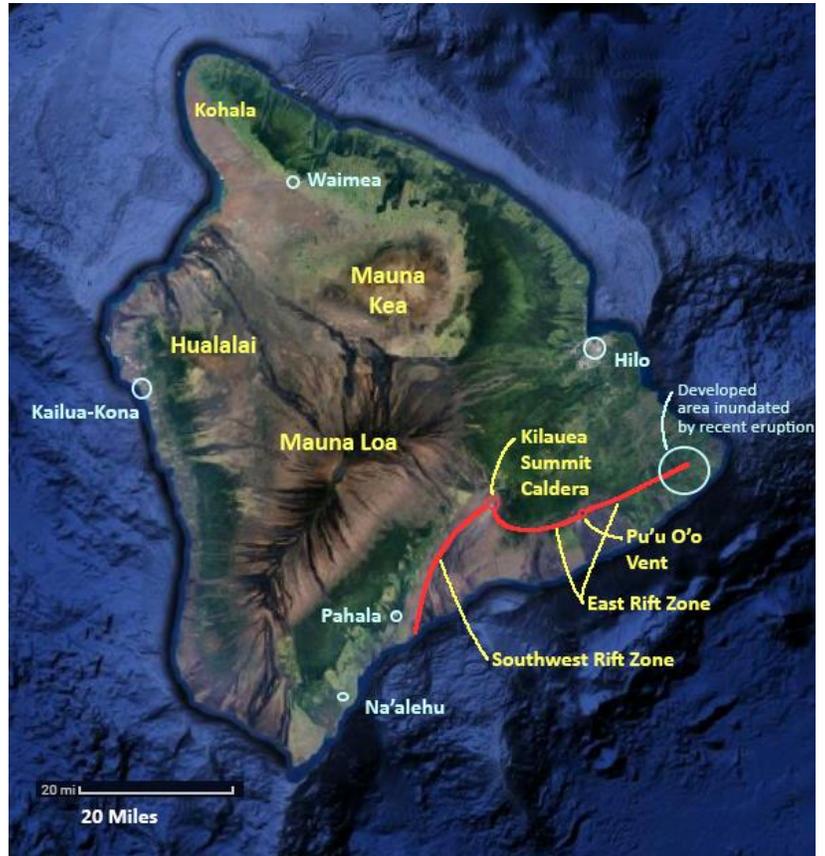
*Scale of three of the volcanoes on the Big Island: Massive Mauna Loa in the center has erupted 33 times in historical times. It dwarfs the more active Kilauea. Hualalai shown in the distance is an active volcano and poses considerable risk to the Kona coast. Photo by USGS.*



I have been most interested in two aspects of the eruptions, the evacuation of lava from and the collapse of the Halemaumau and Pu'u O'o vents, and the M6.9 earthquake and slippage of the flank seaward from the LERZ. I remember watching the webcam infrared images taken from the lip of Halemaumau and watching the lava drain out the volcanic plumbing as the eruption was imminent. Later as the summit collapse was in progress USGS did several drone flybys of the caldera and those were fascinating to watch. Likewise the lava drained from the Pu'u O'o vent, which had erupted continuously for 35 years, leaving another sizable hole in the landscape (about 1000 feet deep). The Science article covers the collapse of the summit (Halemaumau) caldera, but it does not have images of similar changes of Pu'u O'o, which were available during the eruption.

The slippage of the flank of Kilauea touches on a topic I find fascinating and I will cover this in the next article, that of destructive phase processes and the Hawaiian submarine landslides. For this discussion let's look at what's happening with the pull of gravity on Kilauea. All Hawaiian volcanoes have zones of weakness and cracking, called 'rift zones' that radiate out from the center caldera. Freestanding volcanoes tend to develop three rift zones, but since Kilauea is buttressed on one side by the bulk of Mauna Loa, it only has two of these zones. The East Rift Zone is the one that has been active in recent times, and the 2018 eruption was in the eastmost portion of this rift zone.

Hawaiian volcanoes are built upon a bed of, well, rubble. This rubble consists of pillow basalts weakened by exposure to seawater and glassy sand from the submarine building phase of the young volcano. Once the pile of volcanic layers grows to a significant height, then mass-wasting, gravity-driven processes begin to happen. Massive slump blocks begin their inexorable slide seaward and more rapid debris avalanches also occur. This volcanic spreading is abetted by the pressure of the magma in the vent plumbing and dikes of the rift zones. In effect marine volcanoes pry themselves apart.



*Above – orientation to the Big Island: Hawai'i is a pretty big place – the island contains 5 volcanoes, and cities are located away from most active volcanism and in the most level spots. Volcanic features are shown in yellow and orange, and cities and towns are in blue. The massive bulks of Mauna Loa, Mauna Kea, and Hualalai dominate the scenery. The slopes of Kilauea are fairly shallow in angle, and unfortunately, this attracts development. Map base is from Google Maps, which has not yet been updated since the 2018 eruptions.*

Right before lava started to erupt from the Lower East Rift Zone (LERZ) in 2018, there was a large earthquake (M6.9)

from a slip of up to 5 meters seaward in the block of material to the south of the LERZ. HVO geologists suspect that this event opened up a gap in the rift zone and allowed magma to head downrift, which had not happened since 1960. The *Science* article has a well developed discussion of the earthquake and flow of magma down the rift zone.

All very exciting reading for us geology buffs. In our recent holiday in Hawaii, my group visited the top of Kilauea, which is in the Hawaii Volcanoes NP; however, we did not go down to visit the areas that were inundated by the lava. These

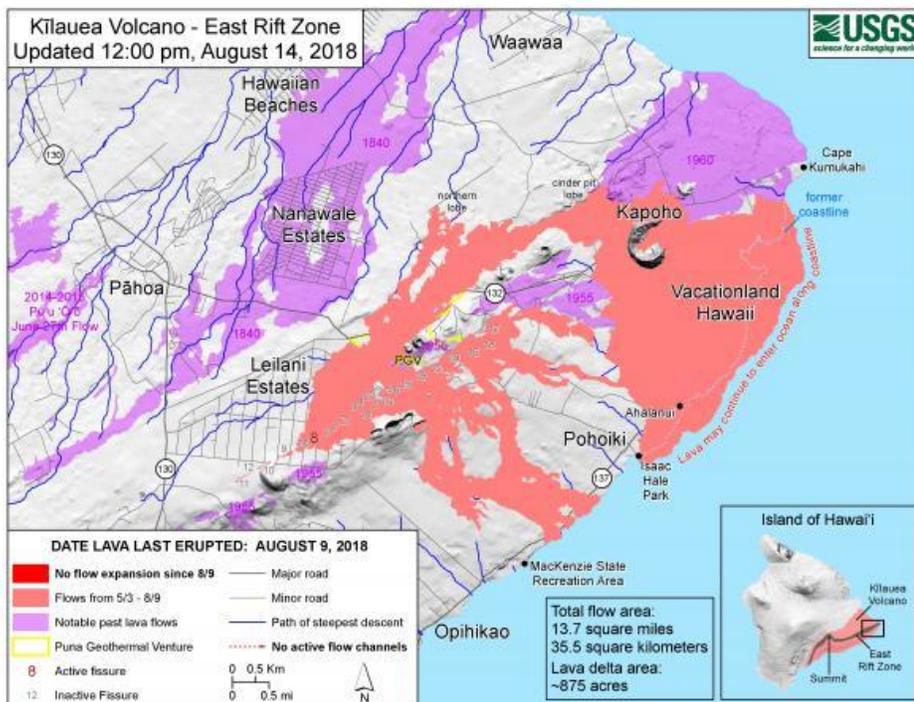
areas are privately owned, and also the recent lava flows were a disaster for the local community. It is very unfortunate that in its normal eruptive cycle, Kilauea was also responsible for destroying the homes of many residents in the area. Perhaps the political lessons learned will be helpful in preventing this cycle from repeating itself.

## Hawaiian Submarine Landslides and the Great Crack of Kilauea

*Or, what goes up must come down! By Carol Hasenberg*

This article came about by Sheila Alfsen asking me to include some information about the Great Crack of Kilauea, which might interest some of the membership when they are visiting the Big Island of Hawaii. I didn't feel I could do justice to the topic unless I also covered the great landslides, produced by volcanic spreading, on the ocean floor surrounding the Hawaiian islands.

The knowledge of landslides around the Hawaiian islands did not come about until the 1980's. As a result of then President Reagan's refusal to sign the Law of the Sea Treaty proposed by the UN in 1983, and subsequent announcement that the US would be declaring a 200-mile



*In this USGS map, the 2018 lava is shown in salmon orange. Older flows are in lavender. This map is part of the USGS HVO website under the 2018 Activity tab.*

Exclusive Economic Zone around all of its territories, the USGS was tasked with mapping those underwater zones. They did so with a relatively new technology, side-scan sonar, which has fairly good resolution for mapping large blocks of material on the ocean floor.

Not only did the side-scan sonar find evidence of landslides about the Hawaiian islands, but their runout distances in the hundreds of miles in some cases, and also the shapes of the islands themselves, indicated that this was a commonly occurring, and in many cases, a catastrophically impacting event in the life of a marine volcano.

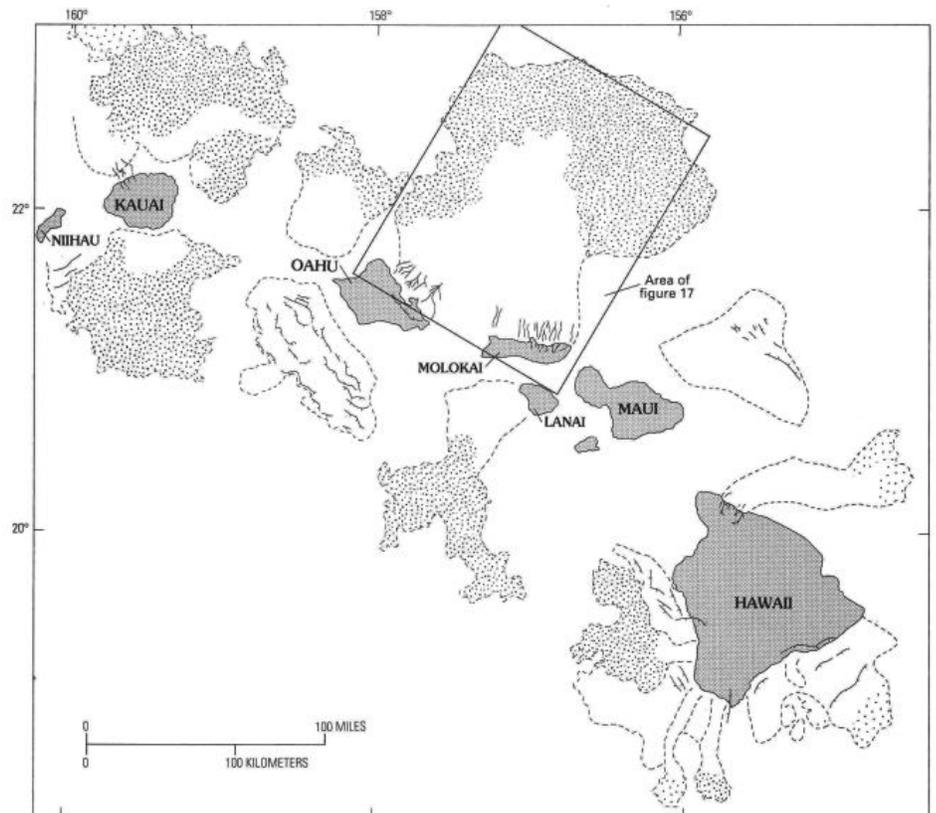
I've already described the basic processes which drive the landslides on these volcanoes in the previous article. Geologists have also been gathering evidence on the forms these landslides take, and break them down into two types: gradual slumping of blocks of material from the sides of the volcano in which large blocks of material stay relatively intact, and catastrophic debris avalanches which break material up into smaller, chaotically jumbled and scattered remnants.

It is the second of these types of landslides which are feared to have formed giant tsunamis that can wash up, and in some cases, over some of the islands. There is some evidence of these having happened in the past where large chunks of coral have been deposited hundreds of feet above sea level.

One of the articles I read in preparing this piece was written in the mid 2000's (see "Slope failure and volcanic spreading along the submarine south flank of Kilauea volcano, Hawaii," below) in which the authors researched the composition of the south flank of the Kilauea volcano and what the likelihood of a catastrophic failure would be on the south flank. Luckily, the researchers have found evidence that such a failure did occur in the geologically recent past (10-50k years), but the material that fell



Below: USGS diagram from "Imaging the Sea Floor," showing the extent of landslides around the Hawaiian Islands. The actual image produced by the side-scan sonar of the large landslide in the box is shown above, from the same article.



formed a shelf that is buttressing the volcano against future catastrophic failures, unless the volcano should become very large.



We visitors to Hawaii can rest a little easier knowing that, and also we can visit the Great Crack in the Kau Desert area with some assurance that the island flank is not in imminent danger of cracking and falling away from there.

The crack is 6 miles long and is a surface expression of the currently quiescent

Southwest Rift Zone of Kilauea. It's easy to spot on Google Maps and if one follows the line it makes, one can see that there is a series of cracks terminating in the Kilauea summit caldera (although the Great Crack is a segment of the cracking further downrift of the section that runs into the caldera).

The crack is really impressive in size, 60 feet wide and 60 feet deep in places, with lava tubes cutting through it and other such features. The NPS has recently acquired the land on which it sits, so they will hopefully develop trails to it for Hawaii adventurers.

### References and Additional Reading

Oregon State's reference page on "[Hawaiian volcanism](#)" is a very detailed article on the subject. It contains a discussion about the giant landslides near the end.

"[Evolution of Hawaiian Volcanoes](#)" page from the USGS HVO website has a basic discussion about volcanic evolutionary stages and destructive processes.

*The Great Crack as seen from the air. From NASA's virtually Hawaii project.*

John S. Schlee, Herman A. Karl, and M.E. Torresan, "[Imaging the Sea Floor](#)," U.S. Geological Survey Bulletin 2079, \*U.S. G.P.O., 1995. Describes using the GLORIA side-scanning sonar to map US territorial waters from 1986-1991. The Hawaiian landslide images used in this article comes from this publication, and this sonar mapping work revealed the presence of these massive underwater landslides to the geologic community. Modern sonar techniques employ both [side-scan and multibeam techniques](#).

Moore, J. G., Normark, W. R., & Holcomb, R. T., "[Giant Hawaiian Landslides](#)," Annual Review Of Earth And Planetary Sciences, Volume 22, pp. 119-144, 1994. This article summarized discovery and knowledge of giant Hawaiian landslides in the mid 1990's, and is referenced quite frequently.

Julia K. Morgan, Gregory F. Moore, David A. Clague, "[Slope failure and volcanic spreading along the submarine south flank of Kilauea volcano, Hawaii](#)," Journal of Geophysical Research: Solid Earth, September 5, 2003. This article discusses the particulars of the ongoing volcanic spreading in the south flank of Kilauea. It is quite technical, but from summary remarks appears to have been motivated, at least in part, to assess the slope stability of the south flank.

"[Giant Landslides of the Hawaiian Islands](#)," from [Dr. Ken Hon's](#) Geology of the Hawaiian Islands GEOL 205: Lecture Notes. Great introduction to this topic, well-illustrated and very easy to read.

"[The Great Crack Hike in Ka'ū](#)," hike description found on the tourism website Instant Hawaii, contains some great pictures of the crack. No doubt the acquisition of the crack by the NPS will change the hike description somewhat, however. See next reference.

John Burnett, "[National Park Service acquires 'Great Crack Property' in foreclosure sale](#)," Hawaii Tribune-Herald, Friday, September 14, 2018, 12:05 a.m.

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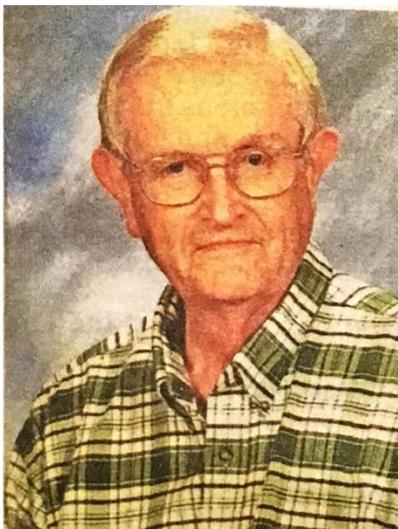
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## In Memoriam: William Stephens Greer



William Greer, a former GSOC member, died at age 88 on January 1, 2019.

Greer was born and raised in Red Bluff, California. He grew up loving the outdoors, and pursued a career in engineering with Westinghouse.

Greer and his wife Lillian moved to Portland in 1963 and continued working for Westinghouse in power distribution systems.

When he retired, Greer pursued his interest in the outdoors by studying geology at PCC and PSU and also by becoming a master gardener specializing in rhododendrons.

Memorial contributions may be made to the OSU Master Gardener Program or the American Rhododendron Society.

### WELCOME NEW MEMBERS!

Dennis Moody	Ann Cornely
Charles Holt	Nancy Ketrenos
Fred & Judith Shipley	
Matt & Darcie Laufenberg	
Weican Chen	Peter Samson

### NOMINATING COMMITTEE RESULTS

The following slate of officers has been selected by this year’s nominating committee:

President .....	Sheila Alfsen
Vice President .....	Dennis Chamberlin
Secretary .....	Barbara Stroud
Treasurer .....	Dawn Juliano
Director, 3 years.....	Julia Lanning
Director, 2 years.....	Megan Faust
Director, 1 year .....	Carol Hasenberg

Nominations are closed for this year’s slate of officers. The slate of officers will be voted on and approved at the Annual Banquet, as weather caused the February meeting to be cancelled.

The Nominating Committee members were Paul Edison-Lahm, Dawn Juliano, and Larry Purchase. Our thanks to the selected members and members of the Nominating Committee!

**The Geological Society of the Oregon Country (GSOC)** is a non-profit organization based in Portland, Oregon. The society is dedicated to the study of geology in the Pacific northwest and is open to persons with all levels of education and professional backgrounds. GSOC was formed in 1935.

In addition to Friday Night Lectures, GSOC offers field trips. Schedules vary year to year for the field trips. You must be a GSOC member or guest of a member to attend most GSOC field trips.

Schedules for all GSOC events are available on the GSOC website, [www.gsoc.org](http://www.gsoc.org). Online payment is also available for most activities and membership.

GSOC also maintains a library at Rm. 69, Cramer Hall, Portland State University. Open 7:00 p.m. prior to meetings.

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Children under age 18 \_\_\_\_\_

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Geologic Interests and Hobbies \_\_\_\_\_

New member Renewing member (circle one)

Please indicate Membership type and include check for appropriate amount:

Individual \$25.00 \_\_\_\_\_ Family \$35.00 \_\_\_\_\_ Student \$15.00 \_\_\_\_\_

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 Portland, OR 97207-0907



# The Geological Newsletter

NEWS OF THE GEOLOGICAL SOCIETY OF  
THE OREGON COUNTRY

May/June 2019  
Volume 85, Number 3

The Geological Society of the Oregon Country  
P.O. Box 907, Portland, OR 97207-0907  
[www.gsoc.org](http://www.gsoc.org)

## Lasers Light Up Prehistoric Perils in Oregon!!!

by Carol Hasenberg

The title of this article is the 'alternative title' shown to us by Dr. Ian Madin, the speaker featured at the GSOC 84<sup>th</sup> Annual Banquet on March 10. Madin came to describe three new areas of Oregon containing active faults that were discovered by analyzing the 'bare earth' maps of the ground produced in LiDAR scans of the terrain.

See *LiDAR Fault Search Yields Results*, Page 26



*Boots on the ground verification of the Twin Lakes Fault.  
Source: DOGAMI paper "The Mount Hood Fault Zone—Late Quaternary and Holocene Fault Features Newly Mapped with High Resolution Lidar Imagery," by Ian P. Madin, Ashley R. Streig, William J. Burns, and Lina Ma.*

## Calendar

### Friday Night Lecture

May 10, 2019, Cramer Hall, Portland State University

Guest speaker Dr. Seth Moran, Scientist-in-Charge, USGS Cascades Volcano Observatory, will present "The Relevance of the 2018 Kilauea Eruption to Volcanism in the Pacific Northwest."

see *Lessons Learned from the Kilauea 2019 Eruption*, Page 24

### Friday Night Lecture

June 14, 2019, Cramer Hall, Portland State University

Guest speaker Dr. John Armentrout, native Oregonian and retired petroleum geologist, will present "Progress Report on the Marine Coaledo Formation: an integrated study of an Eocene subtropical shelf-margin delta, Coos Bay, Oregon."

see *Marine Coaledo Formation*, Page 31

### Downtown Ancient Walls South Tour – still open!

June 1, 2019 – 10 a.m. – 12 p.m.

### Wallowa Mtns Field Trip

June 19, 2019 – June 24, 2019

### East Bank Bike GeoTour

Jun 29, 2019

See [GSOC website](http://www.gsoc.org) for current information on GSOC field trips

**GSOC Friday Night Lectures** are held the second Friday evening of most months, 7:30 p.m., Rm. 53, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. Check the GSOC website ([www.gsoc.org](http://www.gsoc.org)) for more information and updates to the calendar.

**Hourly rates** for parking are available in some parts of PSU parking structures. PSU Parking Structure #2, 1724 SW Broadway across from Cramer Hall is \$5.00 flat rate in the evening. Park in permit (NOT reserved) spaces and pay at the kiosk by entering your vehicle license number. There is also on street pay parking, and many mass transit options. Street parking is \$2.00 an hour, but free after 7:00 pm. More info available [here](#).

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## Lessons Learned from the Kilauea 2019 Eruption

*May 10, 2019, 7:30 to 9:00 pm, Cramer Hall*

The 2018 eruption on the Lower East Rift Zone of Kilauea Volcano was a remarkable event in many regards. From early May through mid-August scientists and society alike bore witness to voluminous amounts of lava erupted out of a new fissure system that formed within the middle of the Leilani Estates subdivision, ultimately destroying over 700 homes and creating 875 acres of new land. Fortunately, casualties from the eruption were few in number. This is attributable to a number of factors, including a good monitoring network as provided by USGS and other academic agencies, a good county emergency management system, boots on the ground both monitoring and coordinating crisis management efforts and good communication and trust between agencies and the public.

There are places in the Cascades where a similar eruption could unfold. These include Newberry Caldera near Bend, and in the Boring Lava Field of the greater Portland area. It's important to note that such eruptions are much less likely than in Hawaii; however it is important to stress having good working models of the volcanic systems, having monitoring equipment in place before unrest begins, engaging stakeholders in the emergency response community, land-management agencies, and communities near volcanoes so that when a volcano wakes up there is broad familiarity with roles and responsibilities which is critical to a smoothly functioning response to such a crisis.

Seth Moran is a seismologist and Scientist-in-Charge (SIC) for the U.S. Geological Survey's Cascades Volcano Observatory (USGS-CVO) in Vancouver, Washington. CVO, one of five U.S. volcano observatories, has responsibility for evaluating volcanic hazards, monitoring activity, and communicating hazards information for volcanoes in the States of Washington, Oregon, and Idaho. Moran arrived at the CVO (from the AVO in Alaska) in 2003, just in time to take part in the response to the 2004-2008 eruption at Mount St. Helens. He also helped establish and/or expand monitoring networks at Mount Rainier, Mount St. Helens, Mount Hood, Three Sisters, Newberry, and Crater Lake volcanoes.

## GSOC Board Meeting Notes

April 13, 2019

President Sheila Alfsen called the meeting to order at Barbara Stroud's home. Other board members in attendance constituting quorum were Barbara Stroud, Dawn Juliano, Rik Smoody, Megan Faust, Julia Lanning, Paul Edison-Lahm, and Denny Chamberlin. Also in attendance was Evelyn Bennett. Minutes of the February 2019 board meeting were approved.

### EVENTS

#### Friday night lectures

Audio system – we will be requiring future speakers to use the microphone we purchased as some people had trouble hearing the speaker at the last meeting.

Holiday Party and Our Year in the Field – after much discussion, there was no consensus on when to do the Year presentation, during the party, have a regular December meeting and do it then, or do it as the January meeting presentation. We did vote to form a committee and ask for volunteers to find a place and recommend a structure for the holiday party as we need a bigger venue.

Speakers for May, June and July lectures have been arranged.

Yumei Wang Le Val Lund Lecture (November 8, 2019) "Earthquakes, Disasters, and Resilience". Plans are continuing for this event.

#### Field Trips and Other Events

##### FUTURE TRIPS

Wallowas Trip, June 19-24: The registration phase of the trip has been completed and the trip is full. There is a waiting list. Trip reconnaissance will happen in mid-May.

Mary's Peak/Coast Range Trip, July 13-14: Sheila would like to do a 30-minute pre-lecture to the attendees, time TBA.

Metro trips: Downtown (June 1, Oct), Eastside Bike (June 29), Johnson Creek (Sept 28) (Paul): Trip registration has commenced for the June 1 Downtown trip and the June 29 Eastside bike trip. The bike trip is full.

Lewis River: Rik determined a date for this one-day trip to be August 17.

#### OTHER EVENTS

Annual Picnic: Date has been changed to August 4 and the venue will be Hagg Lake.

GSA Cordillera Meeting May 15-17, 2019; Sheila will be presenting on Puerto Rico at the AWG breakfast May 17. GSOC will have a table at the meeting manned by several of the attendees.

#### Other Old and New Business

Treasurer's Report submitted by Dawn and approved by board.

There are quite a few members who have not paid their dues for 2019. Please recall that membership dues payments are due on January 1 for 2019 no matter when you've paid the previous year.

#### New Meetings

GSOC has expanded somewhat in the past couple of years, and more activities are being discussed and planned. To facilitate this activity, GSOC is adding an informal meeting of the past and present board members sometime around mid-month on most of the odd months. An email will be circulated prior to these meetings.

There are also meetings planned for the Meetup GSOC attendees, and in general, these will be on the 4<sup>th</sup> Saturday of most months at 2 pm. Sign up online with Meetup to receive the announcements. Meetup is a social media platform used for posting local activities, and it has helped to introduce a lot of people to GSOC and Oregon geology. Questions about signing up can be referred to Paul Edison-Lahm.

## BOARD MEETING NOTES

continued from Page 25

### Other Old and New Business

Next board meeting will be on June 15, 2019, 10:00 a.m. at Barbara Stroud's house.

Notes compiled by Carol Hasenberg from minutes written by GSOC Secretary Barbara Stroud.

## LiDAR Fault Search Yields Results,

*cont. from pg. 23*

*Synopsis of the GSOC 84rd Annual Banquet lecture given on March 10, 2019, with speaker Dr. Ian Madin*

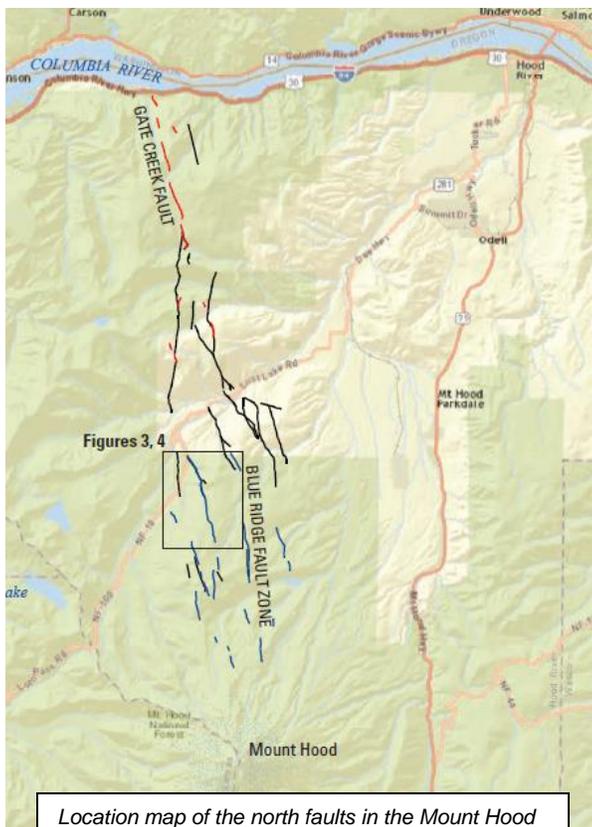
Madin and the Oregon Department of Geology and Mineral Industries (DOGAMI) have embraced LiDAR technology for quite a few years now, and have found multiple uses for this high-resolution technique of mapping terrain, trees and buildings, and other physical features of our state. The 'point cloud' of precise LiDAR data, at a million to one-and-a-half million pings per second, can be used to construct maps of 'bare earth', tree cover, buildings, etc. DOGAMI has used it extensively for landslide mapping and fault mapping.

However useful it may be, LiDAR data is acquired slowly by the state because it is expensive to produce. Luckily, some Oregon industries, especially the forestry industry, produce a lot of LiDAR data for doing tree counts and the like, and their 'poorer cousins' at the state can make their dollars stretch farther by partnering with them to produce the data.

In their search for active faults in Oregon, the DOGAMI geologists are looking for evidence of ground rupture within the last 15,000 years. They scan for fault lines that cut through landscape features in a continuous line, without regard for features older than 15,000 years.

The first area of faults described by Madin are located in the Mt. Hood area, and are referred to as the Mt. Hood Fault Zone. These faults run north to south and are normal faults. Two of the faults, Multorpor Mountain Fault and Twin Lakes Fault, define two sides of a graben that is 10 miles long. They cut through glacial deposits and landslides.

Twin Lakes fault is very well known to the researchers because it has good access from Hwy 35. One section of the fault has a beautiful scarp that is right on the cusp of White River Canyon. In another location the fault produced a wetlands by blocking a stream about 3500 years ago. Yet another area of the fault contains a E-W stepover from one surface expression to a slightly offset one. Frog Lake is also dammed by the fault. Slippage on the fault is moving fast enough to keep Frog Lake dammed.

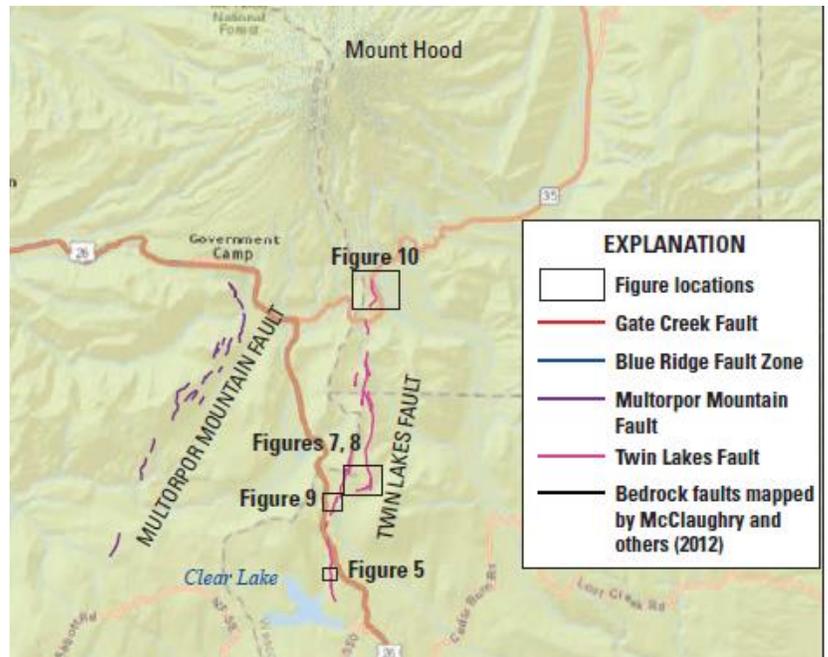


Location map of the north faults in the Mount Hood Fault Zone. Lidar-mapped fault features shown in color, black rectangles show locations of other figures in this paper, and heavy black lines are bedrock faults from recent geologic mapping by McCloughy and others (2012).

Sources: ESRI, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community. Compilation from DOGAMI paper "The Mount Hood Fault Zone—Late Quaternary and Holocene Fault Features Newly Mapped with High Resolution Lidar Imagery," by Ian P. Madin, Ashley R. Streig, William J. Burns, and Lina Ma.

Madin and company trenched through the Blue Ridge Fault on the northern slopes of Mt. Hood, which was more difficult to spot on the LiDAR images due to some very busy terrain. The trench revealed various soil types in a sequence in the area. At the fault, there is a funnel shaped area where the fault opened and material fell in and filled up the crack.

Madin also analyzed the potential earthquake hazards represented by the faults. These calculations are based upon the length of rupture and the amount of slip. He calculated that earthquakes between M6.4 and M7.4 could be generated depending on how many of the faults rupture at the same time.



The second active fault zone identified by DOGAMI is the White Branch Fault Zone, which Madin described as being located south of the moraines of the Suttle Range near Sims Butte, in the North Sister area. A pair of north-south trending faults describe the boundaries of a graben, or down-dropped block, that is 5 miles wide and 15 miles long. An interesting effect of one of the faults is to dam a stream (Boulder Creek). There has been a movement of up to 40 feet on the faults in the last 20,000 years. This amount of slip may produce an earthquake strong enough to do damage in Sisters.

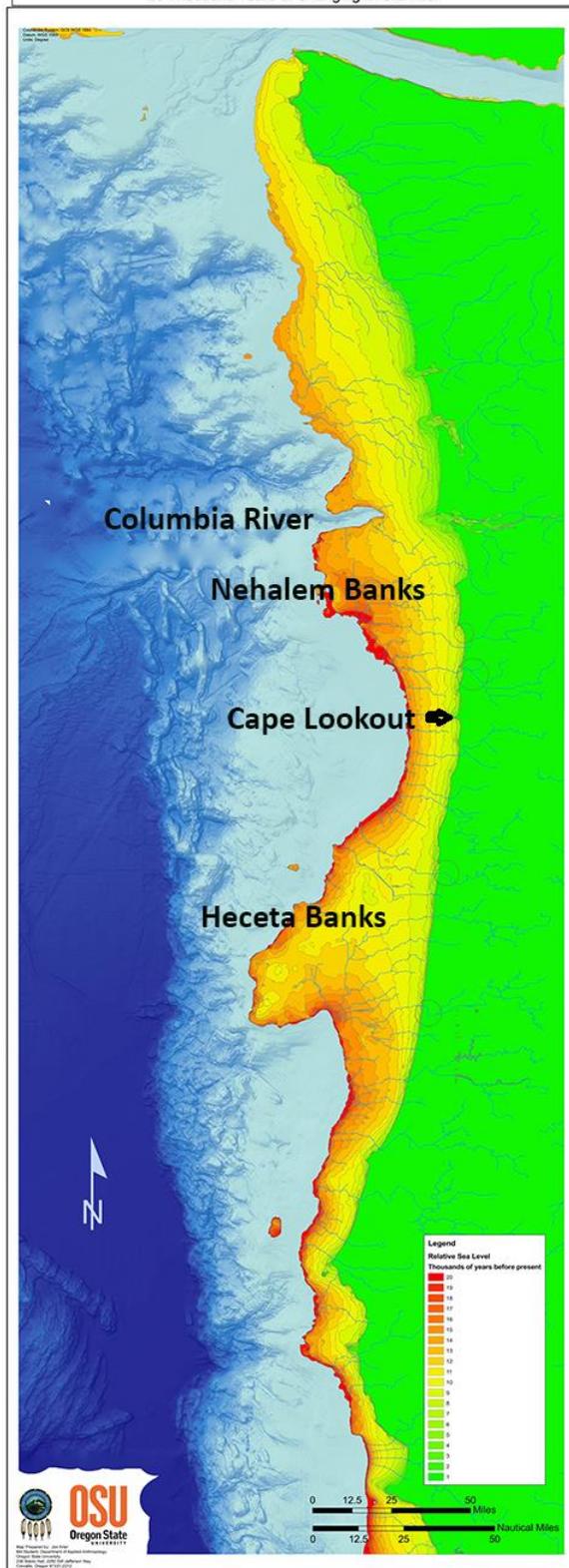
The last group of active faults reported by Madin are in the Strawberry Mountain Range by John Day. These faults contain the youngest feature Madin has seen in Oregon. He cannot wait for the snow to melt so a DOGAMI team can go out there and inspect them. The fault zone contains a 3 mile and a 5-1/2 mile segment that are continuous up and over ridges and other features in steep terrain. They cut through modern alluvium.

Madin reported that in addition to these fault zones, faults have been recognized in several places and will be seen on future DOGAMI publications. Eventually their analysis will be added to future earthquake hazard maps.

*Location map of the south faults in the Mount Hood Fault Zone. Lidar-mapped fault features shown in color, black rectangles show locations of other figures in this paper, and heavy black lines are bedrock faults from recent geologic mapping by McClaghry and others (2012).*

*Sources: ESRI, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community. Compilation from DOGAMI paper "The Mount Hood Fault Zone—Late Quaternary and Holocene Fault Features Newly Mapped with High Resolution Lidar Imagery," by Ian P. Madin, Ashley R. Streig, William J. Burns, and Lina Ma.*

Isostatically Adjusted Paleoshorelines for Washington and Oregon:  
20 Thousand Years of Changing Shorelines



## Predicting Submerged Archaeology Sites in the Pacific NW

*Synopsis of the GSOC Friday night lecture given on April 12, 2019, with speaker Jon Krier, MS from OSU.*

*By Carol Hasenberg*

Jon Krier's work seeks to conduct ancient shoreline mapping in order to find possible locations of submerged archaeology sites along the western coast of North America. He combines modern bathymetry and other technological techniques to assess underwater contours with the oral traditions of indigenous tribes in his work.

His work has evolved from several studies done in Denmark to evaluate archaeology and shipwreck sites. The Danish model differs from that done in the Americas by the difference in historical records and traditions. In Denmark the researchers first ask people for stories of what the land was like in the past. These can be oral or written accounts of past events. Then the researchers model the bathymetry and compare.

In the New World written history began with arrival of European settlers in the 1800's. However, indigenous tribesmen in Alaska and the Pacific Northwest have mostly stayed in the same geographical areas since the first American people crossed the Bering Land Bridge and began the process of settling the continent. Their oral traditions stretch back over a history of several thousand years, or "time immemorial".

Krier's first work grew from an early fascination with the Bering Land Bridge, which included his childhood home in Nome, Alaska. Jon moved to Oregon in 2010 to begin undergraduate studies at UO. In 2018 Jon graduated from OSU with an MA in anthropology. His masters project focused on predictive modeling of submerged sites on the Beringia Land Bridge (BLB), a very large swath of land.

Krier also referred to other findings in which indigenous oral histories were confirmed with natural or human historic events. Studies have compared oral histories for natural events like the eruption of Mt. Mazama and the existence of the Bridge of the Gods. A more recent example is the finding of the wreckage of the HMS Terror and HMS Erebus, British explorer ships that set out in 1845 to find a Northwest Passage through Canada's Arctic. Inuit

oral history recorded the correct location of the sunken ships, more than 60 miles from the expected locations.

Other reports of the natural world of the past can be sifted from ancient creation legends from the oral traditions. On what English speakers refer to as the Queen Charlotte Islands, Haida Gwaii history says they came to the islands to escape advancing ice. The Nehalem Tillamook talk about ice and south wind, and the timing of the formation of the Clatsop Plains. Krier discovered the legend in an older book that was written about their tales. The Clatsop plains formed after the final retreat of the ice ages and this is also confirmed from geological studies.

On Triquet Island along the central British Columbia coast, a Heiltsuk village site was found where traditional tales said it would be. This site was inhabited 14,000 years ago because it escaped inundation by the Cordilleran Ice Sheet, which covered much of British Columbia. On nearby Calvert Island, 13,000-year-old footprints were found on a beach reported by the Heiltsuk to be stable for many years.

Krier has recently been involved in a project along the Oregon coast for the Confederated Tribes of the Grand Ronde. The tribes' objective in hiring the study was to determine where ancient settlements may be located on the submerged coast in anticipation of energy companies coming in to the area. They are having Krier predict where cultural resource assessments need to be done prior to any disturbances.

NOAA provided the sonar data used in modeling the coastlines of the past. It was a bit of a challenge to make the ancient shoreline models because there are a lot of variables. For instance, silt and glacial deposits cover up land exposed in ancient times. One of the trickiest of the variables was to determine the glacial isostasy position of the ancient landforms. The continental glaciers represented a large mass of material, causing the land under them to depress, and the land around them to bulge upward. This bulge was greatest in the location of 150-180 kms from the edge of the ice sheet.

The final product of the study included a 15,000-year baseline coast map, which roughly coincides with oldest known settlements in the area. The bathymetry data helps



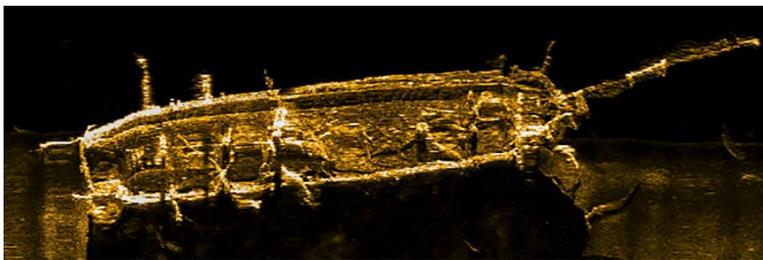
*Photograph of a human footprint (center) impressed into a 13,000-year-old paleosol at the Meay Channel I archaeology site on Calvert Island.*

*Source: [Sci News, March 29, 2018](#)  
Image credit: Duncan McLaren.*

*In 1845, explorer Sir John Franklin set sail from England with two ships, HMS Erebus and HMS Terror, in search of a Northwest Passage across what is now Canada's Arctic. The ships and crew were last seen by Inuit on King William Island and never returned to England. Their apparent disappearance prompted a massive search that continued unsuccessfully for nearly 170 years.*

*In September 2014, an expedition led by Parks Canada discovered the wreck of HMS Erebus in an area that had been identified by Inuit. Two years later the wreck of HMS Terror was located. Historical research, Inuit knowledge and the support of many partners made these discoveries possible. Now Inuit and Parks Canada are working together to jointly manage this fascinating National Historic Site.*

Source: [Parks Canada website](#)



Krier to delineate the drainage systems on submerged areas, which is an important part of determining potential ancient habitation sites. Krier also noted that the modern coastline dates from about 4000 years.

Looking at a map produced by Krier's study of the Pacific Northwest coast over time, we see that far from being a relatively straight line, there were large "banks," or portions protruding from the continental body. Krier modeled these submerged peninsulas looking for headland areas in the 10,000+ years range. West of Newport was a large peninsula now known as Heceta Banks. Loren Davis at OSU is another archaeologist doing some offshore exploration on the coast, and in 2001 a mussel shell was recovered 140 m down, in what was the Heceta Banks paleo shoreline.

The modern fishing ground now called the Nehalem Banks lies further to the north. Nehalem Banks was much more affected by the ice sheet than the Heceta Banks area. It was located on the forebulge and so even though it is deeper today than the Heceta Banks it also was exposed in earliest habitation times.

Another set of possible sites are offshore of Cape Meares and Cape Lookout, capes situated between the two banks. These rocky outcrops of Columbia River Basalt protrude out into the ocean and would have been much larger in the past.

There is some work to be done to increase the information to be evaluated. Current maps are not very accurate at large scales for close up work. This is because they are based on side-scan sonar surveys. This same technique was used in the 1980's for sea floor mapping (see the previous issue of *The Geological Newsletter*).

### **Additional Reading**

[Wrecks of HMS Erebus and HMS Terror National Historic Site](#)

["Ship found in Arctic 168 years after doomed Northwest Passage attempt," \*The Guardian\*, Paul Watson in Vancouver, Mon 12 Sep 2016. Great maps and pictures.](#)

Some history of NW Indigenous Tribes:

[Haida and Tlingit history](#)

[Legends of the Old Massett Haida](#)

First Nations Oral Traditions (Haida Gwaii)

“Archeological find affirms Heiltsuk Nation's oral history: Settlement on B.C.'s Central Coast dated back to 14,000 years,” *CBC News*, Roshini Nair, Mar 30, 2017

“13,000-Year-Old Human Footprints Found on Canada’s Calvert Island,” *Sci News*, Mar 29, 2018

Dr. Loren Davis’ homepage at OSU

## The Marine Coaledo Formation

*June 14, 2019, 7:30 to 9:00 pm, Cramer Hall*

The Middle to Late Eocene Coaledo Formation and underlying Beds of Sacchi Beach record a marine history of forearc sedimentation. The sediments aggrade from slope turbidites to shoreface deltaic sandstone encased in deep-water silty mudstone. This talk is a progress report on a multiyear, multidiscipline research program, testing the hypothesis that the Sacchi Beach-Coaledo succession represents a shelf-margin lowstand of sealevel deltaic system. A team of 12 geoscientists is collecting an interdisciplinary database for reassessing the depositional history of the rocks exposed along the Cape Arago, Shore Acres and Sunset Bay State Parks.

John Armentrout is a native Oregonian, and graduate of the University of Oregon and the University of Washington. He was OMSI Outdoor Education Director from 1967 to 1970 (including at Camp Hancock). He focused on Petroleum Geology as a Mobil Oil Exploration geologist (1973-2000), Consulting Geologist (2000-2016), and University of Oregon Instructor for Petroleum Geology (2014-2018).



### WELCOME NEW MEMBERS!

- |                            |                 |
|----------------------------|-----------------|
| Gretchen Baller            | John Adams      |
| Wendy Whitsell             | Gary Seitz      |
| John & Kathleen Beaulieu   |                 |
| Roger Ley                  | Laurie Elliott  |
| Bruce Castle               | Ann Cornely     |
| Cynthia Smith              | Michael Dunn    |
| Alfred & Nina Fleckenstein |                 |
| Mariah Tilman              | Rebecca Bateman |
| Jill Cohen                 |                 |





# The Geological Newsletter

NEWS OF THE GEOLOGICAL SOCIETY OF  
THE OREGON COUNTRY

July/August 2019  
Volume 85, Number 4

The Geological Society of the Oregon Country  
P.O. Box 907, Portland, OR 97207-0907  
[www.gsoc.org](http://www.gsoc.org)

## The Coaledo Project Revisits the Formation of the South Central Oregon Coast

by Carol Hasenberg

John Armentrout is a native Oregonian who got his geology degrees and went away to work in the oil patch for Mobil Oil. He's now 'retired' and back living in Oregon. As he looks back to the beginning of his career as a geologist, he is proud of his introduction to geology at age 12 in 1954 at Camp Hancock. He went on to become a counselor at the camp, then director at age 26. Fourteen of the campers under his directorship went on to become geoscientists.

*See The Coaledo Project,  
Page 36*



*Dr. John Armentrout 'in situ' in  
the Coaledo area*

## Calendar

### Friday Night Lecture

July 12, 2019, Cramer Hall, Portland  
State University

Guest speaker Vanessa Swenton, PSU  
Geology PhD. candidate, will present  
"Eastern Oregon Volcanics: Yellowstone  
Mantle Plume or Cascadia Slab Rollback?."

*see Eastern Oregon Volcanics, Page 34*

### GSOC Annual Picnic

At Hagg Lake near Banks, Sunday,  
August 4, 2018, 12 – 4 pm

*see page 40, or the GSOC website, for  
more information*

### Mary's Peak/Tyee Field Trip

July 13-14, 2019

### Mt. Tabor/Buttes Field Trip

July 28, 2019, 9:00 am – 12:00 pm

### Mt. St. Helens Helicopter Trip

August 10, 2019

### Upper Lewis River Trip

August 17, 2019

### Johnson Creek Watershed

September 28, 2019

See [GSOC website](http://www.gsoc.org) for current information  
on GSOC field trips

*There will be no Friday night meeting in  
August. Back in September!*

**GSOC Friday Night Lectures** are held the second Friday evening of most months, 7:30 p.m., Rm. 53, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. Check the GSOC website ([www.gsoc.org](http://www.gsoc.org)) for more information and updates to the calendar.

**Hourly rates** for parking are available in some parts of PSU parking structures. PSU Parking Structure #2, 1724 SW Broadway across from Cramer Hall is \$5.00 flat rate in the evening. Park in permit (NOT reserved) spaces and pay at the kiosk by entering your vehicle license number. There is also on street pay parking, and many mass transit options. Street parking is \$2.00 an hour, but free after 7:00 pm. More info available [here](#).

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## Eastern Oregon Volcanics

*July 12, 2019, 7:30 to 9:00 pm, Cramer Hall*

PSU Geology PhD candidate Vanessa Swenton will discuss her research investigating some of the volcanic eruptions that occurred in eastern Oregon approximately 16 million years ago (Ma) to present day. There are two dominant volcanic provinces that have had episodes of high-silica (silicic/felsic) volcanism in eastern Oregon. The older episode is known to be associated with the Yellowstone mantle plume and Columbia River Basalt Group volcanism. The younger episode is within the High Lava Plains, and it is debated as being solely a result of the initial Yellowstone plume, or as a result of Cascadia slab rollback processes.

The provinces are interpreted as a result of separate and distinct magmatic and tectonic processes, primarily due to the 3 million-year age gap between the two episodes. However, there are numerous volcanic eruptive centers that have not been dated, so it is unclear if/how the provinces are related. Swenton's research involves investigating the questions: Are the two volcanic provinces a result of separate and distinct processes? Is High Lava Plains volcanism associated with the Yellowstone mantle plume, a result of Cascadia slab rollback, or a combination of both? She is investigating these questions primarily by acquiring high-precision ages and detailed geochemical signatures of unanalyzed volcanic centers in the study region. If some ages come back between 15 Ma and 12 Ma, it is likely that the volcanic provinces are a result of a single, continuous magmatic process. If all ages come back between 16-15 Ma and 12-0 Ma, then it is likely that the two provinces are a result of separate and distinct processes. This study will provide additional insight into initial Yellowstone plume dynamics and the effect of initial Cascadia slab rollback.

Vanessa Swenton is a second year doctoral candidate in PSU's Geology, Earth, Environment, and Society Program. She has a Master's in Geological Sciences from New Mexico State University where she worked on using field relationships and geochronology to evaluate the formation of the Schoolhouse Mountain Caldera, Mogollon-Datil Volcanic Field. She earned a BS in Earth Science with a concentration in geology, and is also a Secondary Education program graduate, from Central Connecticut State University.



## GSOC Board Meeting Notes

June 15, 2019

President Sheila Alfsen called the meeting to order at Barbara Stroud's home. Other board members in attendance constituting quorum were Barbara Stroud, Dawn Juliano, Rik Smoody, Paul Edison-Lahm, and Carol Hasenberg, constituting quorum. Also in attendance was Evelyn Bennett. Minutes of the April 2019 board meeting were approved.

### EVENTS

#### Friday night lectures

Holiday Party and Our Year in the Field: We voted and unanimously approved doing music, the Year in the Field, and a potluck at Christmas. GSOC has been given a \$500 anonymous donation to pay for the event. Paul is looking into Woodstock Wine and Deli as the venue. Other considerations were discussed but this sounded the best.

The Board approved buying a screen to go along with the projector; its width should be at least 8'. We will need this for the picnic.

#### UPCOMING SPEAKERS

Sheila reported that the Cordilleran meeting was a success in finding potential speakers.

Sept 13th – Nick Zentner will speak on Supervolcanoes of the Pacific NW. Due to Nick's popularity (2 minute Geology and Nick on the Rocks), a bigger venue would be nice. Cramer Hall 53 holds 160 people. The board is working on possible other venues.

Oct 11th – Speakers have been suggested and are being researched.

Yumei Wang Le Val Lund Lecture (November 8, 2019) "Earthquakes, Disasters, and Resilience". The lecture is on course for November with a larger room (200 seat venue), the speaker, and a panel for discussion.

### Field Trips and Other Events

#### FUTURE TRIPS

Mary's Peak/Coast Range Trip, July 13-14: Fee was finalized at \$45. Determined that the pre-lecture would be July 12th at 6:30, before the regular meeting in CH 53.

Metro trips: Johnson Creek (Sept 28) (Paul): Plans in progress. Registration will open August 23. Downtown North (October 5).

Lewis River: August 17. Board developed a budget and set fee of \$20 per participant, including funding a printed guide for this trip. Specific concern is the limited parking, so trip will be limited to 10 cars and 35 participants. It was suggested that we designate a meeting place for all drivers for carpooling purposes. Mileage will be approximately 120 for the trip, and there will be about 2 or 3 miles of hiking involved. Exact location will be emailed to the participants. Registration will open July 12.

Mt Tabor and Buttes: Sunday July 28, 9:00am – 12 pm. Meet in the Mt. Tabor north parking lot by the cinder cone amphitheater.

Mt. St. Helens Helicopter trip: If the trip gets off the ground (organizationally speaking), it will fly on August 10. Keep tuned to the website for more information.

Mt. Hood Faults: Next year.

Tourmaline Hunting: Next year?

Other possible trips for 2020 are Clackamas River Canyon, John Day Rafting, and Clackamette Park.

#### OTHER EVENTS

Annual Picnic: Hagg Lake, August 4, 12-2:30. Bill Orr will speak about new developments in his books Pacific NW Geology and The Willamette Valley: An Environmental History. Books will be for sale at the picnic. Parking \$7 per car. Donations of \$10 per head are requested. Club will supply main dishes and other food will be potluck.

## BOARD MEETING NOTES

*continued from Page 35*

### Other Old and New Business

#### New Meetings:

Informal board meeting, July 6.

Meet-up meeting: July TBA.

Treasurer's Report submitted by Dawn and approved by board.

Bylaws – The board discussed that the recommendations for changes to the By-Laws in 2018 were never approved, as we did not have a business meeting in February. A recommendation was made that rather than simply approve the changes to the Bylaws for last year, we look more closely at them and do other needed changes as well. We had a discussion about the newsletter discontinuance and how to address that with the 50 institutions and individuals that receive it.

Carol will continue to write up the summaries of the lectures. Paul and Carol will work on the thought of developing an annual recap that could be printed and sent to institutions/members, but also be very useful as an archive for GSOC.

Carol and Barb will form a committee to discuss and formulate potential other changes to the Bylaws which would then be approved at the next Annual Meeting.

Member Management Software - The purchase was discussed at the board social last month, and Paul and Barbara (and others) believe it is time to look into this.

Next board meeting: TBA.

Notes compiled by Carol Hasenberg from minutes written by GSOC Secretary Barbara Stroud.

## The Coaledo Project, *cont. from* *pg. 33*

*Synopsis of the GSOC Friday Night Lecture, June 8, 2019, with speaker Dr. John Armentrout*

Armentrout then shifted to his main topic which is the Coaledo project. To get the audience on the right foot he made sure we could pronounce it as Coal-EE-doe. The Coaledo project is a team effort which includes several working and recently retired geologists in a multidisciplinary team to revisit the geology of the Coos Bay area of Oregon. The 18 researchers involved in the project include specialists in geologic structure and stratigraphy, tectonics and paleomagnetism, sedimentology, and paleontology. The team will be updating tectonic and depositional history of the area to improve understanding at both the local and global levels of interest.

The study area will cover the Cape Arago peninsula, from the mouth of Coos Bay to Sacchi Beach. This is an area exhibiting areas folded by compression. The South Slough, which starts at Charleston and defines the peninsula, is the center of a syncline, or basin-shaped fold. Offshore parallel to the syncline is an anticline, or arched fold. The researchers are fortunate to have a great suite of outcrops along the coastline in the area as well as the data from Coos Bay coal basin studies done by geologist Al Niem and others.

Armentrout went on to discuss the details of the project area by referencing a paper by Ray Wells and others on the tectonics of the Siletzia terrane, a seamount plateau similar to the Hawaiian Islands that docked on the Oregon coast 51 million years ago. This process is the environment which created the oceanic basin in which the sediments were deposited, then uplifted and compressed them into the positions they occupy today. Most of the sediments were deposited in the Eocene epoch.

The basin folded and sagged, and then uplifted and eroded multiple times. As the basin folded it created accommodation space that could gather ever more sediments. Then at the end of the Eocene, there were tectonic processes happening that changed the environment so that there were less sediments accumulating in the basin. The Klamath Mountains

began to be pushed northward by the Pacific Plate as the San Andreas fault developed. The accretion of the Siletz island plateau moved the Oregon shoreline from Mitchell to the west of the plateau and with it the subduction zone for the Farallon Plate shifted to the west. The oceanic basin which had gathered the sediments was uplifted and began to erode. In the Coos Bay area, 40% of the last 50 million years are not represented in the stratigraphy. The pushing from the Pacific Plate was met with resistance by the Canadian land mass. In response, the Oregon landscape began to rotate clockwise to accommodate the stress.

As a result of this history of deformation, the South Slough syncline is also crisscrossed with faults. The current research includes not only attention to the location of the faults but studying the stress patterns and deformations which they represent.

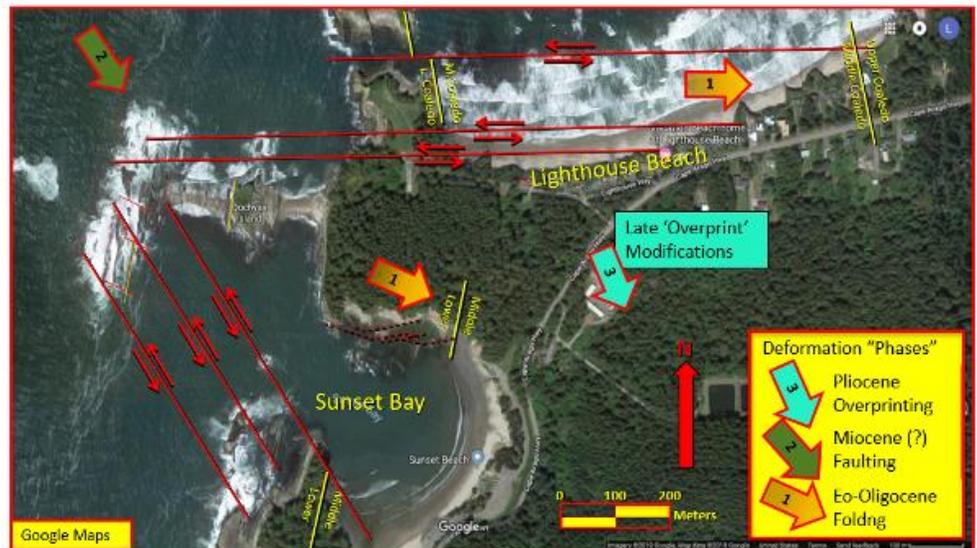
Laird Thompson, a structural geology specialist, is investigating the tectonic history from global to regional to outcrop scale, detailing the changing stress patterns as the orientation of subducting plates evolved along the Pacific Margin. One critical issue of this history is the clockwise rotation of the Coos Bay area as the western extension of the Basin and Range and northward 'push' of the San Andras fault system pushed western Oregon and Washington northward against British Columbia.

Several sedimentologists are on the team and an updated depositional model is in the works by team members Al Niem and Rebecca Dorsey. They have reference material from the 1986 Chan and Dott paper on the depositional environment and depositional cycles.

Some very interesting features along the coastline are the slope basin fan at Sacchi Beach, and a dozen channel sections to be found in the cliffs at the shoreline all down the peninsula. The latter features can be particularly found at South Cove of Cape Arago and south of Simpson Cove.

## Timing of Deformational "Phases" and Orientations

The Coaledo records three phases of deformation:  
Each subsequent phase modifies the previous.

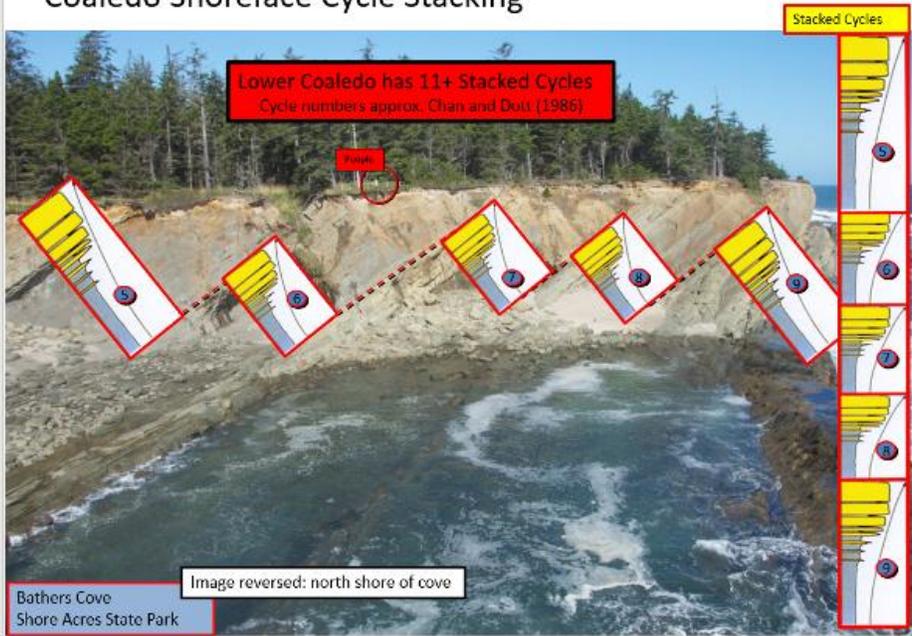


*Image description: Fault directions reveal stress patterns through time in an area that includes Sunset Bay and Lighthouse Beach. Arrows marked 1 indicate deformation directions in the Eocene and Oligocene, 2 indicate Miocene directions, and 3 Pliocene directions.*

*Source: John Armentrout and the Coaledo Project team.*

Another group of fascinating sedimentary features are the packages of stacked depositional sequences that exhibit “coarsening upward cycles.” Each of these represents about 100,000 years’ succession of deeper water mud to thin sand flows to storm-generated low hummocks to the beach, where most fossils are, and could only be deposited during the huge subsidence that occurred during the Eocene. They can be seen on the north side of Sunset Bay and elsewhere.

### Coaledo Shoreface Cycle Stacking



*Image description: Coarsening upward cycles in the deposits in Sunset Bay.*

*Source: John Armentrout and the Coaledo Project team.*

The work of several paleontologists is being used in reviewing guide fossils for the Tye and Coaledo strata. Kristin McDougall of the USGS is reevaluating a 1979 Ken Bird analysis of fossils in depositional zones with more detailed biofacies. Bruce Welton is working on shark teeth samples on Coaledo depth facies. Carole Hickman is working on mudstone mollusks. Fossil pollen and spores throughout the 4000-foot thickness of strata is being studied by a group from Louisiana.

The team is taking advantage of the data collected in the early days of tectonic geology and using modern techniques and analysis to reevaluate and refine the geologic history of the south-central Oregon coast. This will be an exciting advance in our knowledge of the area. And who knows, possibly the subject of a future GSOC field trip?

#### Papers Referenced:

Ray Wells, David Bukry, Richard Friedman, Doug Pyle, Robert Duncan, Peter Haeussler and Joe Wooden, [“Geologic history of Siletzia, a large igneous province in the Oregon and Washington Coast Range: Correlation to the geomagnetic polarity time scale and implications for a long-lived Yellowstone hotspot,”](#) *Geosphere* (2014) 10 (4): 692-719.

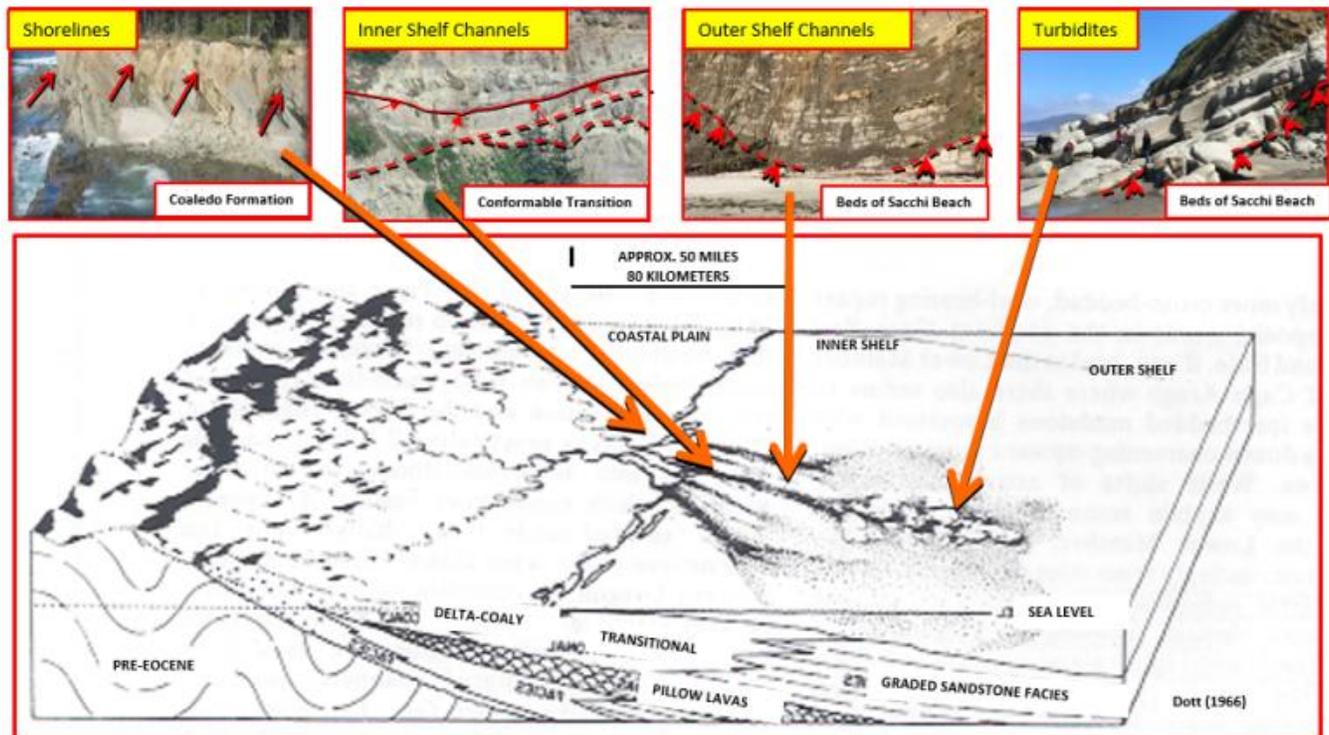
In-Chang Ryu, Alan R. Niem, and Wendy A. Niem, [“Oil and Gas Potential of the Southern Tye Basin, Southern Oregon Coast Range,”](#) with a section on Structural And Stratigraphic Plays by Alan R. Niem, Ray E. Wells, and In-

Chang Ryu and Plate 1, Interpreted North-South Seismic-Reflection Profile Across the Southern Tye Basin, by Peter O. Hales, In-Chang Ryu, and Alan R. Niem, DOGAMI OGI 19, 1996.

M. A. Chan, R. H. Dott, Jr., "Depositional Facies and Progradational Sequences in Eocene Wave-Dominated Deltaic Complexes, Southwestern Oregon," AAPG Bulletin, April 1986.

*Image description: Depositional model for shelf-slope transport. A refinement of the model from Chan and Dott 1986.*

*Source: John Armentrout and the Coaledo Project team.*



## GSOC Reaches Out!

This spring Portland area schools have asked for supplements to their regular Earth Science curricula and GSOC was happy to respond.

In May, Springwater Environmental Science School in Oregon City asked for a speaker on the subduction earthquake, to which Sheila Alfsen, as public outreach officer for GSOC, responded. The students were very engaged and interested to learn about this important topic.

In June, Hockinson Middle School asked for rocks to use as a classroom set. Word was put out to GSOC members who responded generously! We were able to donate classroom rocks for both Earth Science teachers at the school.

Sheila Alfsen spent the day preparing the seventh graders for their upcoming hike around the pumice plain at Mt. St. Helens. The school is grateful to have our help!

Public outreach is also being accomplished by Paul Edison Lahm in the form of MeetUp groups that he has been hosting on behalf of GSOC. We are reaching out to help people become interested in our wonderful geology!

## WELCOME NEW MEMBERS!

Jakob Olesen	Keith Olson
Elisha Smith	Peggy Macko
Annette King	William Boettner
Sue Wright	
Ian Madin & Hilary Johnson	
Barbara & Jack Oakes	

## GSOC Annual Picnic

*August 4, 2019, 12 to 4:00 pm, Henry Hagg County Park at Hagg Lake, donation \$10 per member attending*

This year's GSOC potluck picnic will be held at Henry Hagg County Park, 50250 SW Scoggins Valley Rd, Gaston, OR 97119, OR. Take Highway 26 west from Downtown Portland to turn south on Highway 47 near Forest Grove, then west on Scoggins Valley Road. Picnic will be held in Pavilion C. There is a \$7 per car parking charge, and GSOC is requesting donations of \$10 per head.

If you are coming, bring \$10 a head in cash or checks made out to GSOC, a beverage and a vegetable dish, salad or dessert. GSOC will provide paper plates, flatware, and cups. GSOC board will provide main dishes. Eating will commence as soon as possible after 12pm. Your contribution will go towards renting the pavilion and a GSOC club membership to the Rice Museum for the upcoming year.

There will be a great speaker at this year's picnic! Bill Orr will speak about new developments in his books Pacific NW Geology and The Willamette Valley: An Environmental History." Books will be for sale at the picnic at a discounted price.

## GSA Meeting Recap

*A Big Thank You to all the GSOC Helpers!*

GSOC's contribution to this year's GSA Cordilleran section meeting was a huge success thanks to the many hands that helped build the booth and manned the booth:

- Charlie Raymond
- Marty Muncie
- Clay Kelleher
- Cris Morgante
- Denny Chamberlin
- Herb Dirksen
- Maryann Amann
- Fenella Robinson

Great job you guys!



**The Geological Society of the Oregon Country (GSOC)** is a non-profit organization based in Portland, Oregon. The society is dedicated to the study of geology in the Pacific northwest and is open to persons with all levels of education and professional backgrounds. GSOC was formed in 1935.

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Schedules for all GSOC events are available on the GSOC website, [www.gsoc.org](http://www.gsoc.org). Online payment is also available for most activities and membership.

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# The Geological Newsletter

NEWS OF THE GEOLOGICAL SOCIETY OF  
THE OREGON COUNTRY

September/October 2019  
Volume 85, Number 5

The Geological Society of the Oregon Country  
P.O. Box 907, Portland, OR 97207-0907  
[www.gsoc.org](http://www.gsoc.org)

## Tyee Country and Marys Peak

by Carol Hasenberg

GSOC participants had a great little trip to the Corvallis area in mid-July to observe the geological features of Marys Peak and the Tyee formation along US 20 between Philomath and Newport, Oregon.

*See Tyee and Marys Peak, Page 46*



GSOCers swarm over to the gabbro dike at the base of Marys Peak. The surrounding rock is the Siletz River Volcanics.

## Calendar

### Friday Night Lecture

September 13, 2019, 53 Cramer Hall,  
Portland State University

Guest speaker Nick Zentner, Central Washington University instructor and video spokesperson for geology in the Pacific Northwest, will present "Supervolcanoes of the Pacific Northwest."

*see Supervolcanoes, Page 44*

### Friday Night Lecture

October 11, 2019, Cramer Hall, Portland  
State University

Speaker Dr. Michael Cummings, emeritus PSU Professor of Geology, will present "Implementing Next Generation Science Standards in Oregon."

*see NGSS in Oregon, page 57*

### Johnson Creek Watershed Field Trip

September 28, 2019

### Ancient Walls of Portland, North Downtown Tour

October 5, 2019

See [GSOC website](http://www.gsoc.org) for current information  
on GSOC field trips

**GSOC Friday Night Lectures** are held the second Friday evening of most months, 7:30 p.m., Rm. 53, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. Check the GSOC website ([www.gsoc.org](http://www.gsoc.org)) for more information and updates to the calendar.

**Hourly rates** for parking are available in some parts of PSU parking structures. PSU Parking Structure #2, 1724 SW Broadway across from Cramer Hall is \$5.00 flat rate in the evening. Park in permit (NOT reserved) spaces and pay at the kiosk by entering your vehicle license number. There is also on street pay parking, and many mass transit options. Street parking is \$2.00 an hour, but free after 7:00 pm. More info available [here](#).

**2019 - 2020 ADMINISTRATION:**

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 503/939-6003  
[shealf@viclink.com](mailto:shealf@viclink.com)

## Supervolcanoes

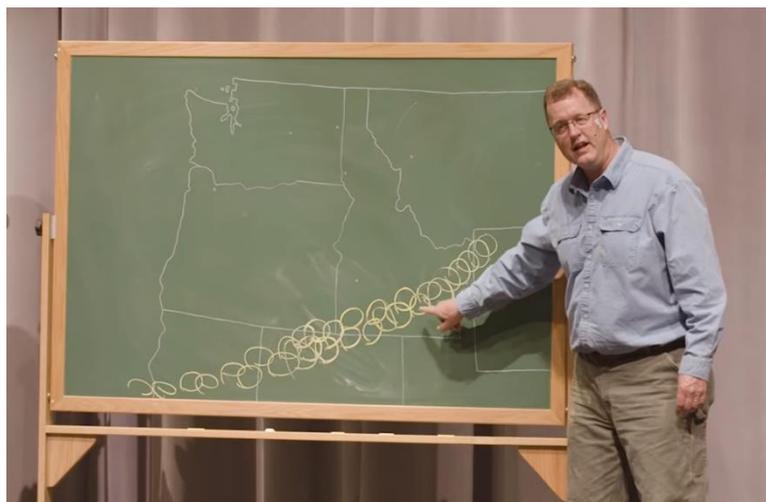
*September 13, 2019, 7:30 to 9:00 pm, 53 Cramer Hall*

Nick Zentner has made a name for himself with his involvement in several series of [video productions](#) explaining geology to a general audience in the Pacific Northwest. His series have included the popular “2 Minute Geology,” “Downtown Geology Lectures,” “Nick on the Rocks” and “The Nick Zentner Geology Podcast.”

Zentner has been with Central Washington University Geology Dept. since 1992. He advises geology undergraduates and mentors graduate students teaching in the field and in the lab. He teaches a popular "GEOL 101 - Geology of Washington" course to CWU students every Fall Quarter and Winter Quarter - and his course is open to townspeople for free! He also teaches "GEOL 351 - Pacific Northwest Geology" every spring. In 2015, Nick received the prestigious James Shea Award, a national award recognizing exceptional delivery of Earth Science to the general public. Past recipients include John McPhee, Jack Horner, Robert Ballard, and Stephen Jay Gould.

In his recent “Supervolcanoes in the Pacific Northwest” lecture, Nick explains the appearance and origins of Supervolcanoes like Yellowstone. He distinguishes them from milder basalt and stratovolcano eruptions. He stresses that humans have never witnessed one of these eruptions because they occur so infrequently. But don’t get too comfortable, because there have been many supervolcano eruptions in the Pacific Northwest...

Those of you interested in the Wallowas and Hells Canyon area should be especially interested in Zentner’s “Downtown Geology Lecture” on Hells Canyon and the Ringold Formation.



*Image description: Zentner explaining just how many supervolcano eruptions have impacted the Pacific Northwest..*

*Source: Zentner's "Supervolcanoes in the Pacific Northwest" video*

## GSOC Board Meeting Notes

August 10, 2019

President Sheila Alfsen called the meeting to order at Barbara Stroud's home. Other board members in attendance were Barbara Stroud, Dawn Juliano, Paul Edison-Lahm, Julia Lanning, Dennis Chamberlin and Carol Hasenberg, constituting quorum. Minutes of the June 2019 board meeting were approved.

### EVENTS

#### Friday night lectures

Sept 13th – Nick Zentner will speak on Supervolcanoes of the Pacific NW in Cramer 53.

Oct 11th – Speakers engagement in progress.

Yumei Wang Le Val Lund Lecture (November 8, 2019) "Earthquakes, Disasters, and Resilience". Paul arranged for Jonna Papaefthimiou of the Portland Bureau of Emergency Management to be on the panel, and Yumei has secured funding for the room rental in Smith Center and is finding other panel members. Paul will introduce Yumei at the meeting.

Holiday Party and Our Year in the Field: We plan to have music, the Year in the Field show, and a potluck on December 14. Paul is the lead planner for the event to be held at Woodstock Wine and Deli.

#### Field Trips and Other Events

##### WRAPUP OF PAST EVENTS

Wallowa Mountains, Hells Canyon and Surrounding Terrain: Carol will continue to sell printed field trip guides until only two will remain for the library. Cost is \$10 and she will bring copies to the September meeting.

Annual Picnic 2019: small turnout of 27 people, \$235 collected in donations. Board agreed to do registration for this event next year in order to predict the number coming. The projector and new screen worked well in the outdoor conditions.

#### Field Trips and Other Events

##### FUTURE TRIPS

Metro trips: Johnson Creek (Sept 28) (Paul): Plans in progress. Downtown North (October 5). Registration for both trips will open August 23.

Lewis River: August 17. Seventeen participants have signed up.

Mt. St. Helens Helicopter trip: Scheduled now for August 24. Enrollment is limited by requirement of 3 per ride. Unfilled cancellations will not be refunded. Current signup – 12.

Sunstone Mines (2020): Emily Calhoun would like to lead this trip and have a number of grad students come along.

Other possible trips being reviewed for 2020 are Clackamas River Canyon, Mt. Hood Faults, John Day Rafting and tourmaline hunting.

##### OTHER EVENTS

85<sup>th</sup> Annual Banquet: March 8th, at PSU's Smith Center; no other plans yet.

#### Other Old and New Business

##### New Meetings:

The Board voted to go back to monthly board meetings beginning in 2020. We would like to continue to invite past board members and other volunteers or involved members to attend. Meanwhile, the board will have another informal Board meeting at Woodstock Wine and Deli on September 21st at 2 pm.

Meet-up meeting: September 21 from 12 to 2 at Woodstock Wine and Deli.

Treasurer's Report submitted by Dawn and approved by board.

Bylaws: there are several items that need to be addressed in the bylaws, including changes from last year and newsletter references. In addition, dues, expenditure approval, and member classifications also need to be updated. Barb and Carol will work on this in the fall.

*Continued...*

## BOARD MEETING NOTES

*continued from Page 45*

**Member Management Software:** Barb and Paul researched this and recommended the Wild Apricot platform. This platform has the capability of managing memberships, creating and distributing emails and other publications, archives of club info and even hosting a website.

The board voted to proceed with a Wild Apricot subscription beginning in October 2019 at the rate of \$50/month, which will handle membership until we exceed 250 members (current level of paid members is about 135).

Barb and Paul will implement the system, with the goal being to set up in time for membership renewals by the end of the year.

**Newsletter:** Carol has resigned her role as newsletter editor effective at the end of 2019. She will continue with the roles of historian and archive manager and contribute articles to the website.

The board voted to discontinue the bimonthly newsletter, replace it with an annual archive publication, and to notify recipients of the printed newsletter of this with the final two mailings.

The board is looking for volunteers for several components of the newsletter that will need to be updated and available to membership, either on the website or as emails to members:

- Calendar – schedule of club activities and information.
- Club news – in memoriams, outreach events, board meeting notes, new members, board member contact info.

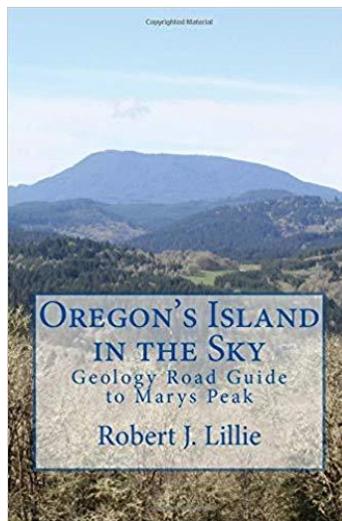
**Next board meeting:** October 12, at Barbara Stroud's house.

Notes compiled by Carol Hasenberg from minutes written by GSOC Secretary Barbara Stroud.

## Tyee and Marys Peak, *cont. from* *pg. 43*

*Field trip recap from July 13-14, 2019*

Sheila Alfsen led the group on Saturday, July 13, on a tour of Marys Peak. Her tour was partially based on the very excellent book by Robert J. Lillie, [Oregon's Island in the Sky: Geology Road Guide to Marys Peak.](#)



This book is available online at a very reasonable cost.

The group's first stop was at the base of Marys Peak on Hwy 34, just past the intersection to the Marys Peak Road. The highway (34) travels a number of miles southwest along the Corvallis Fault, which marks the southeastern boundary of Marys Peak.

At this stop the group saw a very obvious gabbro dike cutting through the Siletz River Volcanic parent rock.

The group then headed up Marys Peak Road and stopped to see steeply tilting layers of the Tyee formation, sediments that collected in an ocean basin in the Eocene offshore from what is now the Klamath Mountains. This formation lies above the Siletz River Volcanics.

Towards the top of the mountain the group stopped at a charming little falls that cut its way down through the gabbro sill at the top of the mountain. It is the durability of this hard layer of rock that has kept Mary's Peak 500 feet higher in elevation than



that of any other peak in the Coast Range.

The group finally made it to the top of the mountain where there were some pretty amazing views in all directions. An incredible forest of noble firs ringed the top, and fields of wildflowers blossomed. Interspersed in all this greenery were the gabbro rocks of the sill.



*Above: Gabbro has the same composition as basalt but with a intrusive phaneritic texture.*

*Left: The graceful blooms of the Columbia lily dotted the fields at the top of the mountain.*

*Below: Group leader Sheila Alfson discusses the features viewed from the top of Marys Peak.*

*Next page, top: Carol and the pillow basalts. I'm not sure who took the shot or who is behind me.*

*Next page, second photo: Paul Edison-Lahm color-enhanced this black and white of the quarry floor to emphasize the shells littering it.*





On the way back down the mountain was the geologic pièce de résistance – one of the best outcrops of pillow basalts in the world. One little drawback of this site is that it is part of a former rock quarry. Although the quarrying was responsible for exposing such amazing rocks, the site has now become a local target practice range. Broken glass and ammunition litter the ground. In fact, Sheila went in to request a cease fire from the users of the site so we could visit the outcrop.

The next day, Clay Kelleher toured the group through several stops along a new section of US 20 built between Eddyville



and a couple miles west of Chitwood, which straightened out the road to lessen travel times between Newport and Corvallis. This section of road was built on the Tye Formation, which is tilted from compressional folding and its many layers absorb water like a sponge. Naturally, the planned route of the new road lay through a series of landslides, which had to be dewatered to prevent further movement. The group got to go down the embankments of the road to check out some of the elaborate dewatering hardware, and even saw a giant wildlife tunnel.

*Below: A fault in the Tye Formation at one of the newer roadcuts on US 20.*

*Right: A row of dewatering pipes at the base on an embankment on US 20.*



## Wallowas/Hells Canyon Field Trip Recap

*June 19-23, 2019, article and most pictures by Carol Hasenberg*

I'll begin this article with a picture of the Buckhorn Overlook taken on May 18, 2019, when Evelyn Bennett, Julia Lanning and I did the reconnaissance for the Wallowa trip. We were directed up here by guest field trip leader Ellen Morris Bishop, as this is the best overlook of the eastern canyons area for observing the ranks upon ranks of Columbia River Basalt flows that override the exotic terrane rocks of Hells Canyon, Imnaha Canyon and the Zumwalt Prairie through which we had travelled to get there. We are actually looking down into Imnaha Canyon here and Hells Canyon is just over on the other side of the last green ridge you can see. The blue ridge beyond is the eastern wall of Hells Canyon.



Another reason that I'm showing this picture is to contrast this nice partly sunny day in May with the partly rainy and cold 'January' day we got for the official trip. In fact, we did not plan to do Buckhorn on the first day of the field trip, but the weather forced us to rearrange the days a bit to save the nicer weather for the day of the hike.

There are only 2 of the 6 formations of the Columbia River Basalt Group outcropping in the Hells Canyon and Wallowa area – the Imnaha below and the enormous Grande Ronde above. The lineation of the canyon walls reflects individual flows of each formation. The grassy bench in the lower portion of the canyon marks the top of the Imnaha.

The next shot shows the weather on June 20, 2019. A participant, Joyce Mills, is wrapped in winter gear to brave the 39-degree weather. The confluence of the Imnaha and the Snake occurs just to the left of the prominent ridge in the canyon.





On the way to Buckhorn the most prominent features in Zumwalt prairie are the Findley Buttes shown in the background of this shot taken at the Nature Conservancy Horned Lark trailhead. The buttes are shield volcanoes from the last of the Grande Ronde flows capping the prairie. Overlying the basalt are various late Miocene ash flow tuffs and windblown loess from the Ice Ages, giving the prairie features a soft, rounded appearance.

Along the Zumwalt Prairie we also encountered a patchwork of low mounds with rocky drainages between them. These 'biscuit scablands' or 'mima mounds' are believed to have been sculpted by generations of pocket gophers, who frequently scurried across the path of the vehicles.



In a couple of roadcuts the Grande Ronde basalt could be spotted on the prairie. This closeup of the basalt at this roadcut shows the onion-peel characteristic of spheroidal weathering, and is not to be confused with pillow basalts. Pillow basalts form under water and exhibit radial cracking patterns.

Later that evening my car buddies Dawn Juliano, Larry Jordan and I went into downtown Enterprise to explore several buildings sheathed with Bowlby Stone, a tuffaceous material erupted during the Grande Ronde flows. Bowlby stone was a popular material because it cut easily when wetted. Larry hams it with the detective work.



Here is the money shot of the graceful Wallowa County Courthouse which is also sheathed in Bowlby stone.

Next day we organized our carpools to head into Hells Canyon. This drive was approximately 90 miles each way over twisty roads from Joseph. Stop 1 on Highway 350, just a few miles from Joseph, was a roadcut through a phreatic explosion of Grande Ronde basalt. The explosion was a result of water or mud mixing with the hot lava. Pelagonite was produced in the eruption, and it is characterized by the sulphurous yellow of the mineral limonite.





Our first two stops in Hells Canyon were in the first five miles north of Copperfield on the Idaho side, where we viewed the greenstones of the Hunsaker Creek formation. These were formed when the ancestral volcanic rocks of the Wallowa Terrane, from the Permian period, metamorphosed under the pressure of the accretionary process. Bishop answers some questions from the participants.

For you mineral buffs, in his book *Islands and Rapids*, Tracy Vallier describes the volcanic rocks of the Hunsaker Creek Formation as metamorphosed to the greenschist facies, changing the composition to keratophyre or quartz keratophyre, rich in the minerals quartz and albite with minor amounts of chlorite, epidote, and calcite.



Looking ahead at Hells Canyon stop 2 we see the swirls of a crag of the marbled Triassic Martin Bridge Formation of the Wallowa Terrane. We stopped near there on the return from the canyon to observe some tiny fossil imprints still present in the rock, and cracked some samples open to smell the 'petroliferous', or oily-sulfurous smell still present therein from the decay of organic material in the original limestone.

This shot shows the rugged character of the Wild Sheep Creek Formation outcrops near Hells Canyon Dam. The Triassic Wild Sheep Creek Formation is more mafic than the Permian volcanic strata of the Wallowa Terrane, and it forms the steepest cliffs of Hells Canyon. Its volcanic rock origins were basalts and andesites, from lava flows, pyroclastic rocks, and breccia from debris flows, and turbidites, intermingled with small amounts of limestone.



June McAtee took this awesome shot of the mountain goats cavorting near Hells Canyon Dam on the Wild Sheep Creek Formation.

Carole Miles poses near a boulder from the Martin Bridge Formation on the last stop before leaving the canyon.





Third day of the trip began with a little drive from Joseph toward the Hurricane Creek trailhead. On the way up the group stopped at an outcrop of the 'Lower Sedimentary Series', sedimentary rocks somewhat older than the Martin Bridge Formation and forming the base of Chief Joseph Mountain.

From the trailhead, the field trip participants diverged into three groups for hiking. This is my 'relaxed paced group.' Woody English, Sheila Alfsen, Dawn Juliano, Jan Kessler, Carole Miles, I think that is Kitty Reed hiding behind Annie English, author Carol Hasenberg, and Bonnie Prange. None of us felt like endangering ourselves on the Falls Creek crossing, which was quite treacherous, so we hung out and looked at rocks in the creek bed and Kitty and Sheila led an impromptu learning session with those rocks.



After the hikers returned, we jumped into our cars and drove over to the next valley west, the Losteen River valley, where we saw this impressive outcrop of Wallowa Batholith granodiorite at the Pole Bridge Picnic Area, where we had a little picnic. This most northerly tongue of the batholith is the most accessible view of 125-140-million-year-old rocks of the stitching plutons that mark the accretion of the Wallowa Terrane onto North America.



During the picnic, the group had a lively discussion of why the moraines of the Wallowa River at the outlet from the Wallowa Mountains, which form Wallowa Lake, were so much bigger and more pronounced than those of the Losteen River, whose mountain valley is nearly straight and much longer than that of the Wallowa River.

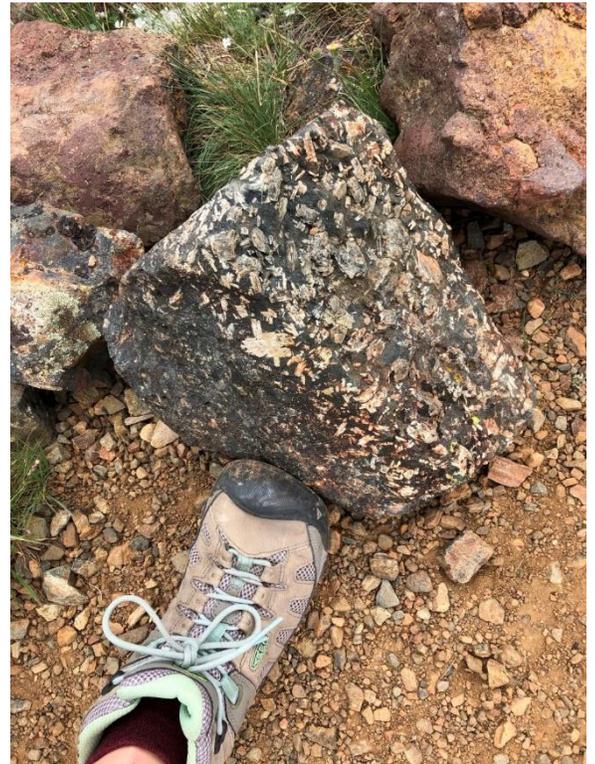
The final day of the field trip began on the terminal moraine from the glacier that created Wallowa Lake. Ellen used this portion of the trip to discuss the fragile ecology of the moraine bunch grass prairie – this area is one of the few remaining stands.

Ellen pointed out and described a number of native and invasive species in the prairie at the top of the moraine. The list included Great Basin wild rye, bunchgrass, buckwheat, pickoon, lupine, cheat grass, timothy, salsify and arnica.

Bunchgrass and native prairie species tend to mass in bunches, leaving space to develop a 'biological crust' in between comprised of slow growing moss and lichen. This protective barrier is easily disturbed by grazing animals.



Heading up the Wallawa Lake Tramway, one gets fabulous views of Wallowa lake and the lateral moraines which enclose it like great arms coming from the mountains. The view at the top of Mt. Howard was not quite as spectacular on this day, as the cloud level was just about the same as the mountaintop. Nevertheless, Kitty Reed and I located 'Bev's favorite basalt' as described to me by Larry Purchase.





Field trip participants Dawn Juliano, Mary and Charlie Raymond, and Woody English chat with Dave Jensen (orange coat) while waiting for the clouds to lift. Photo by Annie English.

On the way down on the tramway, one could also see a spectacular CRBG dike sticking out of the side of East Peak, the next peak to the south of Mt. Howard.



The sun finally set on the end of a fine trip to the Wallows.

## NGSS in Oregon

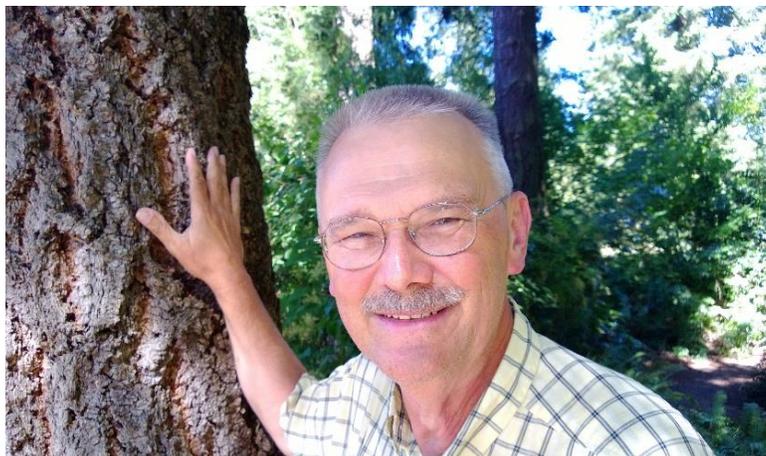
*October 11, 7:30 to 9:00 pm, Cramer Hall*

Dr. Michael Cummings will speak to GSOC at the February Friday night lecture about the advancement of science standards and professional development in Oregon public schools. In 2015, Oregon joined other states to adopt the Next Generation Science Standards (NGSS), which significantly changed the way science is taught in public schools. Supporting teachers as they made the shift from the old way of teaching science to the expectations of NGSS has been the focus of professional development since 2015. Cummings will describe three examples that illustrate how Oregon worked with teachers and districts to implement NGSS. These include: 1) Project based learning in the Mitchell School District, 2) Groundwater studies in Harney basin at Crane Union High School, and 3) Integration and implementation of NGSS in multi-grade classrooms.

Cummings grew up in Prentice, Wisconsin, a small, rural community in northern Wisconsin. His university degrees are from the University of Wisconsin-Eau Claire, University of Minnesota-Duluth and a Ph.D. from the University of Wisconsin-Madison. From 1979 he has been a faculty member of the Department of Geology, Portland State University.

### WELCOME NEW MEMBERS!

Robert Boyce	Cory Samia
Michael Harrell	James Binkley
Marjorie Bush	Maura Hanlon
Christopher Humphrey	Nancy Matheny



**The Geological Society of the Oregon Country (GSOC)** is a non-profit organization based in Portland, Oregon. The society is dedicated to the study of geology in the Pacific northwest and is open to persons with all levels of education and professional backgrounds. GSOC was formed in 1935.

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Phone (\_\_\_\_) \_\_\_\_ - \_\_\_\_\_ Email address \_\_\_\_\_

Geologic Interests and Hobbies \_\_\_\_\_

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Please indicate Membership type and include check for appropriate amount:

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# The Geological Newsletter

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THE OREGON COUNTRY

November/December 2019  
Volume 85, Number 6

The Geological Society of the Oregon Country  
P.O. Box 907, Portland, OR 97207-0907  
[www.gsoc.org](http://www.gsoc.org)

## Nick Zentner, Pacific Northwest's 'Rock Star'!

by Carol Hasenberg

This article is going to be a bit of a departure from the typical GSOC Friday night lecture synopsis, because there is an online video version of the "Supervolcanoes" lecture available on [Nick Zentner's web page](#). However, the GSOC lecture itself was a happening due to the popularity of Zentner's video productions, and there were some wrinkles in the Supervolcanoes lecture that he did specifically for our group that are worth noting.

See *Nick Zentner*, Page 62



## Calendar

Special Event: Yumei Wang  
"Disasters, Resilience and the  
Next Generation"

November 8, 2019 Portland State  
University SMSU 327

Yumei Wang will give her award-winning Le Val Lund Lecture, followed by a panel discussion with Jonna Papaefthimiou, Portland Bureau of Emergency Management; Sasha Pollack, Metro Resiliency Program; and Jay Wilson, Clackamas County Department of Disaster Management.

Seating for the event is limited, so please [register online](#) if you are intending to go.

see *Disasters and Resilience*, Page 60

## GSOC 11th Annual Holiday Party

Saturday December 14, 6:00 pm – 9:00  
pm, Woodstock Wine & Deli, 4030 SE  
Woodstock Blvd., Portland OR

GSOC Members and their guests are invited to the 11th GSOC Annual Holiday Party. The party will feature a potluck dinner, holiday music and multimedia talks of the past year's field trips.

There will be no December Friday night meeting due to the Holiday Party.

for updates on the GSOC Holiday Party,  
see the GSOC website

**GSOC Friday Night Lectures** are held the second Friday evening of most months, 7:30 p.m., Rm. 53, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. Check the GSOC website ([www.gsoc.org](http://www.gsoc.org)) for more information and updates to the calendar.

**Hourly rates** for parking are available in some parts of PSU parking structures. PSU Parking Structure #2, 1724 SW Broadway across from Cramer Hall is \$5.00 flat rate in the evening. Park in permit (NOT reserved) spaces and pay at the kiosk by entering your vehicle license number. There is also on street pay parking, and many mass transit options. Street parking is \$2.00 an hour, but free after 7:00 pm. More info available [here](#).

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**Disasters and Resilience**

*Friday, November 8, 2019, 6:30 - 8:30 pm, Portland State University Smith Center SMSU 327, 1825 Southwest Broadway, Portland, OR*

In her talk, Yumei Wang will present a challenge to develop new and transformative approaches for improving society's resilience to future natural disasters.

The severity and consequences of disasters caused by natural hazards are greatly affected by the functionality of critical lifeline infrastructure after the events. The resilience of critical lifeline infrastructure – related to fuel, power, water, transportation, and communications – is essential for reducing the frequency and impact of future disasters. Currently, various lifeline systems are designed and operated independently; yet many systems depend on each other to function. A single failure in one lifeline system can lead to multiple failures across multiple systems and escalate into a much larger and more complex disaster. To prevent severe critical infrastructure failures and minimize the detrimental societal effects of major and regional disasters such as a Cascadia earthquake and tsunami, as a society we need to develop new coordinated approaches to control the delivery of lifeline services.

Yumei Wang is a resilience engineer at the Oregon Department of Geology and Mineral Industries (DOGAMI). She focuses on building resilience to natural hazards and earthquake risk management, including on schools, emergency response facilities and critical lifelines infrastructure. She has been honored by The American Society of Civil Engineers (ASCE) with the *2018 Le Val Lund Award for Practicing Lifeline Risk Reduction* for her outstanding contributions to the field of lifeline engineering and for promoting seismic lifeline resilience and fuel resilience in Oregon, including the development of a statewide resilience plan."

Wang has been a guest on PBS NewsHour, been interviewed by The New York Times, and appeared in documentaries produced by Oregon Public Broadcast ("[Unprepared: Will We Be Ready for the Megaquake in Oregon](#)"), NOVA, National Geographic, and Discovery. Wang served as a Congressional Fellow in the U.S. Senate in Washington DC, and worked as a geotechnical consultant in California, including on the 1989 Loma Prieta earthquake.

## GSOC Board Meeting Notes

October 20, 2019

President Sheila Alfsen called the meeting to order at Barbara Stroud's home. Other board members in attendance were Dennis Chamberlin, Barbara Stroud, Paul Edison-Lahm, Julia Lanning, Rik Smoody, Megan Faust and Carol Hasenberg, constituting quorum. Past President Bonnie Prange also attended the meeting. Minutes of the August 2019 board meeting were approved.

### EVENTS

#### Friday night lectures

Yumei Wang Le Val Lund Lecture (November 8, 2019) "Earthquakes, Disasters, and Resilience". Seating for the lecture will be limited so members will be requested to [register online](#) for the event. Volunteers would be appreciated for the event and should contact Paul.

Jan 10th – Denny is confirming speaker.

Feb 14th – Business meeting – Ballots will be handed out to members for voting on by-laws and the Board of Directors slate. Speaker TBA.

The board discussed several ideas for speakers for the upcoming year.

#### Field Trips and Other Events

Volunteer Appreciation – Paul will see about moving this event from November to January when we'll have a better idea about our board structure and future trip ideas.

Holiday Party and Our Year in the Field: We plan to have music, the Year in the Field show, and a potluck on Saturday, December 14. Paul is the lead planner for the event to be held at Woodstock Wine & Deli from 6-9 pm. Volunteers would be appreciated for the event and should contact Paul.

#### Field Trips and Other Events

##### FIELD TRIPS

Attendance of our late summer and fall field trips were 16 for Lewis River, 12 for Mt. St. Helens helicopter trip, 20 for Johnson Creek and 24 for Downtown north side.

The board is currently evaluating 2020 proposals for the tourmaline trip and the John Day rafting trip and will announce the information as soon as possible.

##### OTHER EVENTS

85<sup>th</sup> Annual Banquet: March 8th, at PSU's Smith Center; guest speaker is being negotiated and will be announced soon.

#### Other Old and New Business

##### Other Meetings:

The Board voted to go back to monthly board meetings beginning in 2020. We would like to continue to invite past board members and other volunteers or involved members to attend. Meanwhile, the board will have a November Board meeting on November 23 at 10 am at Carol's house, so that bylaws revisions can be reviewed and approved prior to December.

Meet-up meeting: TBA on the GSOC website.

Treasurer's Report submitted by Dawn and approved by board.

Member Management Software: The Wild Apricot platform GSOC account has been created by Secretary Barbara Stroud and plans for adding existing members to the database have been determined and approved by the board.

One important point is that the membership due dates will be rolling from the date of membership for more recent members and for old-time members the due date will be January 31 so that announcements and payments will not have to be made over the holiday season.

*Continued...*

## BOARD MEETING NOTES

*continued from Page 45*

**Bylaws:** There are significant changes to the society bylaws that are being written and will be presented to the membership in December in order that they be voted on by the membership in February 2020.

The most significant change will be a restructuring of the Board of Directors. This is being done to encompass all the major functions of the society in light of the current club size, current activities and changes in organization and communication technology. It is also planned to more fairly apportion work load and terms of service so that being a board member is more appealing to more members of the society.

The other changes are to reflect current membership types and updates to the Newsletter concept and other minor updates.

**Nominating Committee:** Sheila, Paul and Denny have been working on nominations for 2020 which will be announced after the November board meeting.

### Upcoming board meetings:

November 23, 10 am, at Carol Hasenberg's house.

December 14, 4 pm, at the Woodstock Wine & Deli prior to the holiday party.

Notes compiled by Carol Hasenberg from minutes written by GSOC Secretary Barbara Stroud.

## Nick Zentner, *cont. from pg. 59*

*Field trip recap from July 13-14, 2019*

To begin the lecture, Zentner talked about his inspiration for doing the topic of Supervolcanoes in the Pacific Northwest:

Zentner was the guest speaker at the 79th Annual GSOC banquet in 2014. On that occasion, he spoke to the group about the geology of the Kittitas Valley in Washington. During the banquet Zentner sat next to Dr. Paul Hammond, PSU Professor Emeritus and longtime GSOC member. They struck up a conversation, during the course of which Dr. Hammond asked Zentner if he was aware of the calderas that DOGAMI's Jason McClaughry and others had recently recognized in Oregon, including the Crooked River Caldera which contains Smith Rock as one of its boundary features. Hammond told Zentner that these calderas were likely the result of activity from the Yellowstone Hot Spot. From there, Dr. Hammond took out a napkin and sketched out just how a caldera located a few hundred miles north of the track of the Yellowstone Hot Spot could have been caused by it.

This was the beginning of a lecture in which Zentner also could incorporate his knowledge of Idaho geology (he got his master's degree at Idaho State University) and some interesting features of geology from his current home in Ellensburg, Washington, where he teaches at Central Washington University. Specifically, near Mattawa, Washington and on the south side of the Saddle Mountains is a 30-foot deep deposit of volcanic ash known as the Cougar Point Tuff. It comes from a source about 400 miles away in Idaho, where an eruption of magma occurred 11.8 million years ago, and is also attributed to the Yellowstone Hot Spot. The source of this and several other eruptions has been dubbed the Bruneau-Jarbidge eruptive center.

In his study of this feature Zentner was able to make a connection with German volcanologist Hans-Ulrich Schmincke, because in his classic textbook Pyroclastic Rocks coauthored with R.V. Fisher, Schmincke describes accretionary lapilli found in the very same exposure of Cougar Point Tuff. This feature of hollow spheres found in a layer of the volcanic ash are

produced by hailstones falling at the same time as the ash. Dr. Schmincke was delighted that his reference to the material had generated the contact and had Zentner send him some more samples of the Cougar Point Tuff material.

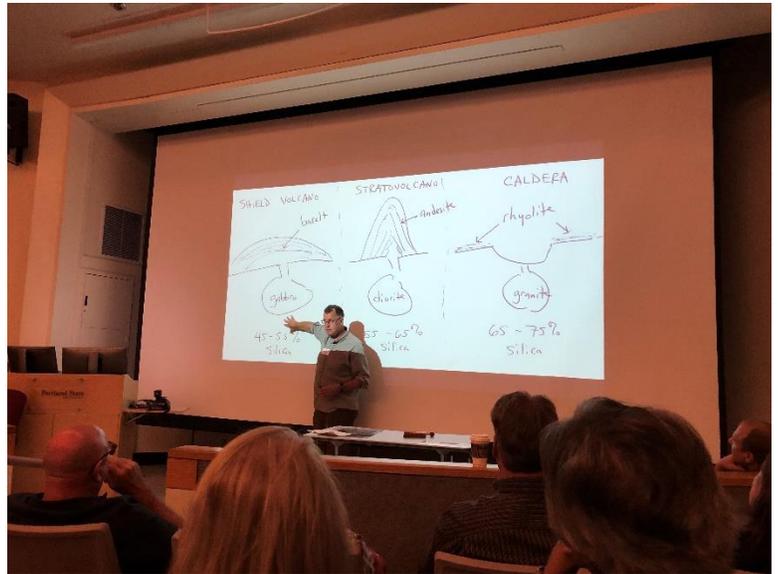
Zentner also was inspired by the Supervolcanoes research to branch out more into Oregon for the topics of his videos. Smith Rock, a popular tourist destination in central Oregon, a mecca for rock climbers and also part of the Crooked River Caldera, was a natural topic for one of Zentner's five minute "Nick on the Rocks" videos for PBS. A particular highlight for the GSOC audience was that Zentner premiered the video during the lecture. The video featured interviews of Jason McCloughry from DOGAMI and retired National Forest Service geologist Carrie Gordon.

The lecture also featured clips of the animation work done by Newlands & Company, Inc. ([nc3d.com](http://nc3d.com)), NW Portland animators, who have been doing animations of the Ice Age floods in Eastern Washington for Zentner's productions. The latest animation clip was of the "umbrella cloud", or strong volcanic explosion produced by the supervolcanoes. Zentner made a point of comparing the umbrella cloud with the weaker plume produced by Cascades volcano eruptions. The point is that the umbrella cloud is so strong that it is not affected much by the wind and that is how 30 feet of ash could be deposited 400 miles to the northwest of the Bruneau-Jarbidge eruption.

Zentner also stressed his appreciation for his friend and videographer Chris Smart who does much of his camera work, including the incredible drone shots found in the videos. With such great teamwork in place, the video work Zentner has been doing has made geology learning fun for many folks who probably otherwise would never be exposed to it. Nick, we salute your work!

### Nick Zentner videos

All of Nick's video works, including the "Supervolcanoes" lecture, "2 Minute Geology" series, "Nick on the Rocks" series, and many others, are available on [Nick Zentner's web page](#). "Nick on the Rocks" videos can also be found on the [OPB website](#).



*Zentner explains the connection between magma silica content and style of volcano in his iconic hand drawn sketches.*

### Can't get enough of Pacific NW geology videos?

Try [BetterGeology](#) videos by Andrew Dunning, PSU undergrad student who participated in the GSOC/RCA field trip in September 2018.

Also there is the "10 of the Best Learning Geology Videos of 2017" article on the [geology learn blog site](#).

### "The Times, They are A- Changing"

*Upcoming changes to GSOC organization are being designed to facilitate membership registration and communications and to just "get the jobs done."*

This is the last print format newsletter that GSOC will be publishing in the foreseeable future. Almost. By now, most of you members have been turning to the GSOC website for your information about what is going on in the club. And that will continue to be the case. For those of you who would like something to download and print, the GSOC board is planning to produce a pdf archive document summarizing the website articles and club activities at the end of each year starting in 2020. Those documents will be available on the website, included in the page with the archived newsletter files.

GSOC is also adopting a new software platform to perform membership registration, renewal and mass email communications starting in 2020. The GSOC Board of Directors will be sending an email to the membership outlining the membership renewal process and will be available to answer questions the members may have regarding the new platform and registration process. It will be important for members to renew their memberships using the process outlined in the email in order to continue to receive society emails and other membership benefits.

Needless to say, all these changes need to also be reflected in the society's bylaws, and the board is working hard on those changes and is planning to present them to the membership in December 2019, so they can be put to the vote in the society's annual business meeting in February 2020.

As the outgoing newsletter editor, I would like to express my appreciation for the society and for the opportunity I've had for writing and editing *The Geological Newsletter*. Twenty years have flown by so fast! – Carol Hasenberg

### WELCOME NEW MEMBERS!

Valerie Rullman	Marilee Janzen
Andrew Baird	James Faulkner
Matthew Brunengo	Sally Kohnstamm
Alexander Gordon	Sam Lee
Mark & Laurie Carter-Piff	
Lee Nusich & Karen Gunderson	
Sarah & Richard Munro	
Sheila & Scott Morrill	

## Floral Notes From the GSOC Wallowa Field Trip

By Teresa Meyer

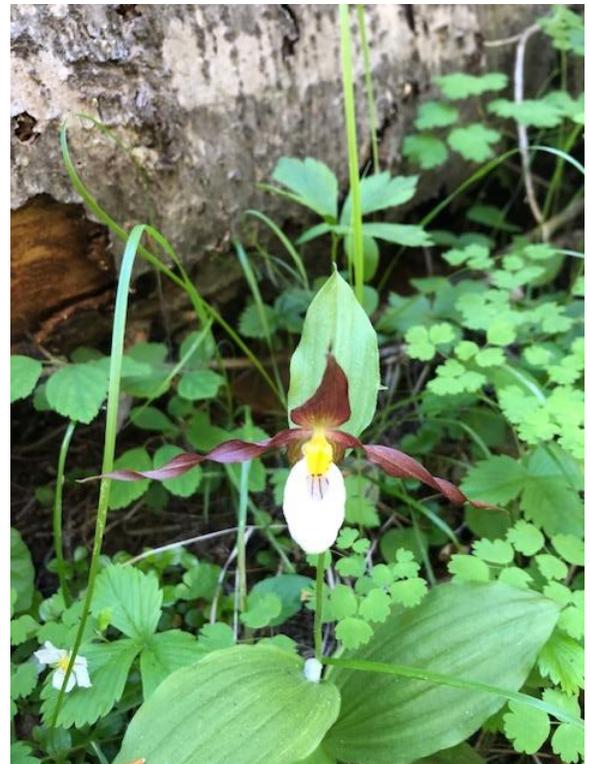
For those of us who were fortunate enough to participate in the Wallowa GSOC field trip last June, along with stunning geology we were immersed in an abundance of wildflowers. We were surrounded by an unbelievable variety of wildflowers everywhere we went. At any one time you could stand still and see more than a dozen or more different flowers surrounding you.

We were fortunate to have several GSOC members who also were wildflower enthusiasts. There were several interesting conversations and discussion of the possible ID of an interesting flower. I know that I learned a lot from the other people on the trip.

We started out on the Zumwalt prairie which is known for its Mima mounds as well as its wildflowers. The Big Headed Clover, Old Mans Whiskers, Larkspur, Lupine and others were everywhere. But I think that the 6-mile round trip hike up Hurricane creek really gave us an opportunity to see the biggest variety. The hike took us through several habitats, avalanche meadows, rocky slopes, moist trees and streams. Here we saw lots of Calypso orchids, an early Mountain Lady Slipper orchid, Striped Coral Root, Balsam Root, Lupine, Meadow Rue, Arnica, Cinquefoil, Penstemon and more.



Our last day took us to the Iwetamlaykin State Heritage site where our guide Ellen Morris Bishop gave us an intro to the value of native bunch grass and other native plants.



Clockwise from top right: Deerhorn Clarkia, Mountain Ladies Slipper, Big Headed Clover..



Along with being an excellent Geologist, photographer and newspaper editor, she knows her plants!

Overall, we saw over 50 species of wildflower — not bad for a geology field trip!



*Clockwise from top left: Scarlet Gilia, a riot of flowers carpet the Zumwalt Prairie with the Wallowa Mountains as a dramatic backdrop, Striped Coralroot, Buckwheat, Calypso Orchid.*



