The Geological Newsletter

News of the Geological Society of the Oregon Country

2023 Archive of Club Activity

Volume 89, Number 1

CLUB ACTIVITIES

GSOC BOARD OF DIRECTORS 2023-2024

The GSOC Board of Directors serves from March 1, 2023 to March 1, 2024. Slate of nominees for Board of Directors was voted and approved at the Annual Business meeting on February 10, 2023.

President	Clark Niewendorp
Past President	Sheila Alfsen
Secretary	Bonnie Prange
Treasurer	Barbara Stroud
Programming Director	Sheila Alfsen
Membership Director	Nancy Collins
Field Trip Director	Carol Hasenberg
Communications Director	Paul Edison-Lahm
Outreach/Vogt Grant Fund Director	Carole Miles
Member at Large	Dawn Juliano
Member at Large	Dennis Chamberlin
Member at Large	Scott Burns
Member at Large	Randall Humiston

GSOC ACTIVITIES 2023

In 2023, GSOC continued to explore the use of new technology in presenting talks to its audiences, expand the role of Portland State University (PSU) students in presentations, provide outreach activities to schools and other groups, and improve and institutionalize registration and safety procedures in organizing field trips. Over the COVID lockdown, PSU had invested in hybrid technology for their major classrooms – so GSOC members are able to choose to attend in person or watch the lecture via Zoom.

The GSOC Annual Banquet had finally returned in November 2022, after cancelling the 2020 and skipping the 2021 banquets. To get the banquets back to their normal spring schedule, another banquet was conducted in March 2023. The society also led 6 field trips in 2023. All these activities serve to highlight the commitment, depth and varied experience of the 2023-2024 GSOC Board of Directors and society volunteers.

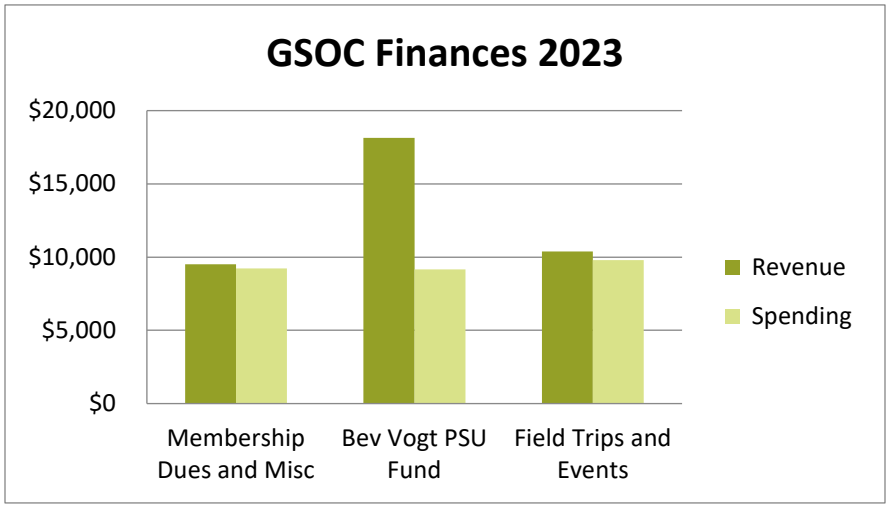
Membership levels continued to hold steady at about 360 members for 2023. Our Wild Apricot membership platform has continued to perform well, helping to keep the society solvent and organized. Many tasks, such as annual dues payment reminders and event registration, are automated, and the members-only section has been populated with past field trip guides, including those produced from 2022 and 2023.

The club and the Bev Vogt Grant Fund are in fine shape financially for continuing activities in 2024. Revenues exceeded expenses for both the general and Bev Vogt funds. Planning the finances carefully for Field Trips and Events over the past few years has given the Board confidence that spending is under control. Membership has leveled out at about 360 members and most of them do renew. New members have offset the loss of those who choose not to renew. Books are balanced monthly and presented to the Board so that any change in trends can be identified quickly, and changes can be instituted as needed. Membership fees have not been raised for 3 years and it does not appear that will be necessary in the near future.

The Board believes that our hybrid lectures, field trips, and field trip guides are critical in offering value to our members. Each is designed by the all-volunteer Board to contribute to our geologic knowledge. An important recent addition is the Geology Hour, instituted in 2022. It is a monthly online event offering our grant recipients opportunity to share their research. The Rock Show-and-Tell is another monthly event, in person. It provides a venue to share and learn about rocks and minerals.

In addition to serving our members, GSOC serves the public through its free hybrid Friday Night Lectures, Geology Hour and Rock Show-and-Tell programs. Outreach to groups and organizations is important as well, and several of our members do regular talks to many other groups during the year.

The GSOC Board foresees an exciting year in 2024, including a lecture by Nick Zentner in May. The club is doing well and will hopefully continue to serve members in such a way that will sustain these important activities over the next several years.



2023 GSOC Finances: GSOC Membership Dues ($8134) and miscellaneous other income pays for overhead expenses and speaker honoraria; Bev Vogt fund is for grants and scholarships in the Geoscience Department at PSU; Field Trips and Events are planned to pay for their own expenses through fees.

THE GSOC BEVERLY VOGT PSU GRADUATE STUDENT FUND – PROGRESS AND RESULTS IN 2023

Prepared by: Carole Miles, committee chair

2023 was the second year since the establishment of the Bev Vogt fund. Thanks to the continuing generous contributions of GSOC members we were able to provide financial grants and scholarships to several undergraduate and graduate PSU Geoscience students. The Bev Vogt Fund committee was composed of the following GSOC members: Carole Miles (chair), Paul Edison-Lahm, Dr. Scott Burns, Dr. Steve Boyer, Patty Hyatt, Dr. Emily Cahoon. Below is a brief summary of the fund's financials and PSU student recipients.

Jan - Dec 2023 financial report:

Prior year fund balance	$11,265.00
Donations	$18,138.50
Honorariums (Geology Hour & FNL presentations)	($1,550.00)
Grad student grants	($7,600.00)
Net fund balance	$20,253.50

Honorarium awards:

- Geology Hour undergraduate = $50
- Geology Hour graduate = $75
- Friday Night Lecture = $150

Graduate student grants:

- Thesis proposal presentation = $100
- Grant award = $1,000

Graduate student grant recipients:

George Anim — Master's candidate

My research is focused on understanding shock deformation in shergottites, the most commonly sampled Martian meteorites. My goals are to estimate deformation intensities in shergottites, identify the number of asteroid impact events they have undergone, and develop additional deformation estimation criteria based on changes in the crystal structure of key minerals such as olivine and pyroxene. Understanding the shock deformation in shergottites (and, by extension, all Martian meteorites) will allow for an unbiased interpretation of primary features that can reveal a lot about the geologic processes that shaped Mars.

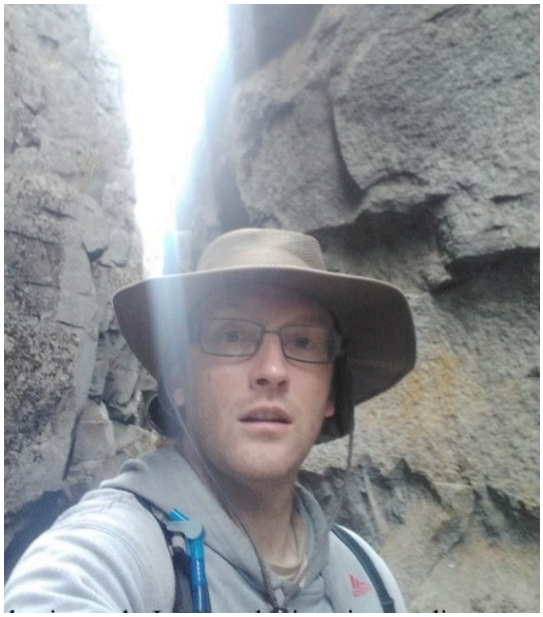
I have analyzed the deformation and textures of nine Martian meteorites under the petrographic microscope and selected five for further analysis under the scanning electron microscope (SEM). Out of the five, I have analyzed three samples using the SEM. I'm working on processing the SEM data to understand the extent of deformation and decipher the possibility of multiple deformation events within the Martian samples. I expect to be done with data acquisition from the two other samples and data processing by the end of spring this year. With that, I am en route to defending my thesis in the summer of this year. Also, I will be making a poster presentation on some of my findings at the Lunar and Planetary Science Conference this March.

Javaria Aziz — Master's candidate

My master's thesis focuses on understanding magma evolution and eruptive history of Three Fingered Jack, a dissected mafic composite cone volcano in the central High Cascades of Oregon. This region is characterized by intra-arc extension, creating an extensive mafic platform dominated by dozens of small scoria cones and voluminous mafic flows of basaltic and basaltic andesitic composition. It has the largest concentration of mafic monogenetic volcanoes in the entire Cascade arc, some of which have erupted in the past 2,500 years. Three Fingered Jack is much larger compared to its neighboring scoria cones. Studying older, eroded volcanoes, like Three Fingered Jack, can help us better understand the eruptive patterns of the more voluminous intra-arc volcanoes of the central High Cascades. These are the ones from which lava flows may travel far enough to pose risk to central Oregon communities.

Analytical methods used for this study are geochemical analysis, Ar/Ar age dating, scanning electron microscope, and detailed field mapping.

Brett Hopt — Master's candidate



Black shales are rocks that are enriched in heavy metals and metalloids. Previous studies have shown that agriculture crops grown on soils formed on black shales pose a health hazard to humans and biota. However, no study has been conducted on the environmental hazard that these outcrops may pose in watersheds with black shale outcrops. I will be studying how these heavy metals are partitioned in streams once released during weathering; heightened knowledge is needed in this area so that state agencies may better protect human and environmental health in areas where metalliferous black shales occur.

For my thesis work, I am analyzing river sediments and water samples from watersheds with black shale exposures in eastern Kentucky for the presence of heavy metals. Preliminary statistical analysis from the NURE sediment database has shown that these stream sediments are statistically significantly elevated in many heavy metals—E.G., Co, Cu, Ni, V, and Zn. Current research includes XRD and sequential extraction analysis of these sediments to determine the likely host phases of the heavy metals.

Obinna Ozioko — PhD candidate

Temporal clustering of deep-seated landslides in the Puget Lowlands; a seismic trigger?

The Puget Lowlands of Washington State is about the most seismically active region in the Pacific Northwest. Paleoseismic records show ample evidence of prehistoric crustal and Cascadia megathrust earthquakes in the region with a temporal cluster of earthquakes in the crustal faults about 1000 years ago. Although multiple paleoseismic records exist for crustal and Cascadia megathrust earthquakes in the area, little is known about the temporal and spatial distribution of earthquake-triggered landslides. To address this, we conducted a comprehensive study applying surface roughness age dating techniques to over 600 landslides in the lower Puget Sound region to explore earthquake-triggered landslides' spatial and temporal patterns.

Preliminary results revealed compelling insights into the relationship between seismic activity and landslide occurrence. Approximately 20% of the dated landslides demonstrated ages corresponding to about 1000 years ago, aligning remarkably with the known ages of the crustal earthquakes in the Seattle, Tacoma, and Olympia faults, respectively. A second

peak emerged from our analysis, indicating that about 15% of the total landslides fell within the age range of the last Cascadia subduction zone earthquake. This temporal coincidence suggests a strong link between seismic events and landslide occurrences during that period. This finding underscores the significance of seismic activity as a triggering or predisposing factor for landslides in the region. This study highlights that approximately 40% of the total landslides in the lower Puget Sound region may have been directly triggered by earthquakes or predisposed to previous seismic events. This substantial proportion indicates the inherent dangers of seismically induced landslides in the area and underscores the importance of understanding the complex interplay between seismic activity and slope stability.

Lizzet Reyes — Master's candidate

Volcanic eruptions release carbon dioxide (CO_2) into the atmosphere, which contributes to the carbon cycle. However, much is still unexplored about how volcanic eruptions affect the movement of organic carbon from vegetation and soil. My thesis focuses on the impact of the 1980 Mount St. Helens eruption on the terrestrial carbon cycle. It examines how the eruption affected carbon storage in vegetation and soils in the affected area. By comparing terrestrial carbon levels before and after the eruption, we aim to establish a carbon budget for the period since 1980.

Analysis of biomass carbon maps generated from various data sources indicates that the area currently holds 11.3 metric tons of carbon. If pre-eruption terrestrial carbon levels were lower, the eruption may have acted as a carbon sink over several decades. We also propose that landslides triggered by eruptions could contribute to carbon sequestration. Overall, the research emphasizes the need to understand the intricate connections between geological processes, such as volcanic eruptions and landslides, and their impact on the global carbon cycle to comprehend their long-term effects on Earth's climate and environment.

I am currently in the analysis stage of my research. I did fieldwork over the summer to verify some LiDAR-derived datasets I use for remote sensing work. My next steps are to develop a terrestrial carbon accumulation curve by doing a time-series analysis of satellite images following the eruption. I will then apply the accumulation curve to an existing terrestrial carbon model to create a carbon budget for the eruption. I am looking to defend at the earliest this spring, but at the latest this summer!

Alyssa Smith — PhD candidate

My research is focused in the central to northern Oregon Cascade Range. In this part of the Cascade Range, erupted lavas are very compositionally restricted as compared to other arc segments. Although the central to northern Oregon Cascade Range does have several large, more andesitic stratovolcanoes, such as Mt. Hood, Mt. Jefferson, and the Middle and South Sister, volcanism is dominated by hundreds of smaller, basaltic volcanoes. Studies of the Cascade Range have acknowledged the prevalence of basaltic volcanism in this portion of the range, but many regional studies have focused on the andesitic centers, leaving most of the basaltic centers unstudied.

The funds I received as a Bev Vogt grantee allowed me to complete my 2023 summer fieldwork season in Central Oregon. I took six PSU Geology undergraduates along with me on four and a half separate sampling trips (that "half" trip was cut short by the unexpected onset of fire season). These trips involved traversing wide areas within the Central Oregon High Cascades and sledgehammering lava from previously unsampled mafic volcanoes.

My assistants and I battled high temperatures, mosquitoes, wasps, and wildfire smoke. We were rewarded with a few dozen rock samples and unparalleled mountain views...and we only broke one sledgehammer handle in the process!

The geochemical data I will obtain from the collected samples will be critical to my doctoral work. I anticipate at least one, but likely two, more field seasons before my Ph.D. work is complete. My research aims to determine why mafic lavas (SiO_2 < ~57 wt.%) are so abundant in the Oregon High Cascades, as well as why basaltic andesites (intermediate to basalts and andesites) are especially common.

Angela Stetson — Master's candidate

Titled "Orphan Basalts: Investigating the Petrogenesis of Unassigned Eastern Oregon Basalts," my thesis project is focused on detailing the origins of basalts mapped within the Telephone Butte, Calamity Butte and Craft Point quadrangles located along the boundary between the Harney Basin and the southern foothills of the Blue Mountains Province. Named for the localities in which basalt samples were collected, several basalt units are mapped in each quadrangle. Similarities in geochemical analyses of each basalt unit suggest that although these basalts have different unit names, they are in fact related and likely originated from the same source.

For this thesis research, I have been working on classifying the origins of basalt and basaltic andesites mapped throughout eastern Oregon over the past seven years. I spent the last two summers geologically mapping the Craft Point 7.5-minute quadrangle in Harney County, Oregon, which has extensive basalt and basaltic andesite coverage. My main question was: “Where did these basalts come from?” Surrounding

maps provided little clues to the source of these lavas. While some map reports suggested a Columbia River Basalt group origin, such as the Picture Gorge Basalt or Steens Basalt, others suggested the Strawberry Volcanics from the southern flanks of the Blue Mountains or even a previously undocumented volcanic event. Thus, I set out to determine the origins of the "orphan basalts," hypothesizing that their source was 1) the Picture Gorge Basalt, 2) Steens Basalt, and/or 3) the basalt of the Strawberry Volcanics.

Last summer, I collected more basalt samples as I continued my mapping project, including one sample from the unmapped House Butte quadrangle directly east of Craft Point. To add to the samples collected from Craft Point, samples collected from previous maps were added to this study, and their geochemical compositions were evaluated. Reported basalt and basaltic andesites from all nine regional geologic maps were compiled to build a dataset of 47 samples for classification. Two samples are still undergoing absolute age analysis; ten were made into polished thin sections. I am currently in the data processing stage of my research and have begun to make preliminary classification by correlating my samples to the geochemistry of previously published data for the Picture Gorge Basalt, Steens Basalt, and basalt of the Strawberry Volcanics.

Honorarium recipients (Geology Hour presenters):

- Andrew Dunning
- Emma Rahalski
- Brett Hopt
- Javaria Aziz
- George Anim
- Angela Stetson
- Heather Ziff

Friday Night Lecture presenters:

Julian Cohen (2022 Vogt grant recipient):
"Ancient meteoric water preserved in volcanic glass shards from the 7 million year old Rattlesnake Ash Flow tuff", July, 2023

Daniel Sheikh (2022 Vogt grant recipient):
"Lithic clasts from lunar meteorites", June 2023

PRESENTATIONS FROM THE GSOC FRIDAY NIGHT MEETINGS, BANQUETS, PICNICS

Most of the 2023 GSOC Friday night lectures are recorded and available on our website, gsoc.org. Big thank you to all the volunteers who produce these events, including Sheila Alfsen, Paul Edison-Lahm, Carole Miles, and Gary Joaquin.

- January 13 – "From Maar Craters to Cinder Cones: understanding Oregon's small, but most-common, volcanoes," by Dr. Emily Johnson, USGS Cascades Volcano Observatory. Hybrid event.
- February 10 – "A Gush and a Rush: Catastrophic Flooding from Ice-Age Lakes Alvord and Coyote into the Owyhee River," by Deron Carter, Geoscience Faculty member at Linn-Benton Community College in Albany, Oregon. Carter spent two years investigating the catastrophic flooding of pluvial lakes Alvord and Coyote as part of his graduate studies at Central Washington University. Hybrid event.
- March 5 – "The Tomanowos Willamette Meteorite Story," GSOC Annual Banquet presentation by Dr. Melinda Hutson, Cascade Meteorite Laboratory, and Greg Archuleta, Confederated Tribes of Grand Ronde. In-person event at McMenamins Kennedy School.
- April 14 – "The Making of Mountains: Emergence of the Oregon Coast Range and Cascades," by Dr. John Bershaw, Portland State University Geology Department Chair. Dr. Bershaw has been researching the emergence of both the Coast Range and Cascades through multiple projects using geochemical and structural analysis of sedimentary rocks within surrounding basins. This work aims to better understand Pacific Northwest mountain range history and to provide an improved tectonic framework for the Portland metropolitan area. Hybrid event.
- May 12 – "Assembling the Northwest: a roadside view of Oregon and Washington Geology," by Dr. Marli Miller, tenured senior instructor II at the University of Oregon. She is a photographer and author of Roadside Geology of Oregon, 2nd ed., Roadside Geology of Washington, 2nd ed., which she wrote with Darrel Cowan of the University of Washington, and most recently, Oregon Rocks, a guide to sixty amazing geological sites. Hybrid event.
- June 9 – "Lithic Clasts from Lunar Meteorites," by Daniel Sheikh, second year PhD student at PSU majoring in the Earth, Environment, and Society program. He obtained his B.S. and M.S. in Geology from the University of Florida and Florida State University, respectively. His presentation described his current research project. He recently presented in-person talks on newly classified lunar meteorites at both the Lunar and Planetary Science Conference and the Annual Meeting of the Meteorological Society. Hybrid event.
- July 14 – "Spatial Variations in Meteoric Water: An Investigation of the Rattlesnake Tuff," by Julian Cohen, one of GSOC's 2022 Beverly Vogt grant award recipients. Cohen presented the results of his master's thesis work — analysis of stable isotopes from ancient meteoric water preserved in volcanic glass shards from the approximately 7 Ma Rattlesnake Ash Tuff Flow, a useful proxy for characterizing ancient climate. Hybrid event.
- August 12 – Annual Picnic at Beacon Rock State Park, Washington. Ian Madin, retired DOGAMI geologist, speaker. Topic was the stratigraphy of the Columbia River Gorge in the neighborhood of Beacon Rock.
- September 8 – "The Good Ship Challenger — Conversion of a Plate Tectonics Skeptic," by Dr. Bill Orr, retired professor, and director of the Condon Collection of Paleontology at the University of Oregon. Dr. Orr's 1969 - 70 participation in the Deep Sea Drilling Project turned out to be a major

rearrangement of his career as well as his attitude about the Earth Sciences. Earning his doctorate under the assumption that the Earth's continents are fixed in place, he came away from a 2-month leg on the drill ship with an entirely new perspective on Geology. With the addition of his participation on a major scientific endeavor came the excitement of being on the cutting edge of a major scientific revolution. Hybrid event.

- October 13 – "Mt Rainier — What is our biggest risk: Pyroclastic flows or Lahars?," by William Burgel is a professional geologist living in the Portland area. He enjoyed a 50 year career almost entirely in the railroad industry. Mt. Rainier, with its relatively high elevation, prodigious rainfall, and a steady source of volcanic emissions, makes for a volcano that is well known for producing lahars; over 55 major lahars have flowed from Mt Rainier during the Holocene. Mr. Burgel will conduct a plausible scenario whereby you, as a member of the audience, must relocate to one of these communities. How do you minimize your risk when deciding where to live? Hybrid event.
- November 10 – "From Volcanoes to Vineyards — A New Geologic Map Reveals Portland's Deep History," by Dr. Ray Wells, Research Geologist at the U.S. Geological Survey in Portland. A new digital geologic map of the greater Portland - Vancouver - Hillsboro metropolitan areas will support emergency response, conservation, agriculture and recreation. The map was produced in cooperation with the Oregon Department of Geology and Mineral Industries (DOGAMI) and the Washington Geological Survey and is based on decades of field and laboratory work by 14 geoscientists. Dr. Ray Wells led the mapping team for this project. Hybrid event.
- December 9 – GSOC Annual Christmas Party was held at the home of Clark and Joyce Niewendorp. Field trip slide shows were shown at the party.

GEOLOGY TALK/THE GEOLOGY HOUR

What started as an online version of the in-person Saturday Meetup Show and Tell by Paul Edison-Lahm in 2020 during the COVID lockdown has evolved over the last four years into The Geology Hour, a Saturday morning geology news and lecture platform for the society. This production is now hosted by a panel of volunteers, including Paul Edison-Lahm, Carrie Gordon, Andrew Dunning (our much appreciated pioneer of Geology News who has departed after September 2023), Emma Rahalski, Javaria Aziz, Angela Stetson, Brett Hopt and George Anim. Note that many of these panelists and presenters are PSU Geology bachelor, master and doctoral students. GSOC encourages student participation by offering much appreciated honoraria.

- January 28 – "Geology Talk – Reactivation of the Doe Creek Landslide," by Carrie Gordon, retired, US Forest Service. Carrie explores a 15-year study of Doe Creek, a small active landslide, in the Ochoco Mountains + Andrew Dunning's Geology News
- February 25 –"Geology Talk - Anatolian Magmas," Alyssa Smith, PSU Geology doctoral candidate thesis presentation + Andrew Dunning's Geology News
- March 25 – "Geology Talk - The Mineralogy of Georgia," Julian C. Gray, principal scientist at Focal Point Mineralogy, LLC, and former Rice Museum curator + Andrew Dunning's Geology News
- April 22 – "Geology Talk - Where Is the Rain-on-Snow Zone in the West-Central Washington Cascades?," Dr. Matt Brunengo, PSU Geology Department + Andrew Dunning's Geology News
- May 27 – "Geology Talk - Doing Science During an Emergency: My Deepwater Horizon Oil Spill Experience Dr. Paul Hsieh, retired USGS research hydrologist + Andrew Dunning's Geology News
- August 26 – "Geology Talk - Unraveling the Mysteries of the Water Systems of the Oregon Caves," Emma Rahalski, frequent Geology Talk panelist's B.S. thesis presentation + Andrew Dunning's Geology News
- September 23 – "The Geology Hour - Dropping Into the Valley: Landslides, Hot Rocks, and Humans in Southern Puget Sound," Kate Shantry, WSU doctoral candidate and professional archaeologist + Andrew Dunning's Geology News
- October 28 – "The Geology Hour - Geochronology and Geochemistry of the Monument Dike Swarm," Heather Ziff thesis presentation + Geology Roundup: "Mysterious Earthquake Lights," by Angela Stetson, and "Afghan Earthquake," by Javaria Aziz
- November 25 – "The Geology Hour: Geology Roundup'" segments included "Grindavik Iceland Volcanism," by Brett Hopt, "Google Earth for Geologists," by Javaria Aziz, and "Earth Mantle Evidence for Giant Impactor," by George Anim. All presenters were 2023 Vogt scholarship recipients.

GSOC FIELD TRIPS IN 2023

The 2023 GSOC field trips are shown in the table below. This past year field trip sign-ups were on a first come, first served basis. Most field trips were online signups with a no cancellations for refund policy. Many thanks to Carol Hasenberg, Field Trip Director, and several GSOC members who organized and led GSOC field trips in 2023 – President Clark Niewendorp, Program Director Sheila Alfsen, Communications Director Paul Edison-Lahm, Member-at-Large Dr. Scott Burns, member Ian Madin, and Vogt Scholarship recipient Alyssa Smith. Sister organization COGS (Central Oregon Geoscience Society member Dr. Daniele McKay was coleader on the Two Cascades trip, and IAFI Palouse Chapter President Lloyd Stoess led the Columbia Basin trip. Thanks also to Ouzel Outfitters for organizing trips especially to cater to GSOC members and other geology aficionados.

Field Trip	**Dates**
Rafting the North Fork of the John Day with Ouzel Outfitters and Emily Cahoon	June
Columbia Basin Ice Age Floods with Lloyd Stoess	June 11-14
Boring Lava Buttes with Ian Madin	July 9
Two Cascades with Sheila Alfsen, Daniele McKay, and Alyssa Smith. Joint trip with COGS.	July 17-18
Annual Picnic – Beacon Rock	August 12
Columbia River Gorge Terroir of Wine with Scott Burns	August 21
Geology of Bandon and Umpqua River Valley with Clark Niewendorp	Aug 31 – Sept 3
Rafting the Rogue River with Ouzel Outfitters and Gordon Grant	September 6-9
GSOC Downtown Portland Building Stone Tour	October 7

SAFETY PROTOCOLS FOR GSOC FIELD TRIPS AND OTHER EVENTS

Early in 2023 the GSOC board of directors was presented with a draft safety protocol document written by Randall Humiston, a new Member at Large in the 2023-2024 board. Drawing on his experience as a safety officer in the US Navy. Randall's document provided a basic explanation of risk management theory and then outlined safety protocols for GSOC field trips and other indoor/outdoor events. Several GSOC board members added to the protocols given their experiences with GSOC field trips and events. This draft document was used in evaluating the field trips for 2023.

Three important results of using the safety protocol for the field trips were requirement of a safety reconnaissance trip for most of the field trips, the incorporation of a safety evaluation form developed for the reconnaissance, and the inclusion of designated safety observers to "bring up the rear" and reinforce safety rules for the trips. Many thanks to Randall Humiston for his diligent work in producing and promoting this document. Also many thanks to the reconnaissance and safety observer volunteers from the club, including Randall Humiston, Carol Hasenberg, Mark Anderson, Julia Lanning, Denny Chamberlin, Sheila Alfsen, Carole Miles and Paul Edison-Lahm.

Below: GSOC participants wear safety vests on roadside stops on the 2023 GSOC Columbia Basin field trip.

IN MEMORIAM – DOUGLAS RASMUSSEN

On February 1, 2023, a very active and much beloved member of GSOC passed away. Doug Rasmussen joined GSOC when his wife Janet became a board member of the society. Janet was a board member for a decade or more, and Doug always accompanied her to the board meetings. Doug and Janet went on many GSOC field trips and even hosted a couple of events on their properties in Baker County and McMinnville. Doug's presence was always soft spoken and gentle.

Doug was a native Oregonian and spent all of his school years in the Willamette Valley. He graduated from the University of Oregon with two master's degrees and taught math and physics for 37 years. He wrote several textbooks including "Introduction to Algebra" and "Applications of Laplace Transforms."

Doug and Janet converted his family farm on Riverside Drive in McMinnville to a natural wetland and built a very isolated cabin on her family's timberland in the Blue Mountains of Baker County. His ashes are buried in the mountain soil near the cabin they built.

Above: Doug and family members

Right: A toast from the 2009 GSOC Waste, Wind and Water field trip.

Below: Group shot from 2008 Baker County field trip. Kneeling is Richard Bartels. First row are Rosemary Kenney, Bev Vogt, Marvel Gillespie, Carol Hasenberg, Janet Rasmussen, Dawn Juliano, Chris Carvalho. Back row are Bob Strebin, Larry Purchase, Doug Rasmussen and Jan Kem.

2023 OUTREACH ACTIVITIES*

- PSU Archaeology Road Show Exhibitor
- Reed College Paideia (students) lecture: Portland Basin Geology
- Johnson Creek Watershed Council Portland Basin lecture
- Oregon Origins Project sponsorship
- Reed College Alumni Reunion lecture: Portland Basin Geology
- People of Color Outdoors Oxbow Park presentation
- Portland Parks educators presentation at Mt. Tabor
- Oregon Glaciers Institute: mapping glaciers on Mt. Hood and collaborating on publication of results
- Hood River Historical Museum presentation: Mt. Hood glaciers and climate change.
- Oregon Master Naturalists: Willamette Valley Transect field trip and Mary's Peak field trip
- Oregon Agate and Mineral Society annual gem show: provided educational exhibit on Quartz: One Mineral Endless Variety
- Share, Learn, Connect sponsored by Just Create Community at Shute Park Library, Hillsboro: presentation on the use of microscopes in science
- World Microscopy Day, London, England: two presentations (Microrefractometry, and Identification of Mineral Grains and Fragments)
- Atlanta Geological Society, Fernbank Museum: presentation on the Minerals of Georgia
- Tellus Micro-Mineral Symposium, Tellus Science Museum, Georgia: presentation on Zeolites of the Pacific Northwest, and workshop on How to construct a micromount
- 2 Rock identification classes for GSOC members
- Geology presentation — Friendsview Manor
- 2 Geology presentations — Cherrywood Village
- Geology presentation — Rotary Club
- Geology presentation — Oregon City
- Fossil presentation — Sublimity Middle School
- Geology presentation — Mennonite Village
- Geology presentation — Tualatin Valley Gem Club
- Geology presentation — Powellhurst Baptist Church
- Geology presentation — Westside Commons

OUTREACH PARTICIPANTS**

- Sheila Alfsen
- Steve Boyer
- Scott Burns
- Paul Edison-Lahm
- Julian Gray
- Carole Miles
- Clark Niewendorp
- Benjamin Sloan

* Geology education and/or service-based activities performed by GSOC members that lie outside standard GSOC events.

** Participant and outreach activities list may not be complete.

Compiled by Carole Miles, GSOC Outreach Director

NEW GSOC MEMBERS FOR 2023

At the latest count, GSOC has 318 memberships and 358 members. Memberships are holding steady for 2023.

Leslie Aickin
Mary Allardt
Sarah Arad
Greg Archuleta
Genevieve Atwood
Mitchel Auerbach
Mark Barnett
Julia Battle
Scott Bennett
Tanya Blacic
Seth Bradley
Tim Bradley
Bill Brauer
Susan Bryant
Robert Carpenter
Deron Carter
John Chambers
John S Chapman
Alison Cole
John Estrem
Robert Ewing
Daveed Fleischer
Maya Foty
Stephen Harlan
Julie Harvey
Rebecca Hatten
Ian Hattie
James N P Hendryx
Eileen Holzman
Jessie Huckemeyer
Ann Hudson
Melinda Hutson
Judy Ilg
Trish Jilot
Emily Johnson
Linda M. Johnston
Albyn Jones
Cy Kratzer
Sabin Lamson
Valkyrie Landrum
Veronica Ledoux
Curtis Lucier
Patrick McCullough
Kyle McDonald
Peggylou Miner
Cary Mrozowski
Kurt Nordquist
Jay Nutt
Jason O'Donnell
Pam Pariani
Olive Perry
Jeffrey Reck
Valerie Rullman
Karen Sarnaker
Ruth Seeger
Jacob Selander
Joseph Thayer
Susan Truesdale
Todd Tubbert
Heather Vick
Brian Webb
George Anim
Javaria Aziz
Michelle Carlson
Giovonna Concia
Megan Diggins
Nathaniel Edmonds
Brett Hopt
Jennifer LaBee
Obinna Ozioko
Lizzet Reyes
Alexis Sansing
Kate Shantry
Samuel Tobey
Elisabeth Wire
Daisy Briseno &
David Vasquez
Jonathan Brown &
Jake Wicks
Emily Brown &
Woods Stricklin
Geoffrey Bunza
Lauren Ciurca &
Alex Michel
Tim Fuller
Glen & Mary Jo Hess
Michael Hynes &
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The society would like to thank all the members who made donations to GSOC in 2023:

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…and to all of those who have donated cash at Friday Night Lectures!

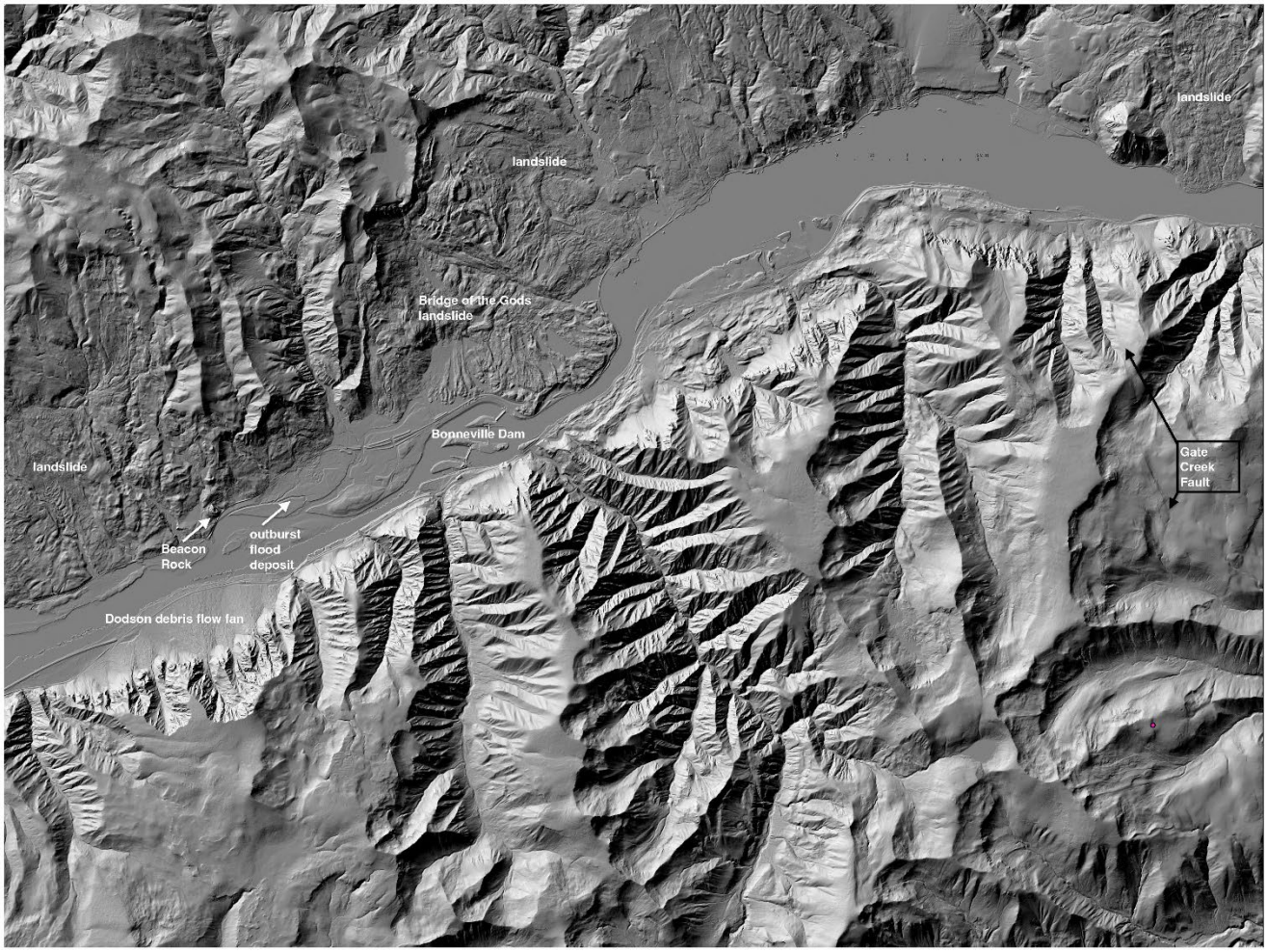
GSOC WEBSITE ARTICLES

GSOC Crowd Enjoyed the Annual Picnic at Beacon Rock SP

August 29, 2023

The GSOC Annual Picnic enjoyed a good turnout this year at Beacon Rock State Park in the Columbia River Gorge. GSOC had not sited the picnic here for over 20 years, and members agreed that this was a very good venue for a picnic. Not only did the site have a serviceable enclosed shelter building, but also a great view of some outstanding geology – Beacon Rock, a remnant of the last known outpouring of Boring lava, dated at 58,000 years ago.

GSOC volunteers Barbara Stroud and Nancy Collins planned the meal and brought the dishes and sandwich fixings. Patty Hyatt provided the plates and bowls. Other attendees brought vegetables and desserts, with a rather heavy emphasis on desserts (no pun intended!).



Lidar map of Vicinity of Beacon Rock courtesy DOGAMI

GSOC member and retired geologist Ian Madin spoke to the attendees after they finished the meal. He brought along a handout of a lidar image of the area (see above) and explained all the different geology

that could be seen on the image. After the talk, he sold GSOC attendees some of the stone pins that he has been making in his workshop at home. The proceeds of the sale were to go to the Bev Vogt Scholarship Fund.

A good time was had by all the attendees.

Two Cascades Field Trip 2023

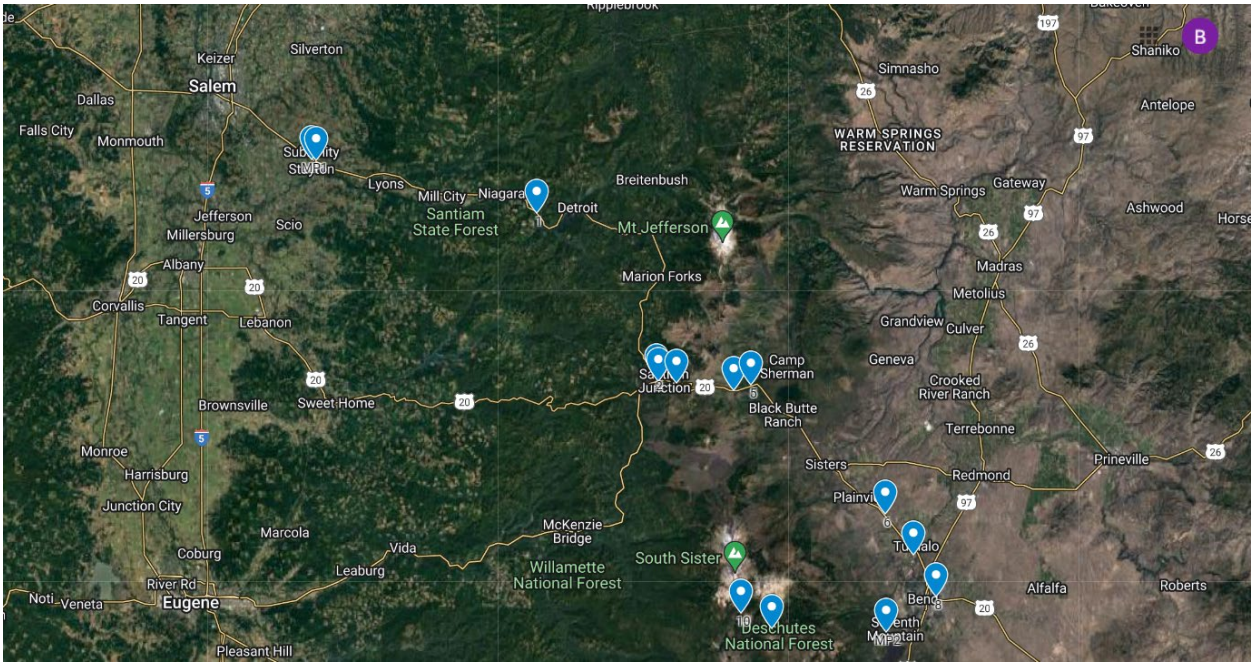
Monday, July 17 and Tuesday, July 18, 2023.

Article and photos by Barbara Stroud, GSOC Treasurer, except for photos of Hogg Rock, Lost Lake and Devil's Hill lava. The online article was later edited by Daniele McKay and Carol Hasenberg for publication as a GSOC field trip guide, available in members section of the GSOC website. Presented here is the edited version.

The trip leaders were Sheila Alfsen - GSOC Past President and current Program Director, Instructor at Portland State University, Linn Benton and Chemeketa Community Colleges; Dr. Daniele Mckay - Department of Earth Sciences, University of Oregon (also helped establish our sister club, Central Oregon Geoscience Society); Alyssa Smith, PhD student at Portland State University; and Dennis Chamberlin - GSOC Board Member, who helped to organize the trip.

Why the name 'Two Cascades'? We drove through the eroded steep sections of the older Western Cascades (or Old Cascades) and then went on to the High Cascades to Bend to explore the area around Mt Bachelor. A highlight of the trip was the view from mid-way up Mt Bachelor.

Map of the trip stops below courtesy Sheila Alfsen



STOP 1 - DETROIT DAM

Our first stop was Detroit Dam (yes, there's plenty of water there this year). Denny Chamberlin told us about the Western Cascades (he lives in the far west side of them, in Mill City). These were volcanoes that erupted beginning 40 million years ago at the edge of what was the Pacific shoreline. They are now eroded by wind and water and landslides and are very steep and rugged. The North Santiam River is tucked in a large canyon and was an obvious choice for building this dam in the early 1950s. In addition to talk of the geology, we discussed the strength of the dam in respect to earthquakes (pretty decent, they say) and the consequences of the Beachie Creek Fire in 2020 on the landscape around us.

View downstream from the top of Detroit Dam

STOP 2 - LAVA FLOW

If you've driven Route 22 through the Cascades, you may have noticed this rough looking lava flow. It's on both sides of the road and has very little vegetation on it. It's about 3000 years old and came from Little Nash Crater (next stop).

Lava Flow along Highway 22

Sheila took out her sweet treats and described three different volcanoes to us – vanilla wafers for shield volcanoes which ooze lava that is less viscous and contains less silica (like the classic Hawaii volcanoes with a'ā or pāhoehoe); Hershey's kisses (steep sides) for stratovolcanoes which are explosive and may produce pyroclastic flows, large ash clouds and lava bombs (more viscous and silica rich, what we're seeing above); and large chocolate chips for the cinder cones with smaller eruptive events that produce lots of scoria which typically piles up right around the cone like a bunch of Rice Krispies. Cinder cones can build up gradually

with Rice Krispies, then change to flowing magma like maple syrup, then progressively more layers eventually becoming a stratovolcano in shape.

We also talked about the subduction of the Juan de Fuca Plate under the North American Plate and how it influences where and why a volcano may erupt violently (or not). Sheila talked about the depth at which rock melts creating magma that might eventually vent at the earth's surface. Then she explained that this trip covers not only the classic volcano and magma types, but also how many exceptions there are to these "rules"!

In general, the shape of a volcano is due to the composition of the magma that erupts as lava onto the surface of the earth. The more fluid basaltic lava spreads out more and tends to produce shield volcanoes. Stiffer, more viscous andesitic lava produces volcanoes with steeper sides, such as stratovolcanoes. In the Cascades few volcanoes have exclusively one type of lava in their composition. It's interesting that a single volcano can produce different types of lava from a single magma source. Lots of factors are involved such as the composition and melting of crustal material surrounding the magma, and separation of the minerals in the magma due to a process called fractional crystallization.

STOP 3 - LITTLE NASH CRATER

Little Nash Crater - now a quarry

Just west of the intersection of Highways 22 and 20, Little Nash Crater is an example of a cinder cone. This is now a quarry and therefore does not look like the classic cinder cone. The red color is caused by the iron content of the magma.

We discussed the differences between scoria and pumice. Both are gas filled, but the scoria is darker and heavier because of the different chemical composition – iron/magnesium/other – and is associated with basalt. Pumice is lighter in color and weight, with more silica, in the magma chamber for longer time, and is associated with more violent eruptions that result from the gas trapped in andesitic or rhyolitic lava. Sheila also noted that phreatic eruptions occur when there is water involved (a body of water or melting glaciers) due to the quick conversion of the water into gas.

STOP 4 - HOGG ROCK

A brief stop in a pull off on Highway 22. Hogg Rock (by Tedder at Wikimedia Commons, CC BY 3.0, https://commons.wikimedia.org/w/index.php?curid=9814808)

A term most of us had not heard before was introduced to us – a Tuya volcano. There have been very few of these identified in the world, but two of them (Hogg Rock and Hayrick Butte) are in this area. Tuya volcanoes occur when the lava erupts underneath a glacier. The glacial confinement of the eruption causes the flat top and steeply sloped sides of these features. The very thick glacier was heavy enough and cold enough to thwart the progress in growing the volcano. Hogg Rock has been dated to 80,000 years old and has andesitic lava.

STOP 5 - MT WASHINGTON VIEWPOINT

Definitely Hershey Kiss, right? Sheila and many other geologists always thought it was the eroded remnant of a stratovolcano. Daniele Mckay explained otherwise on a prior field trip and Sheila passed this on to us at this stop. Mt Washington is actually a highly eroded shield volcano, as you can see if you think of the gentle slope on the right extending right up to the top of Mt Washington.

Mt Washington - note the gentle slope to the right and how that indicates the shield shape (shown dashed).

You might ask about Black Butte, which is located quite close to Mt Washington. Black Butte is described by some as a classic little-eroded, steep-sided Cascade shield volcano, but others refer to it as a stratovolcano. Its lava is basaltic andesite, so a bit of a different thing from the purely andesitic Mt Hood (see the later discussion about this). Mt Washington is younger than

780k years, whereas Black Butte is much older, dated at 1.4 million years. Current theory is that it was not covered by glaciers and therefore escaped much of the erosion that Mt Washington displays.

LUNCH AT SUTTLE LAKE

Suttle Lake - glacially carved, looking west. Mt Washington is to the left (not in the picture). Swimmers (not GSOC) enjoying the warm water.

STOP 6 - THREE SISTERS VIEWPOINT

The view is astounding from this pullout. North Sister is the oldest of the Three Sisters, and South Sister is the highest. North Sister is considered to be a shield volcano, with basaltic andesite being the most prevalent lava. South Sister has a range of lava compositions, from andesite to dacite to rhyolite. The summit is capped with basaltic andesite, with abundant scoria in the summit cone. Broken Top is also visible at this viewpoint.

Three Sisters viewpoint on Hwy 20. From the left, Broken Top, South Sister, Middle Sister, and North Sister

STOP 7 - TUMALO TUFF/BEND PUMICE

The layers are from a large volcanic explosion, resulting in the dark ash layer in the bottom layer, then a "surge" layer of lots of hot gas and fine ash (the light layer in the middle) and finally a pyroclastic flow which settled the ash and fine pumice/scoria on the top. This outcrop (about 65 – 75 feet) is an example

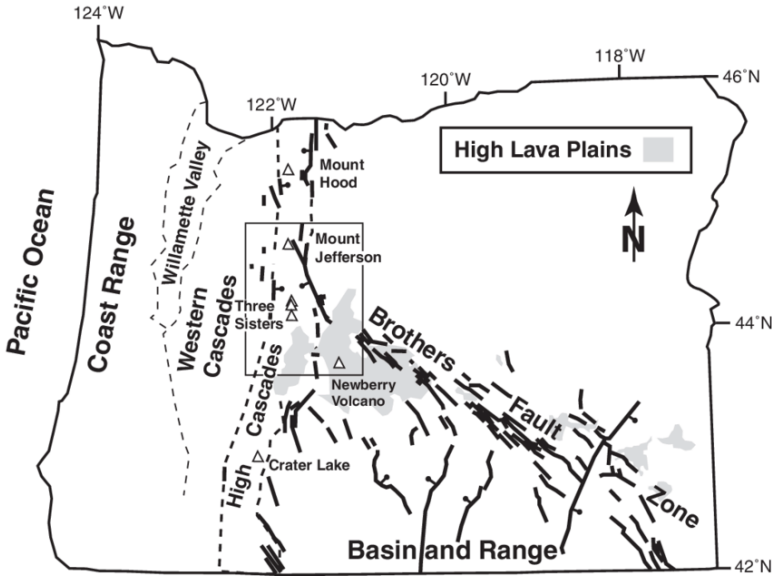
of the layers of volcanic material that "pave" the area of the High Cascades, with just the peaks of the highest volcanoes poking out the top. In the picture below, the top layer is eroding, primarily from water, and there is a house at the top (not visible here) which we all decided we had no interest in owning.

Tumalo Tuff layers

STOP 8 - PILOT BUTTE

We met Daniele Mckay at the top of Pilot Butte, where she oriented us to the physiographic provinces of Oregon. Several are visible from Pilot Butte (particularly on this day, when the weather was perfect), including the High Lava Plains, Blue Mountains and the High Cascades. We could see the High Cascades all the way from Mt Hood up north to Mt Bachelor in the south. And at Mt Bachelor, the weather was clear enough that Sheila pointed out Mary's Peak at the eastern edge of the Coast Range.

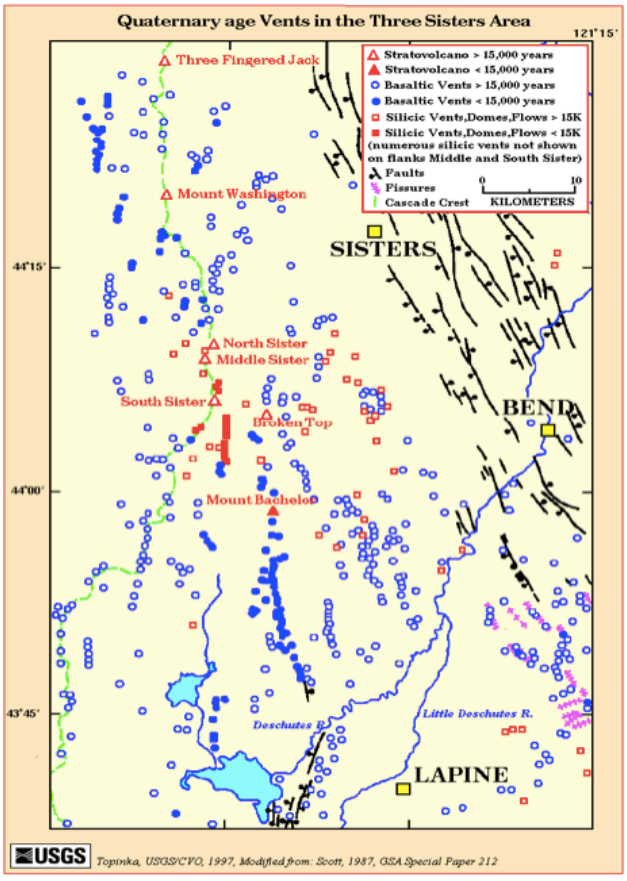
Daniele talked about the numerous faults in the Bend area that trend northwest. Also she noted the numerous cinder cones, over 400 around Newberry Volcano alone. There are also many cinder cones in the Three Sisters and Mt. Bachelor area, and throughout the central section of the high Cascades.



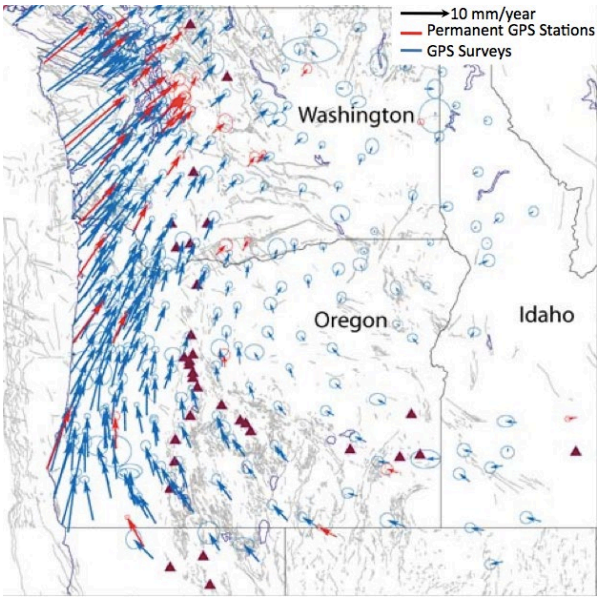
Oregon faults map From Schmidt, Mariek and Grunder, Anita L., "The evolution of North Sister: A volcano shaped by extension and ice in the central Oregon Cascade Arc,", April 2009 GSA Bulletin 121(5):643-662. Map is simplified from Walker and MacLeod (1991) and Jordan et al. (2004).

Danielle also brought the McCaffrey et al map of the many GPS measurements taken from 1991 to 2004 that show the rotation of Oregon and Washington clockwise from southeast to northeast. Daniele and Sheila noted that, for the Pacific NW, this may be as important as the breakthrough of plate tectonics was in its time. This gives a potential explanation for why the volcanism moved to the east (Western Cascades to the High Cascades).

Right: Cinder cone map of central Oregon, adapted from Scott, W.E., 1987, "Holocene rhyodacite eruptions on the flanks of South Sister volcano, Oregon," in Fink, J.H., The Emplacement of Silicic Domes and Lava Flows: Geological Society of America Special Paper 212, p. 35–53.



Left: Crustal rotation velocity vector map from McCaffrey et al, "Fault locking, block rotation and crustal deformation in the Pacific Northwest," Geophysical Journal International, Vol. 169, no. 3, June 2007.



STOP 9 - MT BACHELOR

On our second day, we went to Mt Bachelor, where we took the chairlift (along with dozens of mountain bike riders) up to Pine Marten lodge. We talked for a bit, took many pictures and then ate lunch – there is a café at the lodge.

The weather was again perfect and it is from the lodge that Sheila saw Mary's Peak, situated in the Willamette Valley at the east side of the Coast Range.

Mt Bachelor is young, about 12,000 – 15,000 years old, and given that we have recent evidence for human habitation that dates to 18,000 years ago, it would seem that humans actually saw this change happen in the central Oregon skyline.

Daniele and Alyssa spoke about the sites visible here and helped us understand that the classic ideas of stratovolcano, cinder cone and shield volcano are way too simplified to describe what is happening in Central Oregon (and likely many other places worldwide). Alyssa's PhD studies are about the differences in the volcanoes made of andesite (Mt Hood) as vs. those large volcanoes such as Black Butte and North Sister that are made of basaltic andesite.

Mt Bachelor from the West Village parking lot, Pine Marten lodge is right around the tree line.

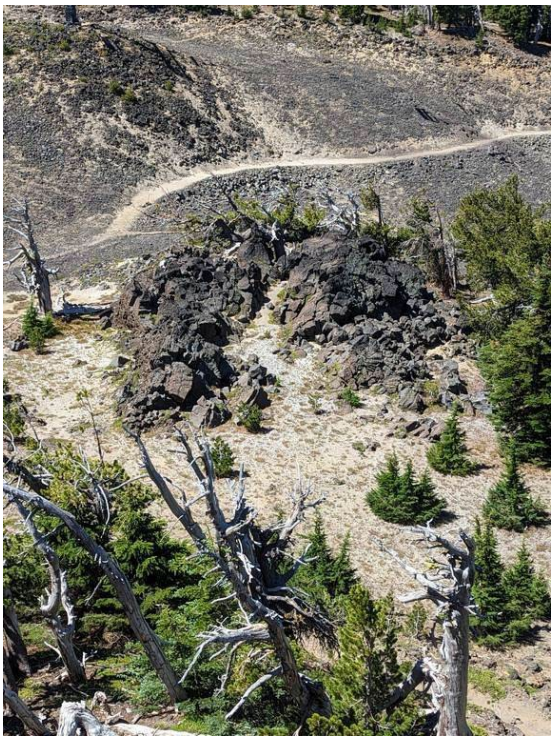
Here is a description found on the web. The USGS describes Mt Bachelor and the surrounding cinder cones as: "… typical of one style of mafic (basalt to andesite) volcanism found throughout the Cascades Volcanic

Arc—effusive eruptions from aligned short-lived volcanic vents." This is why Daniele, Alyssa and other scientists describe volcanoes by composition instead of the shape of the volcano.

We observed the small rocky bits of scoria at the parking lot and on the mountain, but also saw larger lava rocks and bombs there.

Left, small cinder cone chunks from Nash Crater, but indicative of much of the ground cover in central Oregon including Mt Bachelor.

Right, larger pieces of lava seen on Mt Bachelor.



Daniele described subduction (at which point the wind always increased and blew the papers she was using every which way!) and the effects on volcanism. The graphic below shows the general idea; Daniele pointed out that the angle of subduction has a great deal to do with what we see on the surface and can expect. Magma is generated (rocks melt due to heat and water from the oceanic plate that reduces the melting point) at about the depth of 60 miles below the surface. Decreases or increases in the angle of subduction change the location of the active volcanoes.

graphic courtesy Oregon Department of Geology and Mineral Industries.

Daniele also spoke about the 'myth' of a magma chamber. Magma is more likely to be injected in between rock layers. The image of branches on a tree trunk or the root system of a tree is more applicable. Any cracks or faults or weaknesses in the rock above the storage level of magma may result in a volcano – depending on the pressure,

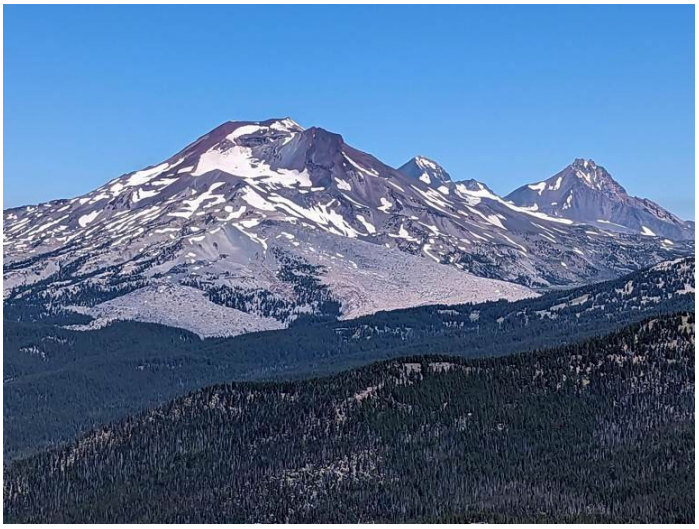
temperature, and dissolved gas in the magma below. This may occur once (monogenetic) or many times (polygenetic) in any given spot. The many fairly recent cinder cones as well as Mt Bachelor are indications that the magma is active and possibly increasing under central Oregon.

GSOC group on top of Pilot Butte in Bend

Broken Top is a good example of not conforming to the shape designations. Broken Top was a shield volcano, that started erupting mafic lava, then changed its nature and started erupting more explosively. Daniele prefers to describe Broken Top and others with the same characteristics as mafic composite volcanoes.

Cinder cone on the north side of Mt Bachelor - unofficially called the Egan Cone.

In 1997, there was some uplift on the west side of South Sister, but it effectively stopped by about 2007 (though some 2021/2 activity has now been noted). The hazard to Bend, Redmond and associated communities is high were anything to begin erupting again. Daniele told us that on a quiet news day in Bend later in the 2010s, there were occasional headlines that simply said there has been no change in the uplift on South Sister.



Three Sisters as viewed from Mt. Bachelor. The large rock outcrop to the right of the summit of the South Sister is thought to be a prior summit that was displaced in a later eruption.

Daniele talked briefly about Newberry Volcano (next Field Trip, anyone?). Though the volcano is shield-shaped, it has also erupted high silica lava (for example, the Big Obsidian Flow that erupted about 1300 years ago). This brought up another 'myth' in basic geology literature – that obsidian cools quickly. It does, but this should be thought of as geologically quickly – years or decades of

cooling, not hours, days, or months as we tend to assume when we see the word quickly.

STOP 10 - DEVIL'S HILL CHAIN OF VENTS LAVA FLOW

At our last stop in the Bend area, we went to a fairly recent lava flow (2000 years old) just south of South Sister. Daniele talked about the rhyolitic lava and the groundwater here. The central Oregon area gets a lot of snow and there are glaciers on the Three Sisters and Mt Jefferson. When snow melts in central Oregon, just one third of it flows directly into streams and rivers. Two-thirds of it goes into the ground which is quite porous and replenishes the groundwater of the area. At the bottom of the lava flow in the picture above, you can see a small lake which is fed by a spring at the base of the lava flow. Perhaps the most famous spring in central Oregon is the headwaters of the Metolius River, but there are many others feeding lakes and rivers.

Left: Example of cooling cracks on a very large rock.

Right: Daniele (closest) explaining groundwater at the lava flow of the Devils Hill chain of vents.(photo by Nancy Collins)

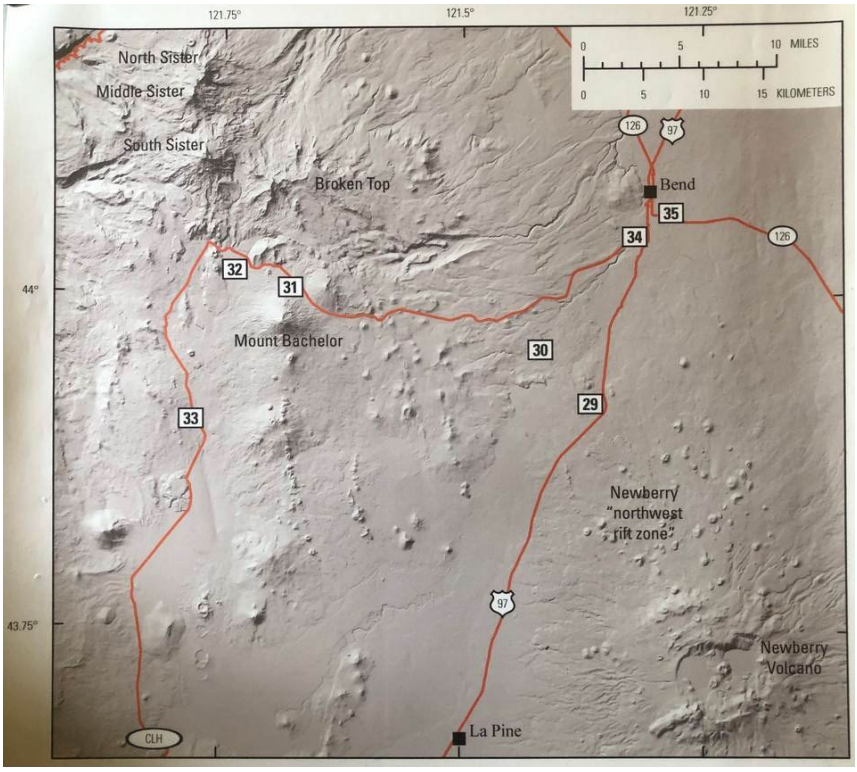
Rhyolitic (high in silica) lava flows can become obsidian and this flow does include a few instances of obsidian. The controlling factor is heat. If the flow loses heat quickly, it will form obsidian, but this particular flow apparently did not cool that quickly and therefore crystallized into rhyolite.

Lost lake "drain". Photo taken on GSOC 2017 Solar Eclipse field trip by Carol Hasenberg.

STOPS 11 AND 12, RETURNING TO STAYTON

So much of our Day 2 was taken up with Mt Bachelor and the lava flow of the Devils Hill chain of vents that we left Bend two hours later than intended. Therefore only 6 – 8 of the 22 participants accompanied Sheila back to the original car park.

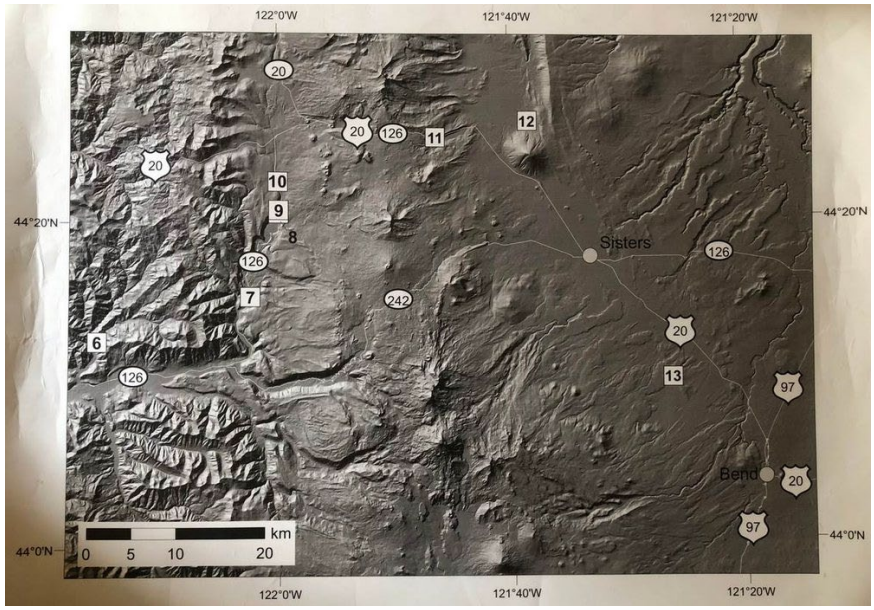
Sheila had intended to stop at Lost Lake (also called a lava tube though it is not) but decided against that. She and the remaining folks did stop at one spot – a roadcut exposure along Hwy 22 near Sublimity where there is lahar material likely from Mt Jefferson. This hot mud flow made it all the way to Sublimity with some pieces of wood in it.



LIDAR MAPS OF CENTRAL OREGON

Daniele shared these maps on our trip – she had these poster-sized laminated LIDAR maps made for a different field trip – so ignore the numbers in squares.

The first map shows the many cinder cones around Newberry Volcano and the Three Sisters. The second map makes obvious the sharp difference in topography between the older, eroded Western Cascades on the left and the smoother High Cascades in the center. The area where the High Cascades currently sits is a graben (sunken area between two higher ones – as you would find in the 'basin' of the Basin and Range geologic province). The High Cascades began eruptions and the base is now covered with so much volcanic material that it filled in the graben and the peaks of the highest volcanoes stick up through the newer levels of lava. The rotation of Oregon and Washington can potentially also explain how this graben came into existence – the Western Cascade area is pulling away through the rotational movement, causing the graben.



All in all, a wonderful, educational, fun field trip. Many thanks to Sheila, Denny, Daniele and Alyssa – all of whom gave generously of their time and energy to GSOC!