



# THE GEOLOGICAL NEWSLETTER

"NEWS OF THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY"

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## The Geological Society of the Oregon Country

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VISITORS WELCOME AT ALL MEETINGS

## CALENDAR

### SEPTEMBER ACTIVITIES

Friday evening talk, September 11, 2009, at 8 p.m., in Room S17, Cramer Hall, 1721 SW Broadway Ave. (between Montgomery and Mill Sts.), Portland State University: Patty and Roger Silver, amateur spelunkers and educational speakers for the Oregon Grotto (local chapter) of the National Speleological Society (NSS), will present "Overview of Caving."

Join GSOC members at **Pizzicato Pizza, 1708 SW 6th Ave.**, at 6:30 p.m. before the lecture for an informal dinner and conversation.

**Free parking** is available at Portland State University Friday nights after 5 p.m. in Parking Structure 2 on Broadway Ave. directly across from Cramer Hall and on level one of Parking Structure 1, bounded by Broadway and 6<sup>th</sup> Aves. and Harrison and Hall Sts.

No Wednesday evening seminar is planned for September.

**GSOC Field Trip, Saturday, September 26, 2009: "The Buried Forests of Mt. Hood."** Join GSOC member Ken Cameron of the Oregon DEQ for a field trip which will examine the eruptive history of Mount Hood and the effect of its eruptions on coniferous forests covering valley floors and lower slopes of the mountain. Field trip participants are to meet at 9:30 a.m. in the parking lot at the Hoodland Plaza located at Welches on Highway 26 on the way to Mount Hood. The meeting place has a Thriftway grocery store and a 76 gas station.

To participate you must be a member of GSOC or a guest of a member. Minors under 18 must be accompanied by an adult GSOC member designated by their parents or guardians. Registration will include signing a liability waiver for all participants. You may register as a GSOC member at the registration site. Bring your lunch, wear good walking shoes, and plan for the trip to last until 3:30 to 4:00 p.m. Cost is \$5 for all participants. Registration for the trip will be done at the meeting place. If you plan on attending or have

questions, contact Richard Bartels (503/292-6939 or [bartbartels@comcast.net](mailto:bartbartels@comcast.net)).

The trip is based on an article "Prehistoric buried forests of Mt. Hood," by Ken Cameron and Patrick Pringle, which appeared in the March 1991 issue of *Oregon Geology*. The article is available online through the DOGAMI website ([www.oregongeology.org](http://www.oregongeology.org)). Copies of the article will also be available at the registration site.

## FUTURE ACTIVITIES

Friday evening talk, October 9, 2009, at 8 p.m., in Room S17, Cramer Hall, 1721 SW Broadway Ave. (between Montgomery and Mill Sts.), Portland State University: Rudy Tschernich, curator of the Rice NW Museum of Rocks and Minerals, and author of "Zeolites of the World," will present "Occurrence and Origin of Zeolites."

Check the GSOC website ([www.gsoc.org](http://www.gsoc.org)) for updates to the calendar.

## A Trip to The Dalles, cont.

synopsis of the June 2009 Waste, Wind, and Water Field Trip led by GSOC Director Dave Olcott and GSOC Vice President Larry Purchase

*Editor's Note: Here is part 2 of the article begun in the August 2009 Geological Newsletter:*

### Day 2: Water

Saturday morning the GSOC group gathered at the Safeway parking lot in The Dalles, fresh for a new adventure. Our guest leader for the day was Tom Bailey, co-owner of Orchard View Farms, Director of The Dalles Irrigation District, and President of the Wasco County Pioneer Association. Tom's family grows cherries on the hills surrounding The Dalles. This was made possible in the mid 1960's when The Dalles Irrigation District was formed, since the area only gets approximately 10 to 12 inches of natural rainfall per year. The Dalles Irrigation District provides water to the farmers in the region surrounding the city. The water is pumped to an elevation of 1800 feet. The cherry-growing district around The Dalles has 5800 acres of orchards which are irrigated from the Columbia

River and an additional 2000 acres which are well-irrigated.

Bailey, another pioneer descendant, relayed to us part of his family's history that involves the acquisition of water in the area. When Bailey's grandfather was a boy, his family lived on Seven Mile Hill just west of The Dalles. They had a homestead well that tapped into the perched water table about 35 feet below the surface. This layer had a very small saturated zone, so the children were told to fill up their bucket a cupful at a time. Bailey's grandfather and his brother became frustrated with this chore, and unbeknownst to their father, resolved to deepen the well. They took turns lowering each other into the well while their father was away and dug the bottom deeper. Although this helped the filling of the bucket on the first day, their well and all their neighbors' wells dried up overnight, because the boys had drilled through the impermeable layer and drained the aquifer. The families were forced to move to Chenoweth to get water. Bailey's grandfather confessed to this deed only after he became an old man.

Bailey took the group to the heights above the downtown and around to several orchard locations. He explained how the technology of cherry farming has evolved since the 1960's. Cherry trees used to be planted at wide spacings and irrigated with big impact sprinklers. This proved to be horribly inefficient in The Dalles area, which is very dry. Fifty to sixty percent of the irrigation water was lost before it reached the ground. Today the trees are planted close and irrigated with drip or micro sprinkler heads. Each tree is monitored for moisture and the water is applied as needed to keep the root zone moist. The district uses all the water it can get (or else lose the water rights) in the most efficient way possible.

Bailey also explained the amount of planning that goes into selecting sites on which the cherry orchards are planted. Slope, elevation, orientation, wind patterns, and soil all play a role in cherry production. Bailey explained that cherry trees are never planted in valley bottoms because that is where it frosts. Cold air drains down with respect to warmer air. Also, hilltops rarely contain deep

enough soil for the root zones of the trees. So the cherries are planted on the slopes of the hills. Cherry trees may live up to one hundred years and older, but their peak production occurs between the ages of 8 and 35 years. Most of the trees planted in the 1960's have been replaced once, and improvements have occurred in the cherry varieties planted and the root stock types.

Another resource that the cherry growers streamline is the labor force that picks and processes the cherries. In order to do this, the orchards must be planned so that the cherries ripen in a continuous sequence throughout the season. This is done two ways: by varying the types of cherry trees planted, and varying the elevations on which the trees are planted. What is referred to as "Bing" cherries by the public are actually a whole suite of cherry varieties that are harvested at slightly different times. "Chelan" is an early ripening variety and "Bing" is one of the primary mid-season varieties. In recent years, "Rainier" cherries have gotten very popular, and we saw many millions of these ripening in the orchards. Also for every 200 to 300 feet gain in elevation, the ripening date is retarded a day or two.

Bailey defended the labor force used by The Dalles' cherry growers from anti-immigration attacks. Although many of the cherry laborers are Hispanic, they are American citizens and valuable, skilled workers. The packing line workers are local residents, and often to maximize labor efficiency, packing lines will be shared with other cherry growers in the area. The orchard workers hail from central California, and undergo special training for their jobs. The orchard workers are so valuable that the growers have special school programs for the children and provide good housing for the migrant families.

The packing, shipping, and marketing of the cherries are very critical to "making it or breaking it" in the business. The most important markets for the cherries are ones that will pay a maximum price for each box. This is compounded by the problem of how to ship the cherries long distances while maintaining the quality. Amazing enough, the most important buyers of The Dalles' cherries live in the

U.S. East Coast, Dubai and the Middle East, Taiwan, Scandinavia, and England, and not the U.S. West Coast. The long distance buyers will pay 2 or 3 times more for premium quality cherries than the residents of our state.

How is the distance/quality problem solved by the cherry growers? Bailey explained that unlike many other crops, cherries do not ripen, that is, produce more sugar, after they are picked. So, cherries must ripen on the tree until they reach about 16-18 brix of sugar, then they are picked. The growers have found that cherries kept between 32 °F and 36 °F in a high carbon dioxide environment will not decompose during shipping. So they select the largest, finest fruit, hydro-cool it to the optimal temperature, pack it in plastic lined boxes, inject a nitrogen-carbon dioxide mixture into each box, and ship by water within two to two-and-one-half weeks anywhere in the world. Smaller fruit are sorted out from the premium sizes and sent to flavor ice cream or to be made into maraschino cherries. The patented packing procedure, using no unnecessary chemicals, has made their international reputation. As part of the company's commitment to quality, a company representative travels to major shipment sites to view the condition of the off-loaded fruit.

On the tour Bailey took us over to Omeg Orchards on Three Mile Road south of The Dalles to view the well-watered orchard operations and listen to a bit of cutting edge cherry growing expertise from General Manager and Mike Omeg. Omeg discussed the planning and drilling operations necessary to provide water to the orchards that have been planted fairly recently in this area. Water wells for these orchards can be over 1000 feet deep and come from a variety of aquifers. The well water may be geothermally heated and may contain undesirable alkalinity and other chemical problems.

The chemical composition of the water is very important to the growth of the cherry trees. Cherries also need to contain calcium to be crisp and firm. So, the well water goes through a series of monitors and chemical injectors on its way out to the orchard. Fertilization of the trees is also accomplished with "fertigation," that is, by injecting the fertilizer into the water, and this reduces the

amounts of fertilizer chemicals needed. These orchards are highly monitored for moisture. A consultant comes in once a week with a “neutron probe” to make a moisture profile of the top 36 inches of the soil. Weather conditions are also monitored by a network of weather stations located in the orchards. Because the cherry growers in this region pay higher rates for power, and it takes power to pump water, the growers work hard to minimize water usage.

Omeg has been involved in experimenting with mulching methods used to conserve water, limit the growth of weeds, and limit pests in the orchards. Geotextile fabrics were tested, but not found to be very successful for two reasons. The fabric actually aided the spread of voles in the orchards by hiding the creatures from their natural avian predators. Voles will girdle the trees if allowed to proliferate. Also the textiles are not sustainable to natural systems. Omeg Orchards has returned to using straw mulch for this reason. In addition to its mulching function, straw replenishes the soil by adding organic matter and it does conserve 10% of the irrigation water.

Despite the heavy emphasis on viewing and talking about cherry production, Dave Olcott managed to get in some information about geology on this day of the tour. The first stop on the hill to the south of the downtown area (Sirosis Park) overlooked the town, the Columbia River, and north into Washington state. From this vantage point, it is very easy to see how much of a “kink” exists in the Columbia River at this point. This is believed to be caused by the action of the Laurel Fault to the east of The Dalles and the Chenoweth Fault to the west of the Dalles. Along the Chenoweth Fault the Frenchman Springs Member of the Wanapum Formation occupies a small butte while the adjacent scabland and the top of the butte is of the Priest Rapids Member. The Columbia River has had its current course for about the last 6 million years. To the west of town, the outcrop along the highway contains the Frenchman Springs Member of the Wanapum Formation of Columbia River Basalt along its bottom and the Priest Rapids Member (also Wanapum) on its top.

From Sirosis Park, the GSOC group traveled along a drive which follows the base of a landslide scarp. Several of the homes here had new foundation work as a result of continued movement of the slide. Traveling up to the top of the scarp on Dry Hollow Road, we observed an outcrop of the Chenoweth Formation in the form of a pebble-cobble conglomerate in a road cut there. The Chenoweth Formation is The Dalles Basin section of what used to be called The Dalles Formation. It consists of deposits of water-borne sediments, lake sediments and volcanic tuff that occurred atop the flows of Columbia River flood basalts some 12 to 13 million years ago. This pebble conglomerate contains 38% exotic material which were brought to the area by ancestral streams and 62% Cascadian volcanics. In the 1980’s geologists revised the formation names to reflect the drainage basins in which they occurred. Rocks in the Chenoweth Formation may be conglomerates, lithic sandstones, or tuffs. Heading toward the orchards, the group stopped briefly at a lahar deposit in a road cut on Skyline Road. This lahar occurs lower down in the Chenoweth and is Cascadian in origin.

Carol S. Hasenberg

### References and Additional Reading:

“Waste, Wind, and Water Field Trip Guide,” edited by Larry Purchase & Dave Olcott contains the trip itinerary and many exhibits obtained from the guest speakers as well as the editors.

Orchard View Farms website:

<http://www.orchardviewfarms.com/>

Omeg Orchards website:

<http://www.omegorchards.com/#>

## SOTA Revisited

2009 President’s Field Trip Synopsis

August 1-4, 2009

by Carol S. Hasenberg

*Well, folks, we’re getting to the end of another GSOC field trip season and it’s been a good one. We had our Presidential field trip a bit early this year because we*

*did not want our guest speakers to be conflicted with the upcoming GSA annual meeting being held in Portland in October. This year's trip explored the High Cascades Graben and the hydrology of the Deschutes River basin. The majority of the participants camped at the Ogden Group Campground of the Deschutes National Forest, and a good time was had by all there. We successfully weathered two thunderstorms in the area, including one of the worst thunderstorms I have ever been in (and driven through) on the evening of Sunday, August 2.*

*For a number of reasons, I am keeping the trip synopsis short this year. Most of the reference papers are available online. The SOTA field trip guide is available on CD from DOGAMI, and the Robert Jensen book is available from DOGAMI or other outlets. There was so much information on these papers and given at the trip stops that I could only take notes on a fraction of it. Many of the references include field trips that the readers can explore in their leisure. There is also a slide show of the trip available online; there is a link through the GSOC website ([www.gsoc.org](http://www.gsoc.org)).*

*So, happy reading and exploring the eastern High Cascades and Deschutes Basin! Also, special thanks to GSOC field trip participants Antonella Mancini and Evelyn Pratt for opening the metal gates to the campground in that thunderstorm (don't tell Ralph)!*

**Day 1, Saturday, August 1:** SOTA Field Trip Revisited with Guest Speaker Richard Conrey of Washington State University in Pullman, Washington:

Conrey was joined by visiting igneous petrologist Dr. Gene Yogodzinski from the Department of Earth and Ocean Sciences, University of South Carolina, and graduate students "Shawn" and "Josh". At Stop 1, the rock quarry on Timberline Road at Mt. Hood, Conrey handed out D.E.M. printouts to the GSOC group as a reference. A D.E.M., or digital elevation model, is a computer-generated elevation map. It was easy to see the High Cascades graben, and other features of interest, in the overall elevation trends of the state. Conrey told the group that what he'd like to convey in the field trip are the structural setup of the Cascade Arc, the spacing and longevity of the stratocones in the arc, and a sense of the complexity of the arc environment. He described the graben, or down-dropped block, that exists from the Three

Sisters to north of Mt. Hood. The oldest section is between the Three Sisters and Mt. Jefferson, then the section between Mt. Jefferson and Mt. Hood, and then the section north of Mt. Hood. The rifting which created the graben is up to 8 million years and 3 kilometers deep in the oldest block, up to 5 million years and 1 kilometer deep in the next block, and up to 2 million years and 600-700 meters deep in the hinged block north of Mt. Hood. In the High Cascade arc, the stratocones of Mt. Hood, Mt. Jefferson and the Three Sisters are spaced about 70-80 kilometers apart. All the Cascade stratovolcanoes are associated with plutonic bodies which attest to their longevity; for example, we have the Spirit Lake Batholith near Mt. St. Helens.

Next stop on the trip occurred in Mill Creek Flat on the Warm Springs Reservation. Conrey pointed out the characteristics of Mt. Hood and Mt. Jefferson. Mt. Hood is particularly characterized by having few satellite cones – there is one central pipe, and eruptions occur like radial spokes on a wheel around the pipe. It has a large volume of material – about 50 cu. km. Mt. Jefferson is shorter with a smaller volume – about 30 cu. km. – and more volcanism in the surrounding area. Conrey mapped the varied satellite volcanism – which consisted of mafic, andesitic, and rhyo-dacitic types – for his PhD thesis, which took 7 years to complete. The two stratocones vary in their compositional range; Mt. Hood produces magma that is 55-65% silicic and Mt. Jefferson produces magma 50-70% silicic.

Conrey also explained that in addition to the High Cascade volcanism that you see in and around and between the stratocones, there is also volcanism related to the arc rifting that created the High Cascades Graben. On the eastern side of the High Cascades, the Tygh Valley, Shitike, and Deschutes Formations, north to south along the eastern graben edge, are rift-related volcanic and related sedimentary deposits, and the formations get progressively older from north to south. On this field trip the GSOC group observed the Shitike and Deschutes Formations. These formations contain a variety of magmatic compositions, from rhyo-dacite to mafic, which can be distinguished by their trace element signatures from High Cascade volcanism.

Stop 3 on the trip was at an overlook for Cove Palisades State Park, where the GSOC group looked at different basalt flows in this dramatic setting. While standing on an outcrop of Tetherow Butte Basalt on the east rim of the gorge, we observed the Canadian Bench Basalt on the west rim. A younger, intra-canyon basalt flow forms The Island, a tongue of land at the confluence of the Crooked and Deschutes Rivers. Conrey also pointed out to the group many Cascades features on the western horizon, which were either stratocones, mafic or silicic arc volcanism around or between the stratocones, or rift-related volcanism. Most prominently of the latter is Green Ridge, which defines the eastern rift edge between Camp Sherman and Mt. Jefferson. Conrey explained how many lava and ash flows of the Deschutes formation filled in paleo-drainage ways, and how the rock of the Deschutes formation is more volcanic to the west and more sedimentary to the east.

Unfortunately due to road construction, the group was not able to get to McKenzie Pass and Belknap Crater, so Stop 4 of the GSOC trip was Stop 6 from the SOTA field trip guide. The stop is located at a viewpoint on Highway 20 about halfway between Sisters and Bend, and provides a good view of the Bend Highland, a volcanic plateau to the south and east of the Three Sisters. Around the Three Sisters, there is such great activity that there are three stratocones, and a lot of other arc volcanism. Conrey pointed out all along the trip how the character of the High Cascades changes as one travels south. These differences cause geologists to wonder about the mechanisms and character of the underlying arc which creates them.

For the final stop, Conrey took the GSOC group to see some rocks at a pumice quarry near the town of Tumalo. This area has an outcrop of Desert Springs Tuff (~630,000 years old) and Bend Pumice/Tumalo Tuff (~440,000 years old). These hot deposits came from sources in the Bend Highland. Some very nice stretched pumice can be found in the quarry.

The GSOC group then thanked Conrey for his interesting presentation, and for presenting the geologic “groundwork” for studying the Deschutes River with Ken Lite on the following day. Thank you again, Rick!

*To be continued next month...*

### **References And Additional Reading:**

Richard Conrey, Anita Grunder, and Mariek Schmidt, *SOTA Field Trip Guide*, “State of the Cascade Arc: stratocone persistence, mafic lava shields, and pyroclastic volcanism associated with intra-arc rift propagation,” State of Oregon Department of Geology and Mineral Industries Open File Report, OFR O-04-04, 2004.

Richard Conrey, David Sherrod, Peter Hooper, and Donald Swanson, “Diverse Primitive Magmas in the Cascade Arc, northern Oregon and southern Washington,” *The Canadian Mineralogist*, Volume 35, 1997, pp. 367-396.

Gary Smith, Lawrence Snee, and Edward Taylor, “Stratigraphic, sedimentologic, and petrologic record of late Miocene subsidence of the central Oregon High Cascades,” *Geology*, May 1987; v. 15; no. 5; pp. 389-392.

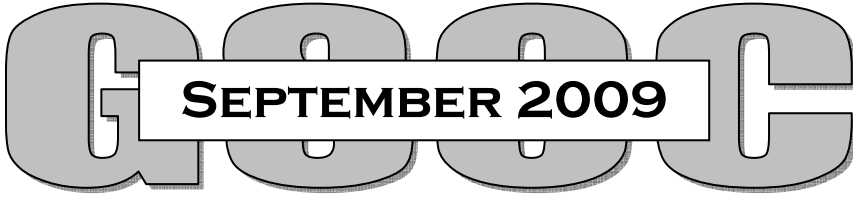
Gary Smith, “Geology along U.S. Highways 197 and 97 between The Dalles and Sunriver, Oregon,” *Oregon Geology*, Volume 60, Number 1, January/February 1998.

Gary Smith, “A field guide to depositional processes and facies geometry of Neogene continental volcanoclastic rocks, Deschutes basin, central Oregon,” *Oregon Geology*, Volume 53, Number 1, January 1991, pp. 3-20.

Gary Smith, “Simtustus Formation: Paleogeographic and stratigraphic significance of a newly defined Miocene unit in the Deschutes basin, central Oregon,” *Oregon Geology*, Volume 48, Number 6, June 1986, pp. 63-72.

P.R. Hooper, W.K. Steele, R.M. Conrey, G.A. Smith, J.L. Anderson, D.G. Bailey, M.H. Beeson, T.L. Tolan, and K.M. Urbanczyk, “The Rrineville basalt, north-central Oregon,” *Oregon Geology*, Volume 55, Number 1, January 1993, pp. 3-12.





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## **GSOC MINI-CALENDAR**

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### **FOR DETAILS, SEE INSIDE**

***Details on "Buried Forests of Mt. Hood" field trip Inside***