JAN 98

THE GEOLOGICAL NEWSLETTER

GSOC

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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OF THE OREGON COUNTRY
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THE GEOLOGICAL NEWSLETTER

Editor: Marlene Adams 360-574-9650
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Assistant: Cecelia Crater 235-5158

ACTIVITIES

ANNUAL EVENTS: President's Field Trip - Summer; Picnic - August; Banquet - March; Annual Meeting - February. **FIELD TRIPS:** Usually one per month, private car, caravan or chartered bus. **GEOLOGY SEMINAR:** Fourth Wednesday, except June, July, August, 8:00p.m. Room S17, Cramer Hall, Portland State University. Library, Room S7, open 7:30p.m. prior to meetings. **PROGRAMS:** Evening; Second Friday each month, 8:00p.m. Room 371, Cramer Hall, Portland State University, SW Broadway at Mill Street, Portland, Oregon. **NOON MEETING:** Usually at noon on first Friday of the month, at Portland Central Public Library, 801 SW 10th, First Floor,U.S. Bank Room, holidays excepted. Suggest date and time be verified by phone to 235-5158 or 221-0757. **MEMBERSHIP:** per year from January 1: Individual - $20.00; Family - $30.00; Junior (under 18) - $6.00. Write or call Secretary for application. **PUBLICATIONS:** **THE GEOLOGICAL NEWSLETTER** (ISSN 0270 5451), published monthly and mailed to each member. Subscriptions available to libraries and organizations $10.00 a year. Individual subscriptions $13.00 a year. Single copies $1.00. Order from Geological Society of the Oregon Country, P.O. Box 907, Portland, Oregon 97207. **TRIP LOGS:** Write to same address for names and price list.

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VISITORS WELCOME AT ALL MEETINGS
INFORMATION: Paul Brown, 227-2136
Evelyn Pratt, 223-2601

VOL. 64, No. 1
JANUARY, 1998

JANUARY ACTIVITIES

NOON MEETING: Central Library, 801 SW 10th, first floor, U. S. Bank Room

WEDNESDAY, Jan. 7, 12:30-2 PM
New Geological Research for Portland Basin Archeology
Alex Bordeau, archeologist for Fish & Wildlife

EVENING MEETING: Rm. 371 Cramer Hall, PSU

Friday, Jan. 16, 8:00 PM
The South Pole's Flying Lifeline
Rhonda L. Buckner, Polar Transport Aircraft Commander, Navy (Ret.)

7:30-8:00 PM: GSOC Library: Check out interesting and timely material from a board member. GOOD MIDWINTER READING!
Our thanks to cookie providers Carol Cole and Marlene Adams.

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On your new 1998 calendar, mark **"GSOC ANNUAL BANQUET"** on March 13.
Dr. Scott Burns will be our speaker.

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Thanks for paying your dues! That's part of what keeps us going.

March FIELD TRIP: When You've Seen One Black Rock, You Haven't Seen 'Em All!
Clay Kelleher gives us a new look at Silver Falls State Park, Oregon's easy-to-reach gem.

Calendar items MUST be given to Evelyn Pratt by the 15TH of the month. 223-2601

REPORT ON THE 1997 PRESIDENT'S FIELD TRIP PART THREE [CONCLUSION]

DAY FOUR: THURSDAY, September 11, 1997

Day 4 Field Trip Reporter, Paul Brown, is the 1997-98 GSOC President, himself. Conveniently, Paul is a practicing psychologist, so that if we suffered any phobias or neurosi on the trip, he was available for handy consultation. His notes are exceptionally clear and lucid, indicating that he might be one analyst who actually listens to his patients.

CAMPOOUT NOTES
From: pbrown@teleport.com (Paul Brown)
To: ArnoldA100@aol.com

Here are my notes:

Up the Yakima River through the Yakima Thrust Fold Belts with Bob Bently, Retired of Central Washington State College. These folds are amazingly obvious at times and document the path of the Yakima River and the uplift of this area.

In the Late Miocene, deformation of the Columbia River Basalt Group (17 m.y.a. to 14 m.y.a.) resulted in these folds. About 6 million years ago these ridges were elevated about 2,000 feet and resulted in many unconformities as the result of faulting and overrunning of one stratigraphic form by another. Bob called these "classic antecedent ridges".

We found Pomona Flows overlying several ridges and Grande Ronde unconformably overlying Wanapum and Saddle River Basalts in the gaps of the fold belt.

-Matt Trevor of GR Photo

The flows were laid down in this order:
Grande Ronde, Wanapum, and Saddle Mountain.

Carpet Analogy. Here the Grande Ronde appears above the earlier two basalt groups because of deformations like folding and thrusting like slipping on a carpet and having it squoosh up and some break through from underneath. (Maybe that's asking a lot from a carpet, but basalt manages to do it.) Some of these individual flows extend to the Coast at Cannon Beach, which shows the tremendous volume and somewhat lesser viscosity than the really sticky silicon-rich basalts all, and which allowed this great extent of the flows.

Stop One Our first stop was at Pomona Heights at the entrance to the Yakima Canyon. The Pomona Flow is tilted considerably here, but it is obvious that it was laid down horizontally and then uplifted about 6 million years later. Its uniform thickness, even on the ridge tops shows this progression. We saw Selah Butte capped with the Pomona Flow, 12 million years old, sitting there at a 10 degree list. Lahars underlie the Pomona and the Priest Rapids Flow, of the Saddle Mountain Basalts, underlies them. Even Roza Member outcrop peeks out lower down (an earlier Saddle Mountain Basalt). The Ancestral Columbia River came through Yakima on its way from Pasco to Hood River and later the Asotin and then Esquatzel Members flowed down the Columbia Canyon and up the Yakima aways.

Then we traveled down section through the core of the Selah Butte Anticline, which Bob assured us was not due to local deformation.

Stop Two We stopped on the bank of the Yakima with R2 (Reversed Polarity) Flows below us and N2 (Normal Polarity) above us.

Bob's Bubble Theory. Bob explained his concept of the "Bubble" Flow Process of Lava Deposition. In this process the flow cools on top first and inflates to form a protective insulating roof bubble for the inner flows and enables them to travel much farther before cooling. This explains how the entablature and colonnade relate to each other.

We saw the site of *Shell Oil*'s drilling around 1980, where they went through 4,900 feet of basalt and 7,000 feet of sediments to find a lot of dry holes.

Stop Three We got to walk up through time from 14 million years ago to 7 million years ago at Burbank Creek through Basalts and sediments.

Next we observed a remarkable faulting and deformation of the Wymer Flow under the Umtanum Ridge. The beds dip and rise, circle 180 degrees and the Wymer Flow stands on end! I was impressed.

Lunch Stop Going upriver toward Ellensburg we walked up a small rise to sit on the Grand Ronde Flow for lunch. Well some of us ate high. Others lunched low at the bus. Does hunger inspire art? Perhaps. More from Ken Yost:

TORTURING A SYLLABLE ——

To a geology professor, every word is a pollysylable—
The hunter's main concern is, "What's killable"—
The bartender likes people who are refillable—
Merchants follow people who are billable—
Pickles in a certain condition are dillable—
The goose' wing feathers are quillable—
Heirs are waiting for anything willable—

To which Bus Driver Bob Schwartzkopf added:
—This is thrillable!

After lunch we drove around the Beavertail Meanders of the Yakima River and down the stratigraphy of 15 Basalt Flows. We descend from the R2 to the N2 and about 6 miles down river the flows all go vertical. (Hard to see, but I'm sure they do.)

The Menashtash Anticline is on the far side of the river, on our left. There are ancestral river gravels on the ridge and outcrops of white Vantage, Roza and below them, the Roza Basalts. These ridges are complicated folds that are difficult to get to reveal their stratigraphy. Out of the Yakima Canyon and into the Kittias Basin briefly, then up stratigraphy.

We are close to the Olympic-Wallowa-Lineament (OWL) here. OWL is an elevated line across the state that no one can satisfactorily explain [Ed: Except for those geologists who fly in at night?] But it makes for some hot debates.

Stop at Highway Rest Area, with Map Studies.

At the rest area there are sediments and Grande Ronde Pillows. But its too windy and cold so I didn't see much here. Now we travel up and down through strata topped with VANTAGE SANDSTONE, then invasive sediments, ROZA Basalt, and more sediments. The roadcuts show these plainly on the way down.

Stop at Road Side Overlook.

Down at Squaw Creek we can see distant ridges that we came through today, and get a sense of the Faults cutting across the folds, which are primary. There is the Vantage Formation to the top of the anticline. The Pomona stops a short distance from here and the canyon of the creek poses a sticky *question*, as articulated by Bob Bently: "It is a very short canyon and flows into the river very soon and the question is, 'What formed this Canyon?' "

And that ended this day's adventure. >Paul Brown

^^

OUR FIELD TRIP BANQUET
Thursday Evening

Field Trip Banquet and Day 5 Reporter, Charlene Holzwarth, is a long-term and active GSOC member and is our current GSOC Historian. She has certainly lived on the wild side, having worked in the Peace Corps in Sierra Leone and taught in the U.S. public school system. Only she can tell you which has been more exotic!

President **Paul Brown** opened the program with a greeting to all 25 members of the 27 people attending the 1997 Field Trip to the 1997 Field Trip to the Central Cascade Range in Washington. We were enjoying a fine beef or codfish meal at the Hilton in Yakima on a Thursday evening, September 11, 1997.

Paul introduced **Gail Rankin** who spoke about **Dr. Ruth Hobson Keen's** missing our Yakima field trip. Esther Kennedy told of some of Dr. Keen's accomplishments, her teaching career, hobbies, and her support of the aims of the Geological Society of the Oregon Country.

Yvonne Prater, a free lance writer, thanked everyone for being so helpful to her on her first field trip. **Gloria Misar** read a poem written about her feelings and experiences during the week. Awards and thanks for this fine banquet were given to the **Committee Of Four**: **Gail Rankin**, **Esther Kennedy, Phyllis Thorn**, and **Rosemary Kenney**. These members, of great experience and wonderful endurance and skill, had arranged for a quiet room, good food, and a program to delight us and mark this occasion. Mention was made of the two *Hornet Victims*: *Esther* **Kennedy** and **Frances Pearson**. The two most diligent *Rock Knockers* were lauded: **Richard Bartels** and **Evelyn Pratt**. A card and our thanks were given to our excellent and accommodating driver, **Bob Schwartzkoph**.

Kenneth Yost shared a poem he had written during the field trip [See November Newsletter] and then was encouraged to quip:

" Impressed by the knowledge of these geologists?
Do you wonder where it's AT?
Look carefully at his[her] attire.
It's alway's under a GOOFY HAT!"

Our capable Field Trip Leader, **Dr. Paul E. Hammond**, was thanked for this excellent plans, his energy (We stopped at every road outcrop.), his entertaining stories, and information about the country. His introduction of and credit for research done by other geologists in this geologically complex area was commendable. (**Wendy Gerstel, Newell Campbell, Bob Bently**, and his dog **Panda**, were not present at the dinner.) A card of thanks was given to our *One More Stop* leader. Dr. Hammond spoke briefly about the geology of the area before describing our Friday's field trip. Then our bus carried us back to the Red Carpet Motel.

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DAY FIVE: FRIDAY, Semptember 12, 1997

Day 5 Reporter, Charlene Holzwarth, wraps up our 1997 President's Field Trip, with her report on: *Our Rainy Return to Portland.*

The next day, Friday, September 12, 1997, we boarded our Raz bus in a leisurely fashion at 8:30. We took Highway 12 toward Naches, past road crews "ruining the road cuts", into fog , then rain, rolling past scenic views over the most alp-like roads seen in the United States. We were traveling on a road usually closed to vehicular traffic in winter. We traveled on Cayuse Pass with its new bridge construction.

[It was during this rainy return, that we traded stories, jokes, and newspapers. Thanks to one of Ken Yost's punny tales, we all can now properly pronounce Ohanapekosh. We also read about that week's big geology story: the Mount Adams' slides.]

On State 12, we passed a few patches of snow before reaching Packwood Ranger Station and community. Because of the Fog, we gave up any idea of photographing Mt. Rainier and discussing the extent of the glacial modification of these valleys.

After driving out of the fog, we were able to see the sandstone underlying volcanic deposits in the road cuts before entering the community of Morton. The sandstone includes quartz, feldspar, and very small amounts of coal. (Renton, WA has better coal deposits.) We viewed the remaining raw earth left from last winter's landslides.

Beyond Morton, the red beds suggest old cinder cones now growing bulbs for the commercial flower market. We were able to see the Mossyback Reservoir and Riffle Lake. We heard of about the lava flows on the north flank of the road. They are thought to be the earliest on the volcanic arc.

We passed Mayfield Lake Dam, Silver Creek, viewed a terminal morraine being researched at this time by Crandall and Frazier and thought to be one million years old.

We passed Salkum landing field used by the U.S. helicopters as they directed rescue operations following the eruption of Mt. St. Helen.

Our leader discussed the glacial outwash plain and the measuring of the soil horizon and the weathering thickness of deposits as they extend miles down from the terminal morraine.

We passed projecting metal used in injecting or pumping out natural gas stored in Level # 9, the Cowlitz Gravels.

Lunch at Spiffy's We had lunch at Spiffy's restaurant. [And the eats at Spiffy's were magnifique! Some of us picked up a good practical traveling tip for seafaring trips to Alaska while lunching with longtime fellow travelers, Bob and Archie: Never choose the sleeping births at right angles to the direction of the waves, if you want a good night's sleep! One advantage of traveling with a group is that you get to go on so many other journeys, past, present, and future, personally or vicariously.]

We napped while rolling south on I-5 and arrived at Portland State close to 2:00 p.m. We felt a quiet success in a field trip with excellent leaders and perfect weather until the last day. — Charlene Holzwarth

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Thus we come to the End of our Tale and the End of our Year. Best Wishes for 1998!

THE GEOLOGICAL NEWSLETTER INDEX

Compiled by Arnold W. Adams

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Compiled by Arnold W. Adams

AUTHORS

The Geological Newsletter would like to Thank all those who have contributed copy, drawings, photos, knowledge, suggestions, and their time and labor to make its publication and distribution possible.

We would like to specially thank both Donald Barr, retired Editor, and Rosemary Kenney, who arranged for the reporting of our 1997 Field Trip and for the reappearance of our Yearly Index.

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Evelyn Pratt, 223-2601

VOL. 64, No. 2
FEBRUARY, 1998

FEBRUARY ACTIVITIES

DAYTIME MEETING: Central Library, 801 SW 10th, 1st floor, U. S. Bank Room

Friday, Feb. 6 **1:00**-2:30 PM: Columbia River South Shore Well Field
Jeff Leighton, Portland Water Bureau

EVENING MEETING: Rm. 371 Cramer Hall, PSU

Friday, Feb. 13 8:00 PM: Quaternary Geology of the Willamette Valley:
A summary of recent mapping, surficial geology, and radiocarbon dating.
Dr. Jim O'Conner, resident hydrologist, USGS
Our thanks to cookie providers Elizabeth King and Gale Rankin.

SEMINAR: Rm. S-17 Cramer Hall, PSU

Wednesday, Feb. 18 8:00 PM: Tertiary Events and Geology of Central Oregon
Richard Bartels

ANNUAL BUSINESS MEETING Friday, Feb. 27 8:00 PM: Rm. 371 Cramer Hall

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GSOC ANNUAL BANQUET is March 13.
Dr. Scott Burns will speak on "Landslides and Public Policy in Oregon."

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Clay Kelleher's March 21 FIELD TRIP: Silver Falls State Park
Meet at 9:30 AM at Silver Falls Historic Lodge near South Falls. Free field trip guide.
Wear water-repellent boots; bring sack lunch; hand lens, hammer optional.

Calendar items MUST be given to Evelyn Pratt by the 15TH of the month. 223-2601

A N N O U C E M E N T S

SILVER FALLS DAY TRIP

Clay Kelleher will be leading a Geology Tour of Silver Falls State Park on Saturday, March 21st. We will be meeting at the Historic Lodge at 9:30 a.m., where there will be a brief orientation. Clay will be providing handouts there. The walk should be completed by about 4:00 p.m.

Sampling is permitted by the park, so you may want to bring your geology hammers. Dress for wet weather, including water resistant shoes. Hand lens are recommended. Bring a sack lunch.

Please Note: There is a $3 per vehicle charge for park admission, payable at the park gate. And there are NO REST ROOMS along the trail; rest rooms are available only at the beginning and end of the trail. The walk is described as a moderate hike.

Be sure to check the March Geological Newsletter for Clay's Geological Notes for this field trip.

THANK YOU FOR THE SPEAKERS

GSOC would like to thank all those GSOCers who make possible our monthly programs. Its not an easy task keeping a steady flow of speakers for our slide shows and lectures year in and year out. Special thanks goes to Cecilia Crater and Dr. Walter Sunderland for all their efforts in arranging for speakers for our Noon Meetings and our Friday Evening Presentations. Special bravo's and purple hearts to all those who helped with the nuts and bolts of the Noon Meetings during our forum and projector challenges.

IN MEMORIAM

Robert Waiste Jr. died December 24,1997. He was born March 12, 1921, in Portland, Oregon. He served in the U.S. Army during World War II. After the war he went to work for the U.S. Army Corps of Engineers where he later became Chief of Administra-tion Services. He received many awards for his excellent work with the Corps. He married Dorothy Damm in 1955. Bob retired in 1977.

Bob Waiste and his wife Dorothy were long time active members of the Geological Society of the Oregon Country. He was elected President of the Society in 1977. During his tenure as President Bob planned and directed a President's Campout. This Campout was held at the base of the Sawtooth Range in the Stanley Basin some miles north of Sun Valley. Some 90 plus GSOC members attended. It was a memorable event.

The family suggests remembrances be sent to the Holladay Plaza Endownment Fund or the American Heart Association.

-- Submitted by Donald D. Barr

SLIDE SHOW SUMMARIES

Slide shows are just as much as much an art form as theatre, movies, and television. For many who can not afford the money or time for long trips, or aren't up to the physical demands of some locations, slide shows are an enjoyable and practical way to explore your world and expand your education. The Newsletter thought it would be nice to report on two past programs held in January.

NEW GEOLOGICAL RESEARCH FOR PORTLAND BASIN ARCHAEOLOGY

The Speaker. Our January 7th Noon Meeting speaker was Alex Bourdeau. This program was made possible by Cecilia Crater due to her affiliation with the Oregon Archeological Society, where Mr. Bourdeau spoke on September 10, 1997.

Mr. Bourdeau's academic background is primarily in history and anthropology, with a minor in geology. Among his geology professors at the University of Montana was David Alt, the co-author of Northwest Exposures, a text used by GSOC in its seminars, and the well known Roadside Geology guide series.

Mr. Bourdeau works as a geoarcheologist with the Fish and Wildlife Service. As explained by the speaker, the need for archeologists by Fish & Wildlife stems from the plain and simple fact that this department "moves a lot of dirt" in the course of preserving and developing ecosystems, and consequently uncovers many archeological sites which must be studied and documented. There are only five geoarcheologists for the West Coast.

Overview of Geological History. Mr. Bourdeau started off his lecture and slide show with a general review of the geological history of the West and Pacific Northwest, starting with 800 m.y.a., when the North American Continent split up in a manner similar to that of today's East African Rift Zone. This resulted in a ocean coastline in Idaho. After this came a quiescent period for the West Coast, with sediment deposition, similar to that presently being experienced by our East Coast.

The action started up again around 250 m.y.a., when our continent changed direction, and proceeded west, slamming into island arcs and microcontinents and adding on new land masses like the Okanogan Highlands, and the Willowa, Ochoco, and Klamath Mountains. A complex process of collision, subduction, accretion of ocean floor, and possibly re-accretions was responsible for many Pacific Northwest landforms, such as the Coast Range and the Cascades. One specific feature formed was the Puget/Willamette Trough of which the Portland Basin forms the central part.

Then between 16.5 and 6 m.y.a. the Columbia River Basalts poured over a vast area. With the small exception of the Boring lavas, the Columbia River Basalts form most of Portland's bedrock. India's Deccan Plateau is the only other continental basalt flood larger than the Columbia River Basalts.

Mr. Bourdeau explained the two competing theories for the eruption of oceanic-like basalt in a continental setting:

1. The North American Continent started to override an oceanic spreading center as it moved northward. This center kept erupting as it was entombed, and came to the surface when it found a weak spot in the continental crust, near the old coastline in Idaho, resulting in the dikes of eastern Oregon and Washington.
2. A large meteorite fell into the Harney Basin of eastern Oregon. This resulted in the cracking of the continent which in turn led to both the creation of the Basin and Range of Nevada and Oregon, and the eruption of the Columbia River Basalts. As the North American Plate moved westward, this plume's volcanic activity was felt to the East, and its activity can now be seen in Yellowstone National Park. This meteorite theory is the one favored by Dr. David Alt.

With world-wide cooling some 3.5 m.y.a. came the Great Ice Ages or the Pleistocene Period, which ended some 10,000 years ago. Globally, much of the earth's water became locked up in snow and ice with a drop in sea level of perhaps some 300 feet. One result of this was the creation of the Bering land bridge which permitted the migration of humans into the Western Hemisphere. As the Ice Ages passed, sea level rose and many river mouths were drowned, including that of the Columbia. The Columbia River can be considered a long estuary from Bonneville Dam to the Pacific Ocean. Sea level still slowly continues to rise today.

During the last part of the Ice Ages, some 13,000 to 15,500 years ago, a lobe of the Codilleran Ice Sheet came down the Percell Trench in northern Idaho and damned up local waters of Montana, forming the

Glacial Lake Missoula. This ice dam broke on some 81 separate occasions resulting in catastrophic floods known as the Spokane, Missoula or the Bretz Floods. These raging waters were responsible for sculpting and scouring areas in the upper headwaters, including the present Channeled Scablands of Eastern Washington, and the Columbia River Gorge, and then would drop their load of boulders, gravel, and sediment further downstream. Thus, we are able to find erratics in the form of boulders and gravels in the Portland area which originated in Montana and Idaho.

[Mr. Bourdeau noted that his graphic slides were prepared by a 14 year-old student in a public school program. They were quite instructive.]

The Bonneville Landslide. That a landslide did occur a few hundred years ago, on the south edge of Table Mountain just west of Stevenson, Washington, into the Columbia River, is without question. Its fairly obvious to the reasonably alert driver that the modern Bridge of the Gods crosses from one side of this slide to the other.

And geologists have a good idea of what factors caused the slide. As noted by our speaker:

"The formations under the Gorge generally dip to the southeast. They're the downfold of a huge anticline which lies under this part of the Cascades. The lowermost rocks are called the Weigle Formation. They're probably one of those island chains that slammed into North America during the Eocene or perhaps the Oligocene. In any case, they've been stewing in their own juice for around 35 million years and have converted almost entirely to clay. Above these are the Eagle Creek Formation, perhaps representing the sides of the volcanoes on the Island Arc. These rocks are generally gravelly conglomerates that are in better condition than the Wiegle rocks, but which are not very well stuck together. And above all this lies the Columbia River Basalts, dense, massive layers that have a tendency to split along vertical fractures. This is a recipe for disaster."

One of the things not known about the Bonneville Landslide is the date of its occurrence: "In 1958, Donald and Elizabeth Lawrence collected the first dates from trees drowned by the pool formed in the Columbia behind the slide." They could only come up with a wide range of between 500 and 900 years ago. Another researcher, Rick Minor, set a more specific date of between 770 and 890 years, but had only one sample to base his claim upon. Currently, a Central Oregon Community College professor is conducting an underwater survey to narrow the age range.

The Bonneville Landslide Hypothesis. Aside from the dating problem, what is also hotly debated is what is known as the Bonneville Landslide Hypothesis, which theorizes that this landslide mass was subsequently breached by the Columbia River, which then caused catastrophic flooding and which in turn caused a temporary depopulation of the native settlements in the area.

"In 1977 Richard Pettigrew . . proposed that this landslide when it was breached by the Columbia, collapsed catastrophically, releasing a flood that totally rearranged drainage patterns in the Portland Basin, erasing much of the archaeological record and causing significant changes in Chinook settlement patterns all along the Lower Columbia. He didn't have geological data to back up this assertion, but he did have evidence of a flood at a couple of archaeological sites on Sauvie Island. He also had Carbon-14 dates which suggested that very few sites in the Portland Basin were occupied before and after about 900 years. There also seemed to be a gap in the dates from around this time. In other words, it looked like the Basin was abandoned for a couple of hundred years and then people came back, they occupied sites in places different from before the landslide."

Much of the archeological evidence weighs against Pettigrew's hypothesis. While Tom Connolly's study of sites along Airport Way, supports it, a study by John Fagaan and Jo Reese in east Portland, indicated there was no such flood. Rick Minor's reanalysis of Pettigrew's Carbon-14 dates, plus other subsequent ones, led Minor to believe there was no such abandonment in settlements. The earlier work of our speaker also indicated no such catastrophic failure of the landslide.

Thus, by 1995 archaeologists seemed to agree that this hypothesis was wrong.

However, geological evidence supporting the Pettigrew hypothesis was supplied by Tom Pierson of the USGS. Pierson was studying hazards along the Sandy River, when he discovered the presence of an unusual sand layer between two previously known and dated lahars or mud flows from Mt. Hood. The Timberline lahar layer was dated to be about 1800 years old. The upper lahar layer, known as the Old Maid lahar, had been noted by Lewis and Clark, and was dated to 1800 A.D., just before they arrived at the mouth of the Sandy River.

The unusual point about the sand layer was that it was identified as coming from the Columbia River, and was the same as sand found at Oxbow and Dabney State Parks, some 15-20 miles from where the two rivers met.

It was Jim O'Connor's theory that this sand was carried this distance by a large flood on the Columbia which backed up into the Sandy. Carbon-14 dating of the sand indicated a date of about 500 years.

Thus, there seemed to be a direct conflict between the archaeological and geological evidence with respect to the merit of the Bonneville Landslide Hypothesis, not, of course, as to the fact that the landslide had occurred, which it obviously had, but to whether a catastrophic breaching of the landslide had occurred resulting in a flood.

Bourdeau's Study of the Sands. Intrigued by this scientific difference of opinion, our speaker did his own study of the sands. Working at Dabney State Park, Alex Bourdeau found micaceous sand exposed on the surface and at an elevation that only a Bretz-like Flood would have reached. Studying the USGS maps of the Oxbow and Dabney state parks, he noticed that the lower Sandy River is normal to the direction of the prevalent east wind blowing down the gorge. It is suggested by Mr. Bourdeau that the sands could have been wind transported rather than water transported.

While debates still continue over Pettigrew's Bonneville Landslide Hypothesis, other geological questions are raised further down on the Columbia.

The Cathlapotle Village Site. The Cathlapotle Village site is a large plankhouse village located on the Ridgefield National Wildlife Refuge. This site was visited by Lewis and Clark. And it has been studied by Ken Ames for five years.

"One of the interesting things, among many, at Cathapotle is the rebuilding of the plankhouses every now and then, and the fact that these rebuilding episodes are stacked on top of one another. In other words, the site is now higher than it was when first occupied."

There are quite a few factors which have probably affected the change of the river level at Cathapotle.

First, this village site is located on a natural levee, and thus is subject to the cyclical flooding of the Columbia and the deposition of sediment accompanying such periodic floods.

But two other factors, are also operating here and are on a grander geological scale: Rising sea level of the Holocene, following the end of the last Ice Age and subsidence quakes.

Subsidence quakes? Our speaker explained:

". . .[T]he westward migration of North America. . . does not occur as a gentle sliding. It proceeds in leaps and bounds. The continent is usually locked onto the Juan de Fuca plate. Pressure builds along the weld between the plates and the edge of the continent wrinkles like a blanket—or a piece of corrugated cardboard. Eventually, the pressure at the contact between the plates exceeds the friction holding them together and the weld breaks—castrophically.

"What's interesting about these breaks is what happens to the surface of the continent—besides the obvious excitement of tsunamis and buildings falling down.

"Since the continental surface was wrinkle, during these earthquakes, it straightens back out again. As a result, parts of the surface go up and other parts go down. The existence of a coastal mountain range suggests that these earthquakes don't completely offset the general uplift of the continental margin. Brian [Atwater, of the USGS] has been successful indating the last of these events in the Lower Columbia. He has found spruce trees and brackish

water plants killed by subsidence earthquakes and has dated the most recent to 1700 A.D. . . .[W]e also have Japanese texts which describe a major tsunami at exactly that time."

His field work also indicates "small overband flood episodes each separated by a period of stability when vegetation became established. . . . This left us a record of recent Columbia River floods with datable material in between. What's exciting about this is we can tie this information back into occupational sites along the Lower Columbia and determine when floods may have triggered rebuilding episodes in the Plankhouse Villages—specifically at Cathlapotle."

Ash Deposits and Dating. Our speaker also commented upon the usefulness of local ash desposits from Mount St. Helens and Mt. Mazama in dating. Each ash eruption has a unique chemical signature, is usually found in easily recognizable layers, and tends to kill trees and other living things that can yield Carbon-14 dates.

"Unfortunately, in the Portland Basin, identifying the ashes in the sediments is in its infancy. However, we do have a little information. For instance, we know that the Columbia has been rapidly filling its estuary for the last 10,000 years because we find Mazama Ash buried 60 feet deep at Kalama, Washington and 25 feet deep at the Portland Airport."

A question and discussion period followed the slide presentation. During this time, the speaker talked about the number of Native Americans which the Portland Basin is believed to have been able to support and how local studies arrived at this figure [about 60,000] by studying the natives' cultivation of Wapato, an aquatic plant.

Direct quotes and reporting of remarks obtained from Slide Show Notes of Alex Bourdeau.—M.A.

Fractured Geology will be back in MARCH.

THE SOUTH POLE'S FLYING LIFELINE

Friday, January 16th Slide Presentation
by Rhonda L. Buckner,
Polar Transport Aircraft Commander, Navy (Ret.)

Not everyone can work in Antarctica and love it.

First, there is the physical reality of Antarctica. If its a nice, windless day it can feel surprisingly warm, so much so that you can work outside in your shirt sleeves and be comfortable. That's how it is in incredibly dry climates—it really isn't the "cold", it *is* the humidity, or lack thereof..

But don't kid yourself, it is still cold. People and things don't function quite the same. Like the fellow whose mustache froze and cracked off. Pilots know this, and, as a matter of course, never just cavalierly shut off an idling engine. You keep it running in Antarctica.

It is so cold, that garbage doesn't disintegrate in an ordinary compost pile. You must haul your garbage out of Antarctica or you must push it into the bay, so you don't have to see it there, not rotting away. If you are finicky about environmental issues, you don't want to come here for just a lark. Be sure you have an important job to do, so it is worth the pollution you will undoubtedly create.

They call the place 'The Ice'. It is hard, packed ice. You can't have normal building foundations on the ice. You live in austere huts with little privacy. You do not count on normal indoor plumbing. If you can't make it to an outhouse when the weather is bad, a bucket will have to do.

And the weather gets bad. Especially when cold heavy air seeps down from the glaciers creating katabatic winds. That is when it gets pretty turbulent, when it is especially hard to fly a cargo plane in Antarctica.

Not that it is ever easy to fly a C-130 down here. It is all white; there is no depth perception. You rely on your navigator and your instruments. But not a compass. Every direction is north at the bottom of the world. This place is not for everyone. -- M.A

MAR 98

THE GEOLOGICAL NEWSLETTER

GSOC

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Editor: Marlene Adams 360-574-9650
Calender: Evelyn Pratt 223-2601
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Assistant: Cecelia Crater 235-5158

ACTIVITIES

ANNUAL EVENTS: President's Field Trip - Summer; Picnic - August; Banquet - March; Annual Meeting - February. **FIELD TRIPS:** Usually one per month, private car, caravan or chartered bus. **GEOLOGY SEMINAR:** Fourth Wednesday, except June, July, August, 8:00p.m. Room S17, Cramer Hall, Portland State University. Library, Room S7, open 7:30p.m. prior to meetings. **PROGRAMS:** Evening; Second Friday each month, 8:00p.m. Room 371, Cramer Hall, Portland State University, SW Broadway at Mill Street, Portland, Oregon. **NOON MEETING:** Usually at noon on first Friday of the month, at Portland Central Public Library, 801 SW 10th, First Floor,U.S. Bank Room, holidays excepted. Suggest date and time be verified by phone to 235-5158 or 221-0757. **MEMBERSHIP:** per year from January 1: Individual - $20.00; Family - $30.00; Junior (under 18) - $6.00. Write or call Secretary for application. **PUBLICATIONS: THE GEOLOGICAL NEWSLETTER (ISSN 0270 5451)**, published monthly and mailed to each member. Subscriptions available to libraries and organizations $10.00 a year. Individual subscriptions $13.00 a year. Single copies $1.00. Order from Geological Society of the Oregon Country, P.O. Box 907, Portland, Oregon 97207. **TRIP LOGS:** Write to same address for names and price list.

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INFORMATION: Paul Brown, 227-2136
Evelyn Pratt, 223-2601

VOL. 64, No. 3
MARCH, 1998

MARCH ACTIVITIES

DAYTIME MEETING: Central Library, 801 SW 10th, 1st floor, U. S. Bank Room

Wednesday, March 4 12-1:30 PM: Thunder Eggs
Lewis Birdsall, GSOC Member

****

Friday, March 13: GSOC ANNUAL BANQUET
Terwilliger Plaza, 2545 SW Terwilliger Blvd., in the Auditorium. Deadline for ticket purchase is *February 28*.

Speaker: DR. SCOTT BURNS
Topic: "Landslides and Public Policy in Oregon"

****

WEDNESDAY SEMINAR: Rm. S-17 Cramer Hall, PSU

March 25, 8:00 PM: Tertiary Events in the Geology of Central Oregon (continued) - Richard Bartels

TWO FIELD TRIPS COMING UP!

March 21 FIELD TRIP: Silver Falls State Park led by Clay Kelleher
Meet at 9:30 AM at Silver Falls Historic Lodge near South Falls. Free field trip guide. Wear water-repellent boots; bring sack lunch; hand lens, hammer optional. Carpooling encouraged - call Bev Vogt, 292-6939, or Rosemary Kenney, 221-0757, either to ride or to ask for passengers.

Saturday, April 4 FIELD TRIP: 1:00 pm, Rice Museum in Hillsboro

Preview, April 10: Marshall Gannett will focus on Hydrology of the Upper Deschutes Basin - a timely topic relating to one of Oregon's fastest-growing areas.

Calendar items MUST be given to Evelyn Pratt by the 15TH of the month. 223-2601

Geology of Silver Falls State Park

by Clay R. Kelleher, GSOC past President

Introduction.

A field trip, details elsewhere in this Newsletter, will be conducted by the author on March 21, 1998 to explain the geologic structures visible at Silver Falls State Park. Lava flows of the Columbia River Basalt Group dominate the landscape of the park. This article summarizes other published works describing the source of these flows, their mineralogy, how they reached this area, and the development of basalt outcrop structures. In addition, the author describes how observations of outcrop appearance and careful inspection of hand samples can be used to develop a reasonably accurate stratigraphy of the park.

Columbia River Basalt Group.

The Columbia River Basalt Group (CRBG) consists of a series of continental flood basalt flows that erupted from rifts in present-day southeastern Washington, northeastern Oregon and west-central Idaho from 17.5 Ma (million years before present) to 6 Ma. 85% of the volume of these flows erupted in the relatively brief time period of 16.5 to 15.6 Ma to produce a formation called the Grande Ronde Basalt. The total volume of all CRBG flows is 174,300 ± 31,000 km^3 and total surface area is 163,700 ± 5,000 km^2 (Tolan and others, 1989). To gain some perspective, the area of the state of Washington is 176,616 km^2, so if these flows were spread evenly, they would cover the state in lava nearly 1 km deep (about 3,000 feet).

The CRBG is divided into at least 56 units with distinct names, comprising 311 lava flows. The exact volumes of individual Grande Ronde flows may be as much as 3,000 km^3. Later flows are generally smaller; the Pomona flow (12 Ma) is among the largest at 760 km^3, and the four "basalt of Silver Falls" flows, emplaced sometime between 15.6-15.3 Ma, averaged 177 km^3 (Tolan and others, 1989). Each Silver Falls flow was roughly equal to the volume of Mt. Hood from its base.

The CRBG lava issued from linear rifts many kilometers in length, enabling the entire volume to reach the surface in "a few days to little more than a week or two" (Tolan and others, 1989) or "a few weeks to several months for large volume CRBG flows" (Beeson and Tolan, 1996). Usually the molten lava found valleys of the ancestral Columbia River and some tributaries, and if the lava volume was large enough it could reach the Pacific Ocean. When it solidified in these valleys the river would have to find a new course.

Paleotopography.

The topography of the region in the middle Miocene (Figure 1) resembled that of today. There was a low coastal barrier, a higher range with volcanoes inland, and a low plateau to the east. However the coastal range was occasionally breached by valleys and the inland lowland was partially blocked by NW-SE structural highs. Two such barriers were the Portland Hills-Clackamas River structural zone and the Gales Creek-Mount Angel structural zone (Beeson and others, 1989). Instead of a narrow gorge through the inland mountains there was a broad lowland. This lowland, the Columbia Trans-arc Lowland was 60 to 70 kilometers wide at its narrowest constriction roughly between the present-day upper basins of the Washougal River in Washington and the Molalla River in Oregon (interpreted from map of Beeson and others, 1989).

Grande Ronde Basalt.

Early Grande Ronde flows deposited much of their volume on the eastern plateau and relatively narrow zones further west, but were unable to cross the two structural barriers in the western lowland. Late Grande Ronde flows, using the earlier flows as a foundation, crossed these structural zones, penetrating as far south as Salem, The final Grande Ronde flows, called the Sentinel Bluffs unit, now form the valley floor in Silver Falls State Park (Beeson and Tolan, 1996). Norman (1980) distinguished four Grande Ronde flows in the park, two "High-Mg" (relatively high in magnesium) and two "Low-Mg", and stated that they could be distinguished in the field by their grain size and jointing characteristics. These flows were emplaced upon the sedimentary units of the lower Miocene Molalla Formation and the Oligocene-Miocene Scotts Mills Formation (interpreted from map of Orr and Miller, 1986).

Vantage horizon and Wanapum Basalt.

There followed a hiatus in CRBG eruptions long enough for a thick layer of weathered rock, soil, and vegetation to develop on all basalt surfaces. Then eruptions resumed with several non-eruptive periods, creating a formation called the Wanapum Basalt. The most voluminous component was the Frenchman Springs Member, which consisted of six named units in 21 flows. The fourth of these six units, the basalt of Sand Hollow, is dated at 15.3 Ma (Tolan and others, 1989). The Frenchman Springs Member covered about 40% of the larger area of all CRBG flows, practically all of it on weathered tops of Grande Ronde flows. This zone of burnt soil, sediment, and tree casts, centimeters to meters thick, is called the Vantage horizon. It is easily recognized throughout the Columbia basin and lower Willamette Valley, including

Silver Falls State Park. Norman (1980) distinguished three Frenchman Springs flows in the park.

At the time the Vantage surface was forming, the ancestral Columbia River had cut a narrow channel southwest from the present location of The Dalles, through the site of Mount Hood, and to the south of Salem, but its route to the ocean is uncertain (Figure 1) (Beeson and Tolan, 1996). Then the basalt of Ginkgo, the second Frenchman Springs unit, erupted in four flows totaling 1570 km^3, completely filling this paleocanyon, forcing the river to find a new route. In Silver Falls State Park a roughly U-shaped section 50 to 100 meters deep and about 1 km wide, of the Grande Ronde Basalt downstream from Elbow Falls, is cut out and filled to the top with basalt of Ginkgo (Figure 2) (Norman, 1980, Beeson and Tolan, 1996).

This left the Silver Falls region an area of low relief. A geologically short time later four more flows totaling 710 km^3 erupted, three of which passed over this area as "sheet flows" (relatively uniform thickness throughout the area). These flows are called the basalt of Silver Falls, which forms the spectacular overhanging precipice rock of North Falls (Beeson and others, 1985), and other basalt exposures in the higher areas of the park. After another geologically short time, the seven flows comprising the basalt of Sand Hollow erupted 2,660 km^3 of lava. Only one of these flows reached this area, forming a sheet flow atop the basalt of Silver Falls.

Post-CRBG deposition.

No more Columbia River Basalt reached this area. All later flows either followed a course close to the present-day Columbia River or were confined to eastern Oregon, eastern Washington, and Idaho (Tolan and Others, 1989).

Thick lateritic soils formed on the surface exposures of basalt, which were locally eroded. While still in the Miocene, eruptions from local sources deposited tuffs of dacitic composition on top of the basalt. These tuffs, a unit of the Sardine Formation, generally occur at most elevations in the Silver Creek drainage above 1,400 feet (interpreted from Orr and Miller, 1986). Dacite is rock chemically similar to that of the 1980 Mt St Helens eruption; tuff forms when volcanic ash and related material cements.

Development of present topography.

Subsequent downcutting easily penetrated the Sardine Formation, but the basalts of Sand Hollow and Silver Falls resisted erosion. The Vantage horizon at the base of these flows eroded easily, and the contrasts in erosion rates helped form the waterfalls (Norman, 1980). The fast-flowing streams cut through most of the Grande Ronde Basalt in the park. Silver Creek cuts through the base of the basalt into the Scotts Mills Formation just outside the northwest boundary of the park (Orr and Miller, 1986).

Field methods.

Serious investigations to identify basalt units usually include chemical analyses. Most amateur geologists lack this resource, and must depend on what can be seen with a handlens and from visible structural relationships.

To the casual observer basalts are difficult to tell apart in the field because there is such a narrow range in their mineralogy. Olivine and plagioclase, when present, are easiest to spot. A hand sample can be described by which minerals it contains, their sizes and abundance, and for plagioclase, the shape of the crystals. But what if several samples from different stratigraphic positions all have plagioclase 0.2 to 2.0 mm long and no olivine? This can happen at Silver Falls State Park. The solution can be divided into two parts: observation of the stratigraphy and observation of subtle mineralogical differences.

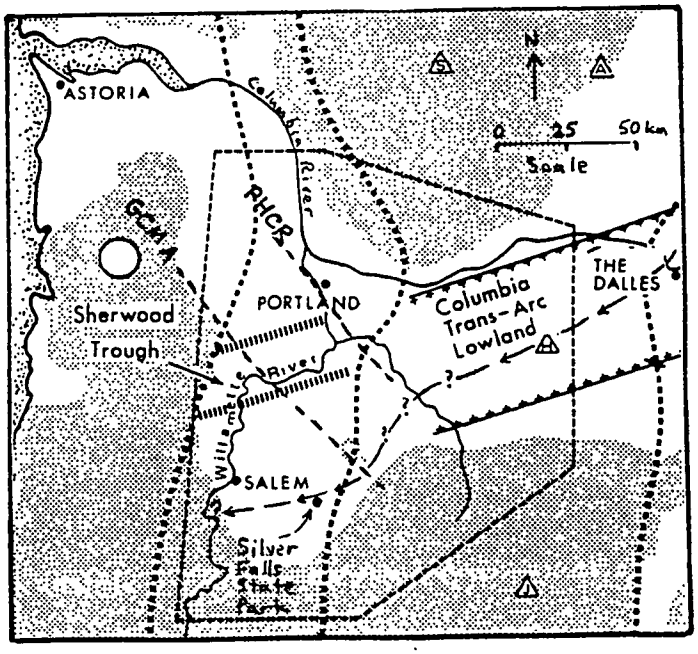

Figure 1. Columbia River Basalt Group (unshaded areas) in N.W. Oregon. Dotted lines - boundaries of modern Cascades and Puget-Willamette Trough. Triangles - modern High Cascades volcanoes. Dashed arrow - path of Ginkgo intracanyon flow. NW-SE dashed lines - Structural zones: GCMA=Gales Creek-Mount Angel, PHCR=Portland Hills-Clackamas River. The Sherwood Trough was not discussed. (After Beeson and others, 1989, Beeson and Tolan, 1996)

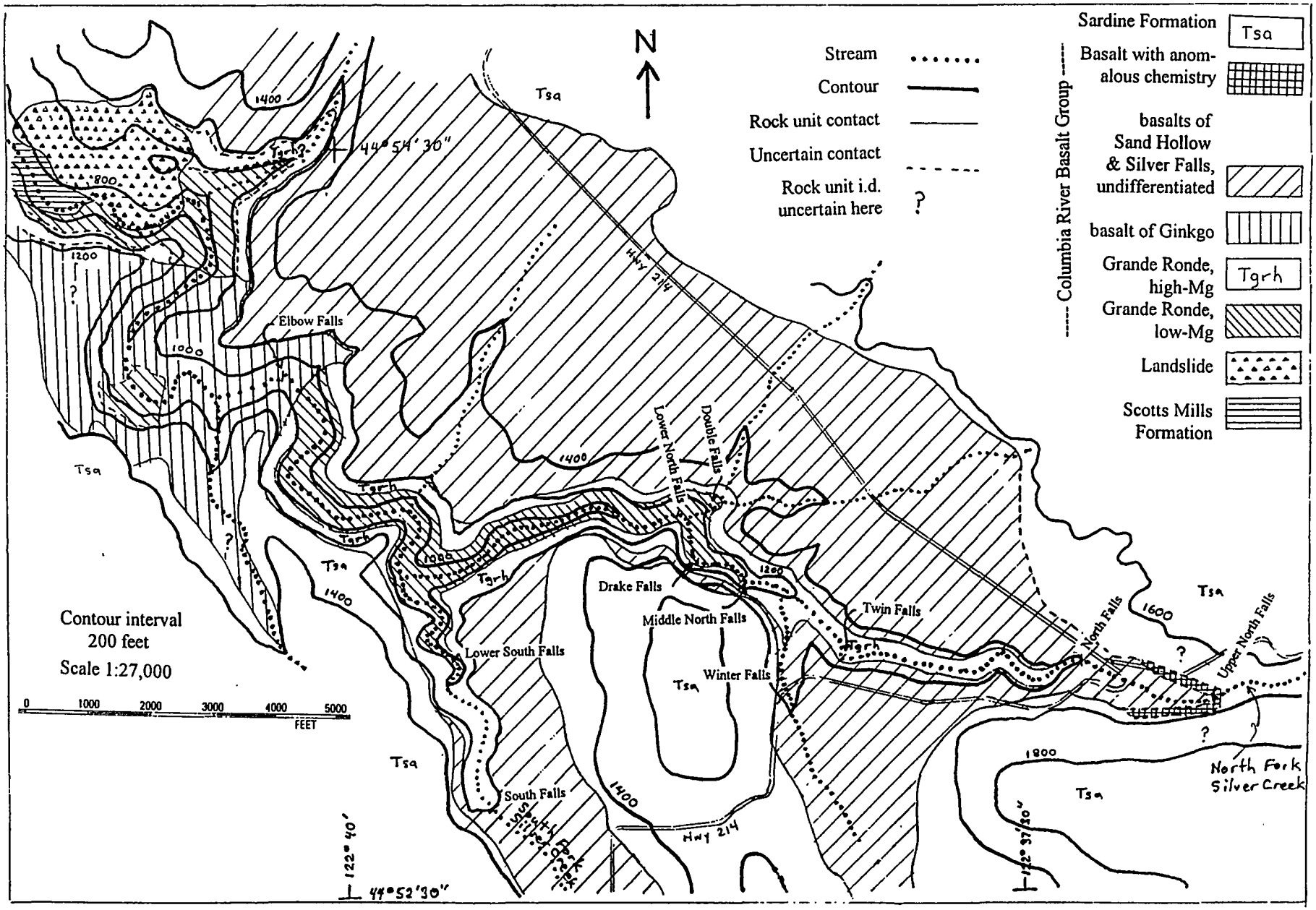

Figure 2. Geologic map of Silver Falls State Park, Oregon (after Norman, 1980, Orr and Miller, 1986, Beeson and Tolan, 1996)

Basalt structures and texture.

Stratigraphy is especially easy to observe at Silver Falls State Park. Behind and next to each waterfall is a cliff of nearly fresh rock washed clean of vegetation in a tall vertical section. In such large exposures, falling water often reveals subtle changes in erodability as a lineation on the rock face, evidence of a possible contact between two lava flows. The Vantage horizon is such a feature, but prominent wherever it appears. Trails behind both North Falls and South Falls are constructed on this horizon.

Between waterfalls trail cuts frequently expose small sections of basalt. By recognizing the textures that distinguish the bottom, middle, and top of a lava flow, one can use the smaller sections to connect the stratigraphy of one waterfall to the next one.

The base of a flow may consist of pillow lava, basalt in contact with underlying sediments or with inclusions, or basalt colonnades. Pillow lavas form when molten basalt flows into a body of water. They exhibit concentrically curved jointing patterns on a small scale with glassy rinds, making them easy to identify in a small exposure. When molten basalt moves across a zone of weathered rock or soil it can scoop up fragments of that material. These fragments are often much lighter color than the basalt. When a new flow comes to rest upon solid rock from an earlier flow, its temperature drops very slowly, beginning at the surface of contact with the old rock. Quite likely, joints begin to form in 5- to 7-sided polygons, and are propagated toward the center of the body of cooling lava, forming the famous "columnar structure". However columns can also form from the tops, sides, or interior of cooling basalt bodies, so the significance of columns depends on their orientation and contacts with other structures (Figure 3). Columbia River basalt flows sometimes flowed through temporarily nearly-dry river valleys due to the damming action of the flow upstream, resulting in columnar basalt in direct contact with river boulders, gravels, and fines.

Flow tops may be evidenced by a colonnade, entablature, of vesicular zone. Vesicles can form elsewhere but are most common at the top of the flow due to the low pressure in the cooling lava, allowing bubbles of gas to form. Entablatures are common at the surface of CRBG flows, but are not as common in some other basalts of the world, such as Kiluaea, in Hawaii. One body of evidence suggests that the entablature forms when a large amount of water flows over a cooling lava flow, penetrating downward, causing it to cool quickly (Long and Wood, 1980). In the Pacific Northwest, the source of a "large amount of water" could be the dammed-up portion of the Columbia River overtopping the flow. Entablature rock is characterized by random jointing patterns on a small scale. Entablatures rarely occur at the base of flows.

Plagioclase lithology.

Table 1 lists plagioclase characteristics described by Beeson and others (1989). There is a considerable overlap in the lithology, so that a single sample found in the field might fit the criteria of several rock units. It is necessary to examine

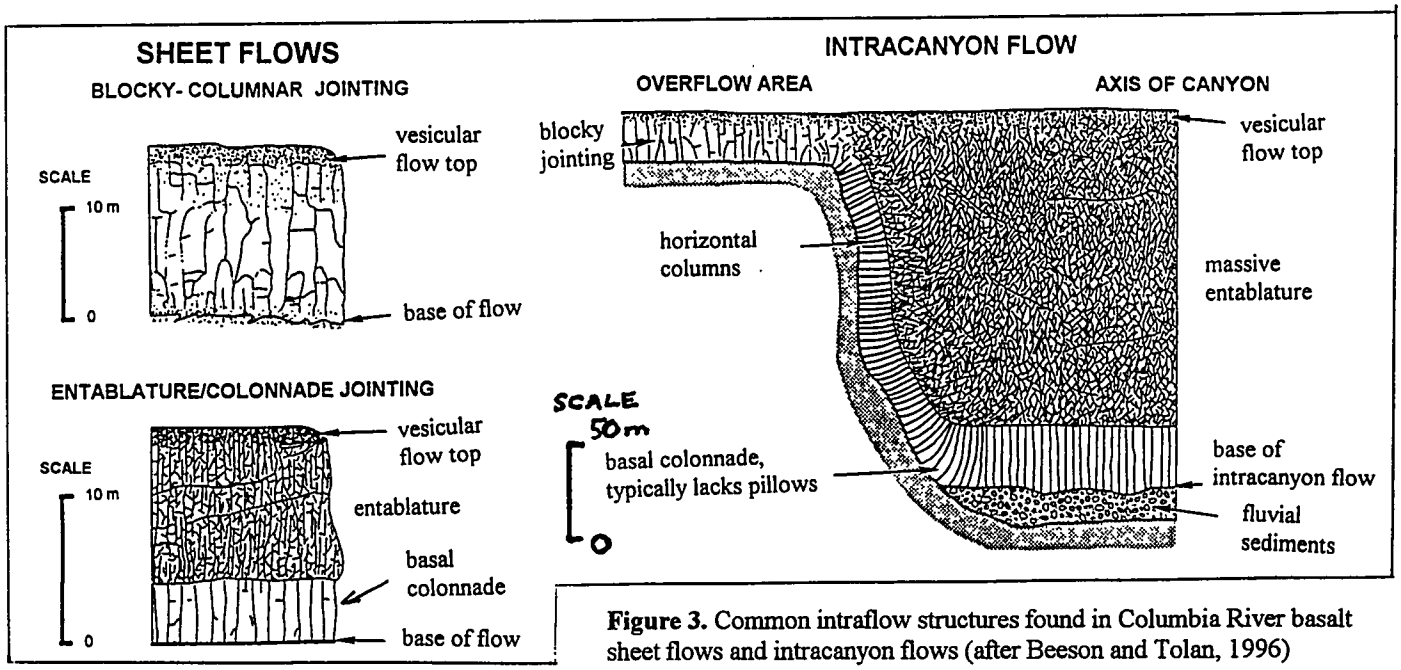

Figure 3. Common intraflow structures found in Columbia River basalt sheet flows and intracanyon flows (after Beeson and Tolan, 1996)

many samples, from widely spaced outcrops if possible, to identify the rock unit with some confidence.

The author's experience in Silver Falls State Park is that phenocryst size is not as useful as groundmass characteristics (the dark gray portion that forms most of the rock). In ten samples of probable basalt of Silver Falls of Sand Hollow outcrops, only one of them had phenocrysts as long as 0.5 cm. (Basalt of Ginkgo is not accessible by park trails, and was not examined.) However, many samples differed noticeably in abundance of microphenocrysts. Where they were abundant, the sample "sparkled" in good light; where they were sparse, plagioclase was hard to find, even with a handlens. The shape of the microphenocrysts could be seen with a handlens. "Equant" crystals resembled small grains of salt, but more careful examination was needed to distinguish tabular (flat) from acicular (needle-like) grains.

Groundmass grain size may also be a useful characteristic for distinguishing the high-Mg from the low-Mg Grande Ronde flows. Fresh surfaces of samples with fine grain size have texture resembling fine sandpaper, while the texture of coarser samples is rough enough to be visible without a handlens.

Sardine Formation.

The tuffs of the Sardine formation erode readily, so natural outcrops in the park are rare. Where exposed in roadcuts it is easily recognized. When fresh, it is a soft, yellowish-gray rock composed of cemented pumice fragments typically 1 cm diameter down to microscopic size. It is often found weathered to a light yellowish-brown color whose samples easily crumble. It might be most easily traced in the park by the color of the soil that develops on it: a medium yellowish brown as opposed to the reddish soil that commonly develops on basalt surfaces.

Conclusion.

Cited references provide sufficient information to delineate on a geologic map of Silver Falls State Park two types of Grande Ronde rock units, the basalt of Ginkgo, and two younger Frenchman Springs units, and to separate the basalts taken as a unit from the older and younger rock units. There was insufficient information to distinguish on that map the basalt of Silver Falls from the basalt of Sand Hollow.

Lithologic differences among the basalts in the park are usually alone insufficient to identify a single hand sample in the field, but through understanding of basalt structures, observation of stratigraphy, and examination of several samples, identification could be made with some confidence.

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Orr, W.N. and Miller, P.R., 1986, **Geologic Map of the Drake Crossing Quadrangle, Marion County, Oregon, Geologic Map Series GMS-50**, State of Oregon Department of Geology and Mineral Industries, Portland, Oregon.

Rock Units → / Plagioclase Characteristics	Grande Ronde	Frenchman Springs, basalt of		
	Sentinel Bluffs	Ginkgo	Silver Falls	Sand Hollow
Abundance of plagioclase phenocrysts	Rare to abundant	Typically abundant	Sparse to abundant	Sparse to abundant
Size of phenocrysts	0.2 to 0.7 cm	0.2 to 2.0 cm	0.3 to 1.5 cm	0.3 to 3 cm
Glomerocrysts?	No	Yes	Yes	No
Groundmass grain size	Fine to medium	Fine to medium	Medium to coarse	Fine to coarse
Groundmass microphenocryst shape	Tabular and acicular	Sparse	Abundant, equant and acicular	Sparse

Table 1. Comparative lithologies of CRBG units found in Silver Falls State Park (after Beeson and others, 1989)

References (Continued)

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ANNOUNCEMENTS

The Geological Newsletter would like to thank GSOC past President Clay Kelleher for his impressive article "Geology of Silver Falls State Park.

The GSOC Day Trip to Silver Falls State Park on Saturday, March 21, 1998, begins at 9:30 a.m. at the park's Historic Lodge. Please try to remember to bring the above article and diagrams to better understand and enjoy Clay's discussion.

GSOC members interested in Car Pooling to Silver Springs State Park on March 21st should contact Bev Vogt at 292-6939 or Rosemary Kenney at 221-0757. This applies whether you are seeking a ride or offering a ride. Thank You.

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Be Sure to Read The April Newsletter for
Fractured Geology
and information about
The Rice Northwest Museum

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CHANGE IN INCOMING OFFICERS LEAVES VACANT POSITION

Dr. Walter Sunderland has resigned his position as incoming President of the Geological Society of the Oregon Country (GSOC). Pursuant to Article VI, Section of the Bylaws, Beverly Vogt, as incoming Vice President, will assume the position of President for the 1998-1999 year. Charlene Holzwarth has graciously agreed to serve as Acting Vice President until the Board appoints a new Vice President. The position of Vice President is extremely important to GSOC because this year's Vice President becomes next year's President.

The Board is looking for someone who is willing to serve as Vice President this year and President next year. Anyone who is interested in serving should contact a member of the Board as soon as possible. Although the position of Vice President/President has leadership responsibilities, GSOC has an extensive network of talented and dedicated members who maintain many of the ongoing activities of the organization, and the leadership role of Vice President/President is not as demanding as some members may fear. GSOC has a long history of interesting and valuable activities, and helping to continue that tradition as Vice President/President is an opportunity for the right person who believes in what GSOC stands for and does.

Please contact any Board member if you are interested in this opportunity to help direct and guide GSOC's future. --- B.V.

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Happy St. David's Day
Patron Saint of Wales
March 1st
Be Sure to Wear Leeks!

****

Happy St. Patrick's Day

March 17th

Sixty-Third Annual BANQUET on MARCH 13 th

The 1998 Annual Banquet of the Geological Society of the Oregon Country will be held at Terwilliger Plaza, 2545 SW Terwilliger Boulevard, in the Auditorium on: **Friday, March 13.**

The new deadline for reservations is March 6, 1998.

Please make your reservations as soon as possible.

TIME: 5:30 p.m.--Social time and viewing of exhibits; 6:30 p.m.--Dinner followed by program.

SPEAKER: **Dr. Scott Burns**, Professor of Geology, Portland State University, speaking on:
"Landslides And Public Policy In Oregon"

RESERVATIONS: Cost of the dinner is $16.50. Entrée choices are Roast Sirloin or Chicken Wellington. Reservations should be made as soon as possible, with the absolute deadline of March 6. If you want To Make a Reservation Call Phyllis Thorne at 503-292-6134.

PARKING: There are four places to park at Terwilliger Plaza: (1) Front of building; (2) behind the building, accessible by going through the passageway in the middle of Terwilliger Plaza; (3) just north of the Plaza; (4) across the street to the north between the yellow house and the corner house. -- B.V.

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New Engineering Geology Book Donated to GSOC LIBRARY

At our February 13th Evening Meeting, **Peggy Allen**, widow of **Dr. John Allen** and longtime Geological Society of the Oregon Country (GSOC) member, donated a new book on the engineering geology of Oregon to the GSOC library.

The book, ***Engineering, Groundwater, and Engineering Geology: Applications from Oregon*** is edited by **Dr. Scott Burns**, Geology Department of Portland State University.

The 689-page book presents sixty-nine papers by eighty-two authors on engineering geology in Oregon. It is a remarkable collection of papers on current and classic geotechnical topics in the state, including land use planning, geohazards, water resources, dams, and landslides. It presents case histories and examples from all parts of the state and provides insight on the kinds of problems that engineering geologists address in Oregon. In it you can read about all of those engineering problems you have been hearing about for years. Included are numerous maps, drawings, and photographs illustrating various problems and solutions.

The book is Special Publication 11 of the Association of Engineering Geologists and was published by Star Publishing Company of Belmont, California.

GSOC members may examine it or check it out from our GSOC library. ---B.V.

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GSOC LIBRARY at PSU's Cramer Hall

GSOC would like to thank **Cecelia Crater** for opening the GSOC Library for the past few months before our Friday Evening Meeting. Cecelia took on this temporary extra duty in addition to her regular Noon Lecture and Newsletter duties.

It is intended that the GSOC Library at PSU in Cramer Hall will be open and its materials made available to its members either before or after our Fourth Wednesday of the Month meetings.

Presently we suggest that if you are interested in using the library during an evening meeting at PSU, you check with **Richard Bartels** (Bart) or one of the officers or newsletter staff who are present at that meeting. We will keep you updated on any new library arrangements the new GSOC Board may be making in the future.

We would also like to thank **Rosemary Kenney** for her compilation of GSOC Field Guides. Rosemary is hard at work gathering full collections of Field Guides from past President's Annual Camp Outs/Field Trips. These old field guides would be made available for check out from the GSOC Library for those interested in making their own independent trips and vacations. Rosemary currently needs the guides from the years 1994 and 1995. It is our understanding that Rosemary will be copying these for our archival purposes and will be returning your field guides to you. Our thanks also to all those GSOC members who have been helping Rosemary in this project. ---M.A.

APR 98

THE GEOLOGICAL NEWSLETTER

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

GSOC

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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THE GEOLOGICAL NEWSLETTER

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For contributions, notices, etc. contact Editor at 1809 NW 90th St., Vancouver, WA 98665-6757, or e-mail: GSOCnewsMA@aol.com

ACTIVITIES:

ANNUAL EVENTS: President's Field Trip-summer; Picnic-August;Banquet-March, Annual Meeting-February. FIELD TRIPS: Usually one per month, private car, caravan or chartered bus. GEOLOGY SEMINARS: fourth Wednesday, except June, July, August, and holidays, 8:00 pm. Rm. S17, Cramer Hall, PSU. Library: Rm 57, Open 7:30 pm prior to meetings. PROGRAMS: Evening: Second Friday evening each month. 8:00 pm, Rm 383, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: First Friday monthly except June, July, August and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Suggest time and date be verified by phone: 235-5158 or 221-0757. MEMBERSHIP:per year from January 1: Individual-$20.00, Family-$30.00, Junior(under 18)-$6.00. Write or call Secretary for applications. PUBLICATIONS: THE GEOLOGICAL NEWSLETTER (ISSN 0270 5451),published monthly and mailed to each member. Subscriptions available to libraries and organizations at $10.00 year. Individual subscriptions $13.00 year. Single copies $1.00. Order from Geological Society of the Oregon Country,P.O.Box 907,Portland, Oregon 97207. TRIP LOGS: Write to the same address for names and price list.

APPLICATION FOR MEMBERSHIP
THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Name:_____Spouse

Children under age 18:_____

Address:_____ City:_____

_____State_____Zip_____

Phone:_____

Geological interests and hobbies:_____

Individual: $20.00_____Family: $30.00_____

Junior, under 18, not included with family membership: $6.00_____Make check payable to: The Geological Society of the Oregon Country, P.O.Box 907, Portland, Oregon 97207_____

GEOLOGICAL NEWSLETTER

THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY
P.O. BOX 907, PORTLAND, OR. 97207

VISITORS WELCOME AT ALL MEETINGS
INFORMATION: Beverly Vogt, 292-6939
Evelyn Pratt, 223-2601

VOL. 64, No. 4
APRIL 1998

APRIL ACTIVITIES

DAYTIME MEETING: Central Library, 801 SW 10th, 1st floor, U. S. Bank Room

Thur., Apr. 2 12-1:30 PM:
Geology & Flowers of the N Cascades
GSOC Past President Don Barr

FRIDAY EVENING MEETING: Rm. 371 Cramer Hall, PSU

April 10 8:00 PM:
Hydrology of the Upper Deschutes Basin
Marshall Gannett, Hydrologist, USGS
Thanks to cookie-provider Rosemary Kenney

WEDNESDAY SEMINAR: Rm. S-17 Cramer Hall, PSU

April 22, 8:00 PM:
Geology of Central Oregon (continued)
GSOC Past President Richard Bartels

Saturday, April 4 FIELD TRIP:
1:00 pm, Rice NW Museum of Rocks and Minerals, Hillsboro
Directions: Go west on Hwy 26; take Exit 61. Drive N short distance to first road (Groveland) which parallels Hwy 26; turn W (left) about 1/2 mile. Ray Crowe, 640-6581

Calendar items MUST be given to Evelyn Pratt by the 15TH of the month. 223-2601

RICE NORTHWEST MUSEUM OF ROCKS AND MINERALS

The Rice Northwest Museum of Rocks and Minerals in Hillsboro, OR, has an excellent collection of minerals, as well as reference materials, that is available for viewing, study, and research to anyone who is interested in the earth sciences. The museum was founded by Richard L. and Helen M. Rice in 1996 for the purpose of passing on to present and future generations the knowledge and pleasure to be derived from these beautiful specimens.

The museum has an extensive collection of crystallized mineral species: world-class specimens of common quartz and gypsum; colorful copper minerals; one of the two finest red rhodochrosite specimens in the world; rare and beautiful crystals of emerald, ruby, aquamarine, morganite, and amethyst; and thousands of other specimens from around the world.

The collection also displays lapidary works: large cut and polished sections of petrified wood, fossil palm, and cycad; polished specimens of green variscite, rhodochrosite, malachite, lapis lazuli; turquoise, chrysocolla, rutilated quartz, and more.

A northwest mineral museum would not be complete without agate. The Rices began their collection in 1938 with a handful of Oregon beach agates. The museum displays agates from locations throughout the Americas, including the U.S., Argentina, Brazil, and Mexico. Thunder eggs from many of Oregon's classic localities are featured.

The museum is open to visitors from 1:00-5:00 p.m., Thursday, Saturday, and Sunday. Group tours are by appointment only. Admission is free to the general public. The museum is located at 26385 NW Groveland Drive, Hillsboro, OR 97124; phone 503-647-2418. Take State Route 26 west from Portland to Exit 61 north. Take the first turn west onto Groveland Drive.

Reprinted, with thanks from GSOC, from *Washington Geology*, December 1997. See our Calendar for Field Trip on Saturday, April 4th.

COMPLETELY FRACTURED GEOLOGY

by Evelyn & Ralph Pratt

1. Planktonic: What to apply to a sagging 2X4 to get it back into shape
2. Colluvium: A big open-air stadium where Romans fed Christians to the lions
3. Crevasse: As in, "I say, which crevasse shall I wear with this shirt - the blue one or the one with the penguins?"
4. Dendritic: Of or pertaining to the teeth
5. Chromite: A little critter on a big black bird
6. Gabbro: The back of a classroom where all the talkers sit
7. Chloritic: Really, really angry
8. Cabochon: Chon's taxi
9. Pyroxene: A place where loud modern music is amplified to the 3.1416th power
10. Basin And Range: Two things that might be found in a kitchen that has no plumbing

See Page 26 for Correct Definitions

NEWSLETTER: B&W vs. COLOR

Some GSOCers have asked if we could bring back the old color editions of yesteryear. During the vast Pre-M&BG [Microsoft and Bill Gates] Era, The Geology Newsletter sometimes sported green ink. We too would love to have a more distinctive look for our cover and perhaps for some Holidays, and we are dutifully looking into the matter. However, be advised that our general forecast for the foreseeable future is for Black & White. Reason: We'd like to Stay in The Black, financially speaking! Rosemary Kenney does her very best to keep printing costs as low as possible so that GSOCers can receive the most bang for their membership/subscription buck.

April Fool's Day Update: The Capes Homeowners Association will be petitioning God for a special exemption from all Her Natural Laws as they apply to the coast of Oregon.

Charlene Holzarth
Acting Vice President

Speaker: Dr. Scott F. Burns
Professor of Geology
Portland State University

Beverly Vogt 1998-99 GSOC President

SIXTY-THIRD ANNUAL GSOC BANQUET

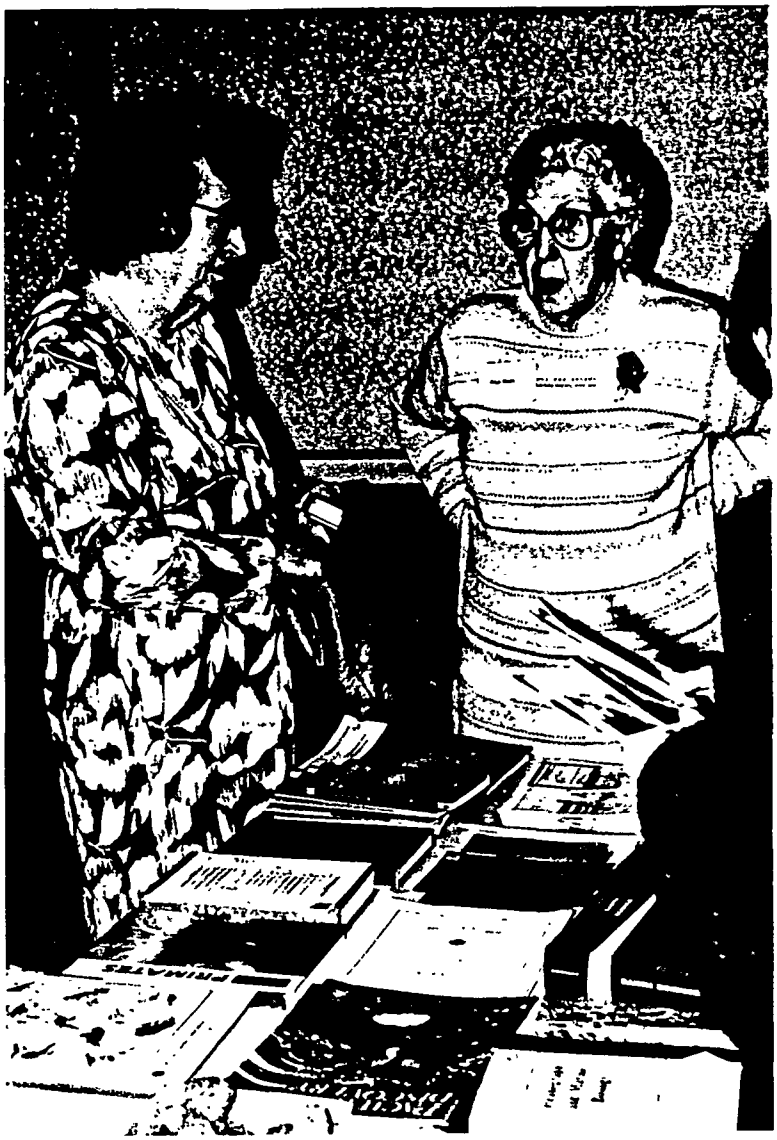
PAST GSOC PRESIDENTS

Phyllis Thorne
1998-99 Secretary &Treasurer
and 1997-98 Treasurer

This is a memorable photo of Phyllis Thorne enjoying a rare moment of relaxation. Generally her duties do not permit her such long periods of tranquillity.

Mildred Phillips

Mildred Phillips is our only Charter Member!



Clara Bartholomay & Peigi Stahl
At the Book & Publications Table

Dorothy & Ralph Mason

The Geological Newsletter would like to thank Bob Richmond for his great Black and White Photos of the 63rd Annual GSOC Banquet. Thank you Bob and Good Luck with the new bachelor pad!

Don't Shoot! Its Just the Geologist. The Developer Got the Money!

Due to the flu, I did not attend the GSOC Banquet. My husband, Arnold, being a loyal mate, dutifully attended, took notes on the speech given by **Dr. Scott F. Burns** entitled ***Landslides and Public Policy in Oregon***, and faithfully related the natural and man-enhanced disasters recounted by Dr. Burns. It sounded like a peach of a speech. I am sorry I missed it, especially since it is a bear to reconstruct a talk in such a second-hand fashion. So please forgive my punting...

Landslide stories are as old as the hills upon which they occur. Years ago when I moved to Wyoming, I quickly became a master kibitzer on the subject. Early road and dam builders made some honeys of mistakes in the Western U.S. Their colossal blunders often composed the emotional high points of my geology field trips.

"Can you believe what those idiots did? Look, they cut off the toe of that landslide when they put in the road. That reactivated an old landslide. An entire mountain may come down!" Yes, I used to enjoy this Monday morning geology-ing. How could those old fogy engineers and geologists have been so dumb!

I learned some basic geology no-no's and can still recite some: Never, never, cut the toe of a landslide. Never load the head of a landslide. Never add water to the slope increasing weight on the slope and water pore pressure. Never load the slope by cutting and filling. I also learned how geology and topography could combine for a disaster. An underground bed of clay tilted downward in the same direction as the aboveground topography was a good recipe for a landslide. Water would be trapped on the clay's upper surface and would act as a lubricant. Anything above that clay layer would eventually submit to gravity's tug.

Of course, I already knew that only a fool would build his/her house on a foundation of sand. And I learned that one must take into account climactic cycles. Don't get deceived by the 5, 10 or 20 years of dry weather. Eventually, we will move back into a wet cycle again. Heavy rains could reactivate old landslides.

On one geology field trip along the Wasatch Front in Utah, I finally got a lesson in modern land development practices. As we neared one site, our geologist guide told of his experiences as a consulting engineer to the developer of the subdivision we would see. He described how pressure had been applied to him to sign-off on an exemption to a geology-based restriction, so that an extra lot could be sold. He said he had refused to bow to the developer's greed. Just as he finished up his story we arrived at the site and the geologist's face paled. The extra lot had been staked-out and was being offered for sale, just as the developer had wished.

Now, that developer could have shopped for a less ethical geologist, or could just have used a friend or relative at the county office. This was Utah! What else could you expect? It wasn't like Oregon which took its land planning seriously, was it? And then I heard about The Capes at Oceanside, Oregon. . . At least those old fogies earlier in history had scientific ignorance as an excuse. Wonder what ours will be? -- MA

Correct Definitions: COMPLETELY FRACTURED GEOLOGY
adapted from AGI Dictionary of Geological Terms, 3rd Ed., Bates & Jackson, by E. Pratt

1. Planktonic: Having to do with floating aquatic organisms
2. Colluvium: Talus, scree, and other loose deposits brought down by gravity to the base of a slope or cliff
3. Crevasse: A deep crack or fissure in a glacier, caused by the glacier's movement over an uneven surface
4. Dendritic: Having a branching tree-like pattern; said of crystals, stream drainages, etc.
5. Chromite: A black ferromagnesian mineral; the most important ore of chromium
6. Gabbro: A dark basic mineral with crystals large enough to be seen easily; the intrusive equivalent of basalt
7. Chloritic: Pertaining to chlorites, a group of platy, usually greenish, mica-like minerals, widely distributed in low-grade metamorphic rocks and in clays
8. Cabochon: A highly-polished, unfaceted, convex gemstone
9. Pyroxene: A group of common rock-forming silicate minerals with short, stout crystals, and good cleavage in two directions intersecting at approximately 90 degree angles
10. Basin and Range: Regional structure dominated by fault-block mountains separated by sediment-filled basins.

MAY 98

THE GEOLOGICAL NEWSLETTER

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Calender:		**Assistant Business Manager:**	
Evelyn Pratt	223-2601	Cecelia Crater	235-5158

For contributions, notices, etc. contact Editor at 1809 NW 90th St., Vancouver, WA 98665-6757, or e-mail: GSOCnewsMA@aol.com

ACTIVITIES CHAIRS

Calligrapher:		**Properties and PA System:**	
Esther Kennedy	(541) 772-3031	Richard Bartels	292-6939
Field Trips:		**Publications:**	
		Rosemary Kenney	221-0757
Geology Seminars:		**Publicity:**	
Richard Bartels	292-6939	Evelyn Pratt	223-2601
Historian:		**Refreshments:**	
Charlene Holzwarth	284-3444	Friday eve: Gale Rankin	223-6784
Hospitality:		Archie Strong	244-1488
Noon: Rosemary Kenney	221-0757	**Volunteer Speakers Bureau:**	
Evenings: Carol Cole	233-2619	Bob Richmond	282-3817
Library:		**Programs:**	
		Noon: Cecelia Crater	235-5158
Annual Banquet:		Evening:	
Esther Kennedy	(541) 772-3031	Carol Hasenberg	282-0547
Phyllis Thorne	292-6134	**Transportation:**	
Telephone:		Beverly Vogt	292-6939
		Rosemary Kenney	221-0757

ACTIVITIES:

ANNUAL EVENTS: PRESIDENT's FIELD TRIP-summer; PICNIC-August;BANQUET-March, ANNUAL MEETING-February. FIELD TRIPS: Usually one per month, private car, caravan or chartered bus. GEOLOGY SEMINARS: fourth Wednesday, except June, July, August, and holidays, 8:00 pm. Rm. S17, Cramer Hall, PSU. Library: Rm S7, Open 7:30 pm prior to meetings. PROGRAMS: EVENING: Second Friday evening each month, 8:00 pm, Rm 383, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: First Friday monthly except June, July, August and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Suggest time and date be verified by phone: 235-5158 or 221-0757. MEMBERSHIP:per year from January 1: Individual-$20.00, Family-$30.00, Junior(under 18)/Student -$10.00; PUBLICATIONS: THE GEOLOGICAL NEWSLETTER (ISSN 0270 5451),published monthly and mailed to each member. Subscriptions available to libraries and organizations at $10.00 year. Individual subscriptions $13.00 year. Single copies $1.00. Order from Geological Society of the Oregon Country,P.O.Box 907,Portland, Oregon 97207. TRIP LOGS: Write to the same address for names and price list.

GEOLOGICAL NEWSLETTER

THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY
P.O. BOX 907, PORTLAND, OR. 97207

VISITORS WELCOME AT ALL MEETINGS
INFORMATION: Beverly Vogt, 292-6939
Evelyn Pratt, 223-2601

VOL. 64, No. 5
MAY 1998

MAY ACTIVITIES

DAYTIME MEETING: Central Library, 801 SW 10th, 1st floor, U. S. Bank Room

Friday, May 1 2-3:30 PM: Where Flood Basalts Meet the High Cascades
Evelyn Pratt, GSOC Past President
This will be the LAST DAYTIME MEETING until September.

FRIDAY EVENING MEETING: Rm. 371 Cramer Hall, PSU

May 8, 8:00 PM: How Plate Tectonics Set the Stage for Civilization in the Eastern Mediterranean, given by Dr. George W. Moore, OSU & USGS
Thanks to cookie-provider Gale Rankin

WEDNESDAY SEMINAR: Rm. S-17 Cramer Hall, PSU

May 27, 8:00 PM: Geology of Central Oregon (continued)
Richard Bartels,GSOC Past President

Saturday, May 16 FIELD TRIP to Historic Quartzville Gold Mining District
Leader: GSOC President Beverly Vogt; *guest lecturer*, Jerry J. Gray, DOGAMI, ret.
Directions: Allow 2 hours from Portland to meeting place. Take I-5 S to Albany; US20 thru Lebanon & Sweet Home. E of Sweet Home, 2 mi. E of Foster Dam Overlook & Point Cafe, meet at jct. of US Hwy 20 & Green Peter Dam/Quartzville Rd. turnoff.
What to see: Gold mineralization, minerals, mining history, a mine tunnel, recreational gold miners in action. Guest lecturer Jerry Gray is an expert on the area's mining history.
What to bring: Lunch, flashlight, rock hammer, hand lens, sample bags, marking pen for samples, rain gear, and ENTHUSIASM!
To carpool (250 mi. round trip): Bev Vogt, 292-6939, or Rosemary Kenney, 221-0757

NEXT MONTH: Fri., June 12, 8 PM: 1996 Royse Debris Flow, Dodson, OR (in Col. Gorge) Ken Cruikshank, Geol. Dept., PSU

Calendar items MUST be given to Evelyn Pratt by the 15TH of the month. 223-2601

ANNOUNCEMENTS

THE PRESIDENT'S CAMPOUT

The 1998 President's Camp Out will be held from Sunday, October 11th to Saturday, October 17th. This trip will feature the geology of the Central Oregon area of Camp Hancock. More detailed information, including costs, will be announced as soon as trip plans are formalized. If there are any questions you have or information you would like to share, please contact GSOC President, Bev Vogt at 503/292-6939.

MONTHLY FIELD TRIPS

Please be sure to carefully check your Calendar in this Newsletter for news of monthly field trips. GSOC is trying its very best to schedule a monthly field trip during the warmer weather months. Refer back to this month's Calendar for details regarding the May trip to the Quartzville Mining District.

MAY & JUNE
Friday Evening Speeches

To help our members and audiences more fully appreciate our lecture/slide programs, we are featuring ABSTRACTS of our upcoming May and June Friday Evening programs in this issue. Fear not the word "abstract"! These summaries are not in the least abstract. You do not have to be a geology expert to understand and enjoy them, nor will you have to devour megadoses of coffee to stay awake long enough to read them. They are short, simple, and straightforward summaries intended to help you prepare ahead of time for the lectures themselves. The Geological Newsletter would like to thank GSOC President, Bev Vogt for her assistance in obtaining these abstracts and the May and June Friday Evening Speakers for their composition.

NEW VICE PRESIDENT

At its last meeting, the new GSOC Board of Directors named Carol S. Hasenberg Vice President for 1998-99. Charlene Holzwarth was kind enough to serve temporarily as Acting Vice President until this appointment could be made. As most of our members know, the Vice President slot opened when Dr. Walter Sunderland informed GSOC that he would not be able to serve as President for the 1998-99 term, resulting with Beverly Vogt, the original 1998-99 Vice President nominee, filling the role of GSOC President.

This seemed to provide us the perfect opportunity to launch a new series for The Geological Newsletter, namely biographies of our members. So let us now meet our new GSOC Vice President. . .

Member Biography. Carol S. Hasenberg lists her birthplace as Weirton, West (by God) Virginia. Her maiden name is Holt. She was born on July 27, 1956, and graduated from Weir Senior High School in 1974, as a National Merit Scholarship Finalist. Carold graduated with honors from Michigan State University in 1980 with a B.L.A. in Landscape Architecture. As an undergraduate, Carol participated in an Overseas Study Program to Warsaw, Poland.

Like many a GSOCer before her, she heard the call of the Pacific Northwest from afar, and answered it. She earned a B.S. in 1989 and an M.S. in 1994, both in Civil Engineering, from Portland State University, and numerous academic honors, including the Harry White Scholarship from PSU's School of Engineering.

Carol is curently an instructor at PSU's Civil Engineering Department and a research assistant on the seismic hazards assessment project for the Portland Metropolitan Region. Carol is a Licensed Professional Engineer. Her most recent private sector positions were Staff/Lead Engineer at IDC, and Project Engineer at Walker/Diloreto/Younie, Inc, both in Portland.

Carol attributes her interest in geology to:

- PSU Geology classes, starting in the late 80's with Dr. Palmer, and including Geology of the Pacific NW, Earthquakes in the Pacific NW, and Geophysics;
- The significance of seismic considerations to structural engineers in Oregon
- Her love of hiking and her desire to understand what she is observing

Carol especially looks forward to participating in GSOC field trips, which she feels that is what geology is all about. And she hopes to help GSOC focus on bringing in new members.

Carol husband, John Hasenberg, is an architect. They have a 12 year old son, Paul. Carol and John have been married since 1983, and the Hasenbergs have lived in Northeast Portland since 1985. They consider time at their beach cabin and their yearly family vacations as some of their most enjoyable family moments.

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ABSTRACTS of Upcoming Programs:

ABSTRACT For: JUNE 12, 1998 LECTURE

Friday Evening Program
GSOC Guest Lecturer : Kenneth M. Cruikshank, of PSU's Geology Department
Formal Title of Lecture: "The 1996 Royse Debris Flow, Dodson, Oregon"
Unofficial Subtitle: "Well, honey, you finally got that rock garden you wanted".

About Our Speaker: Dr. Cruikshank received his PhD from Purdue University in 1991 in the area of geomechanics. He joined the faculty at PSU in 1994 after post-docs at Purdue and Stanford. Dr. Cruikshank's area of research interest is geomechanics, and he has worked on numerical modeling of folding, fracturing, and debris flows.

The following abstract was supplied directly by Dr. Cruikshank:

In February 1996 a group of debris flows cascaded into the Columbia River Gorge communities of Dodson and Warrendale about 55 km east of Portland, Oregon. The flows covered Interstate 84 and swept a freight train off its tracks. The Interstate was closed for five days. The combined volume of the flows has been estimated to be between 740,000 and 1,150,000 m3. One group of debris flows inundated the residence of Carol and Hersh Royce. A 650-m long stretch of the Royce debris flow from where it was confined to a single channel to near the flow terminus has been mapped at a scale of 1:250. The mapping of this recent debris flow gives some insight into how the flow behaved and on the development of levees and other features.

The Royce flow left an unusually boulder-rich deposit. Boulders up to 90 tonnes were transported. Only a few boulders were split or have large chips, suggesting that large volumes of muddy debris lubricated the flows. Much of the interstitial mud has been removed by subsequent rain and stream flow. There is a thin film of mud between the boulders where they are in contact.

Many of the boulders are marked by striations with different orientations. Striations on *in situ* boulders tend to be unidirectional and indicate the flow direction. At bends in the main channel the debris exited the channel and formed a new debris channel flanked by levees. Near the upstream end of the map the main channel splits into two parallel channels which coalesce into a single debris apron around the Royce household.

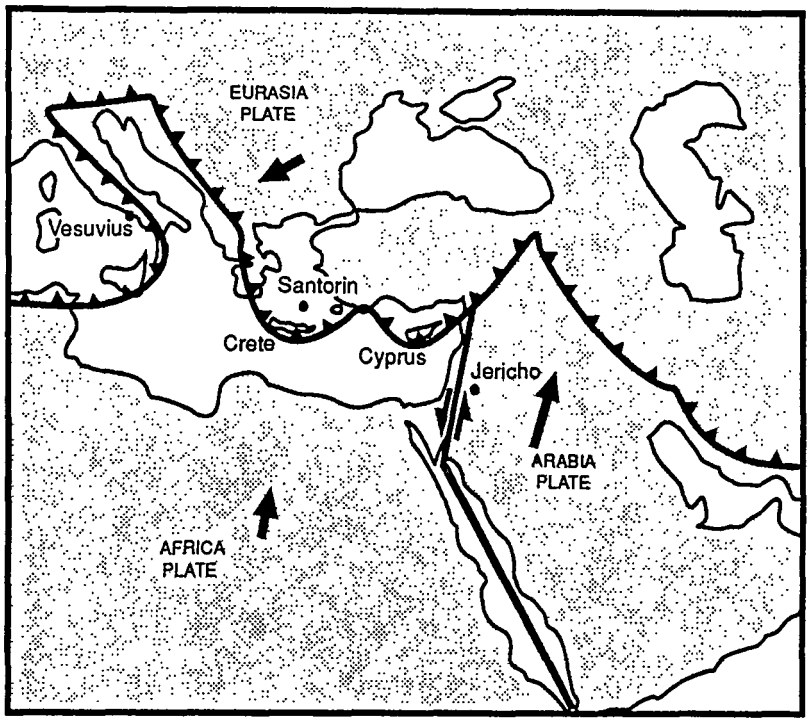
Of the two debris flow channels, only the channel containing a creek shows any evidence of erosion. Levee position and size were partially controlled by levees from older flows and tree jams. Within the main channels levee-like features formed downstream on either side of large boulders that were restrained by tree stumps.

ABSTRACT For:
MAY 8, 1998 LECTURE
Friday Evening Program

How Plate Tectonics Set the Stage for Civilization in the Eastern Mediterranean

by George W. Moore

Department of Geosciences,
Oregon State University,
Corvallis, OR 97331



The plate-tectonic collision between Africa and Europe had led to approximately the present geography by the time big-brained humans arrived, first the Neanderthals 300,000 years ago, then modern humans 50,000 years ago. Before the humans, during the Age of Dinosaurs, an equatorial "Gulf Stream" from south of Asia had swept into the Pacific and warmed the globe. But then India collided at the Himalaya, and after that Australia moved north to close the remaining gap, and the Earth entered a period of deepening refrigeration.

Minor variations in sunlight hitting the Earth then became critical. They were chiefly caused by the 20,000-year top-like gyration of the spinning Earth, and the 100,000-year hula-hoop rotation of the Earth's solar orbit. These worked together to produce 100,000-year glacial-interglacial stages, each of which gradually became colder during 20,000-year substages, then rebounded abruptly. The Neanderthals lived during the last three glacial-interglacial stages, and modern humans were fully dispersed during the final glacial maximum.

At that time, sea level was as much as 127 meters below its present level, owing to the enormous volume of water tied up in continental ice sheets. Then the rebound came, and the sea rose about 1 meter every 100 years for more than 10,000 years. This flooding swept the hunter-gatherer humans ever higher and prevented them from establishing permanent coastal settlements. At about 4,000 BC, however, the easily melted glacial ice was exhausted, and sea level stabilized. Soon, coastal villages became established, then cities, and finally the trade and culture that we associate with civilization.

The advancing civilizations were next affected more intimately by plate-tectonic processes. A plate boundary that festoons through the eastern Mediterranean had created mineral deposits that fueled art and industry. Cyprus is a seafloor island uplifted where Africa and Europe collide. Erosion there has exposed seafloor pillow lava

rich in copper formed at black smokers like those off the coast of Oregon. That copper, combined with tin from granite flanking the Red Sea, provided the raw material for the Bronze Age.

But the beneficial products of plate tectonics, including the metals and the Persian Gulf's petroleum, are countered by two of civilization's greatest terrors—earthquakes and volcanoes. The great plate boundary that courses through the Mediterranean and underlies its adjacent mountains has caused endless disasters. An earthquake likely toppled Jericho's walls and also the bronze Colossus of Rhodes, which stood only 50 years, then lay on the ground for the next 800 years, to be marveled at as one of the Seven Wonders of the World.

Converging tectonic plates shear together at an inclined boundary—a subduction zone. Metal-producing uplifted areas, such as Cyprus, lie on the upper plate close to where the boundary intersects the surface of the Earth. A line of volcanoes marks the surface somewhat farther from the boundary. These volcanoes seem to be caused by water in material carried down on the lower plate into the subduction zone. The water lowers the melting temperature of superheated rock at the base of the upper plate, and melted rock then rises toward the volcanoes.

Such volanism has been devastating in the Mediterranean region. Ash form Vesuvius buried the Naples suburbs of Pompeii and Herculeum under 6 meters of ash. Earlier, Santorin Volcano north of the Island of Crete exploded catastrophically, ravaging nearby islands and sending out a tsunami that destroyed coastal cities around the Aegean Sea, including Crete's Minoan capital of Knossos.

Indeed, people of the eastern Mediterranean, more than at most places, still need to have measures in place to protect from the hazards of plate tectonics—from earthquakes, volcanoes, and tsunamis.

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Summary of a Previous Lecture:

"Hydrology of the Upper Deschutes Basin,"
by Marshall Gannett,
USGS Water Resources
Held on Friday Evening, April 10, 1998

At the Friday evening, April 10th GSOC meeting, Marshall Gannett of the Water Resources Division of the US Geological Survey (USGS) in Portland presented a status report on research currently being conducted jointly by the USGS and the Oregon Department of Water Resources in the Upper Deschutes Basin.

The Upper Deschutes Basin, which includes the cities of Madras, Redmond, Bend, La Pine, Sisters, and Prineville, is experiencing rapid urban, rural, residential, and commercial development. The surface water resources within this basin are fully appropriated and closed to further development. This means that current and future development will depend on groundwater to supply water needs.

A major concern being addressed by the study is the long-term result of groundwater decline and its effect on surface waters. Obviously, since surface waters are fully appropriated, granting further permits for groundwater use may adversely effect the surface water discharge.

A secondary question deals with canals that are used to divert surface water for irrigation. Because these canals are currently not lined with impermeable materials, they leak. Significant amounts of water are lost for irrigation but also appear to leak back into the water table. Would lining these canals so they stop leaking alter the hydrology of the basin?

The groundwater recharge areas of the basin lie along the west side of the basin in the Cascades, where precipitation is extremely high. The aquifers are within the Deschutes Formation, consisting of ash-flow tuffs, sediments, and lava flows, which lies above the impermeable John Day and Clarno Formations. The groundwater flows away from the Cascades and then to the north. Surface water losses in the southern portion of the basin are replaced by recharge of surface waters near Pelton Dam, north of Madras, where the groundwater table intersects the Deschutes River. Surface waters here have a five-fold increase in discharge. This intersection also accounts for the numerous springs northwest of Madras. Opal Springs by itself accounts for a third of the discharge at that point.

The study shows that the annual drawdown by irrigation is replaced in the off season by recharge of the groundwater, whose level is a function of 11-year climate cycles. The groundwater levels are also affected by the amount of water leaking from canals. In addition, the study shows that the response time to an increase in precipitation in the recharge area is approximately two years.

In general, the groundwater responds quickly to recharge from precipitation. This sensitivity to precipitation means that the groundwater also vulnerable to a long-term drought. Also, the high volume of groundwater flow throughout the region appears to provide enough dilution to avoid contamination of groundwater by septic tanks.

A computer model of the basin hydrology has been developed to show in what direction and how rapidly water moves through the basin. This model can be used to predict the effects of further permitting of groundwater use and of lining irrigation canals.

--Summary by Richard Bartels and Beverly Vogt

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Geological News Clipping

SURF And TURF Battle in WA. The wisdom of "beach armoring" is finally being publicly questioned in the state of Washington. Beach armoring refers to human attempts to halt beach erosion by such artificial means as constructing rock seawalls. Washington State does not legally prohibit beach armoring. At least five states—Oregon, North Carolina, South Carolina, Maine, and Rhode Island—do have such legal prohibitions or curtailments.

At issue is an 850-foot-long, 15-foot high rock seawall, erected in October 1996, at the mouth of Gray's Harbor in Southwest Washington to protect a row of condos on the beach of Ocean Shores. State regulators, environmentalists, and a national beach erosion expert believe that armoring destroys beaches for the public, are costly, and increase beach erosion.

Duke University geology professor, Orrin Pilkey wrote a 1997 study entitled, "Management of Washington's Ocean Beaches: A Banana Republic Approach?" which criticized the "Newjersey-ization" of SW Washington Beaches.

--News Source: *The Columbian*, April 12, 1998, Page B2

COMING ATTRACTION!!!

The Geological Newsletter is pleased to announce that our June issue will feature Paul Hammond's article, "Fifes Peaks Volcano, Southern Washington Cascade Range—A Rock Climber's Challenge". This article was previously published in Mazama Annual. GSOC has received permission for next month's reprint. Fifes Peaks Volcano was one of the geological areas visited and studied on the 1997-98 President's Campout. We are sure that our readers will greatly enjoy this article.

JUN 98

THE GEOLOGICAL NEWSLETTER

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

GSOC

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ACTIVITIES:

ANNUAL EVENTS: President's Field Trip--Summer or Fall; Picnic—August; Banquet—March; Annual Meeting—February. **FIELD TRIPS**: Usually one per month, private car, caravan, or chartered bus. **GEOLOGY SEMINAR**: Fourth Wednesday, excluding June, July, August, and holidays, 8:00 p.m., Rm. S17, Cramer Hall, PSU. GSOC Library: Rm. S7, Open 7:30 p.m. prior to meetings.
PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm 383, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: Usually First Friday monthly except June, July, August, and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Suggest time and date be verified by phone: 235-5158 or 221-0757. **MEMBERSHIP**: per year from January 1: Individual-$20.00; Family-$30.00; Junior (under 18)/Student-$10.00
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VISITORS WELCOME AT ALL MEETINGS
INFORMATION: Beverly Vogt, 292-6939
Evelyn Pratt, 223-2601

VOL. 64, No. 6
JUNE 1998

JUNE ACTIVITIES

THURSDAY, June 4: Field Trip to Centralia Coal Mine, Centralia, WA

Leader: GSOC President Beverly Vogt

Meeting place & time: 10:30 AM in coal mining parking lot, Centralia

Directions: Take I-5 north to Centralia.

Take exit 82; drive west on Harrison to 2nd stop light at Johnson Rd.
Turn right onto Johnson Rd.; go 4 blocks.
Turn right onto Reynolds Rd.; go 1.4 miles to N. Pearl.
Turn left onto N. Pearl; go 2.8 miles to Big Hanaford Rd.
Turn right onto Big Hanaford; go ~4.5 miles to coal mine (about 1/4 mi. past steam plant).
PARK in coal mine parking lot. (If no spaces are available, ask inside.)

Tour time: about 1 1/2 hours

For more information or to carpool: Call Bev Vogt, 503-292-6939, or call Rosemary Kenney, 503-221-0757

FRIDAY EVENING MEETING: Rm. 371 Cramer Hall, PSU

June 12, 8:00 PM: The 1996 Royse Debris Flow, Dodson, Oregon
Dr. Kenneth Cruikshank, Professor of Geology, Dept. of Geology
Portland State University, Portland, OR

NO NOON MEETINGS OR WEDNESDAY SEMINARS UNTIL SEPTEMBER

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Next Month: FRIDAY EVENING MEETING: July 10, 8:00 PM - Sand Dunes of Oregon by Frank Reckendorf, Engineering Geologist

FIELD TRIP: July 11 - Buried Forests of Mt. Hood, led by Ken Cameron, DEQ

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Calendar items MUST be given to Evelyn Pratt by the 15TH of the month. 223-2601

ANNOUNCEMENTS

President's Campout To Be Held October 11-17 at Camp Hancock, Central Oregon

The 1998 President's Campout will be at the Oregon Museum of Science and Industry's **Camp Hancock** on **October 11th** through the **17th**. Attendees will stay in A-frame dormitories at the camp and learn about the geology of central Oregon, study paleontology, collect fossils, collect rocks, and take tours to areas with interesting geology. There will also be opportunities for birdwatching, astronomy, and lapidary work.

The group will leave by bus on Sunday morning, October 11, and return to Portland on the afternoon of October 17. The cost of campout is **$500**, based on registration of 20 people. If more attend, the cost will go down, and refunds will be given to participants. The cost includes bus transportation, tip to bus driver, lodging at Camp Hancock, all meals, and field trip guide.

The accommodations at Camp Hancock are A-frame dormitories with electricity. Bathrooms are in the adjacent building with hot and cold running water, flush toilets, and hot showers. Because we will be sleeping in bunks with mattresses but no bedding provided, be sure to bring a sleeping bag, pillow, towel and washcloth, soap, and flashlight.

People interested in attending should contact Phyllis Thorne (503-292-6134) as soon as possible, but definitely before July 15. Payment for the Campout should be in the form of two checks, one for $204 payable to OMSI, the other for $296 payable to Raz Transportation Co.

The two checks should be sent by mail to: Geological Society of the Oregon Country, Field Trip, PO Box 907, Portland, OR 97207-0907. **The checks must be at the GSOC Post Office Box no later than July 31**. If there are any questions, contact:

Phyllis Thorne (503-292-6134),
Rosemary Kenney (503-221-0757), or
Beverly Vogt (503-292-6939).

WELCOME NEW MEMBERS!

Gerald & Jacqueline Painter

Thomas & Vivien Holeman

Mary Grafton Kirkendall

Donald Gidney

Tom & Diane Gordon

ELECTRONIC CALENDAR

In addition to *The Geological Newsletter* sent via U.S. Mail, GSOC is happy to announce that an electronic form of our *Calendar* can be e-mailed to you at no additional cost. Our May *Calendar* was sent by Evelyn Pratt to those few e-mail addresses she had. If she doesn't have your e-mail address, please send it to her electronically at: **Ralf70@aol.com** We encourage our members who have an e-mail address, to take advantage of this additional option. It will help us to get information to you in a timely fashion. We do our best to publish the Newsletter promptly, however, our bulk mail can be delayed at the post office. We at GSOC will respect your cyber privacy and will treat your e-mail addresses with discretion. -- M.A.

Fifes Peaks Volcano, Southern Washington Cascade Range—A Rock Climber's Challenge

by Paul E. Hammond

The author received Mazama Research support in conducting this study.

"A complex area of craggy boulder-studded spires and sharp pinnacles, resembling citadels" is how Beckey[1] described the climbs at Fifes Peaks (Figures 1 & 2). These prominences rise to elevations of 6,375 to 6,917 feet with cliffs of 600 to 1,000 feet. They are erosional remnants of the rubbly filling of a deep caldera, about 4 miles in diameter, which once nested in this large 25-million year old (early Miocene) volcano. Imagine the caldera at Crater Lake, Oregon, filled to its rim with rubbly lava flows, then eroded deeply over time by streams and glaciers. The resulting landforms would be pinnacles like those at Fifes Peaks.

Location Fifes Peaks volcano is located 25 miles eastnortheast of Mount Rainier and 45 miles northwest of Yakima on the eastern slope of the Cascade Range, where it is breached by the American River tributary of the Naches River and Washington State Highway 410 (Figure 3). It lies partly in the Norse Peak Wilderness Area within the Wenatchee National Forest.

Dimensions The volcano, at 6,917 feet elevation, was a broad, low-profile stratovolcano, resembling a shield volcano, about 2,000 feet high, covering an area of about 175 square miles. (Mount Rainier covers about the same area.) Fifes Peaks is composed chiefly of lava flows of andesite and basalt and minor amount of tuff (consolidated volcanic ash) deposits. (The interested reader should consult the article by Wise[4] in the 1964 *Mazama* on the characteristics of volcanic rocks in the Cascade Range.) Its caldera is elongated to the northeast, covers an

Figure 1. East Peak and spires from ridge above Miner Creek. Compare with drawing in Beckey.[1] Photo by P.E. Hammond.

area of about 40 square miles, and is filled to a maximum exposed depth of 2,800 feet (below the elevation of the basal lava flows of the volcano; Fig. 3 & 4).

Construction of Fifes Peaks Volcano This volcano was constructed in three stages. The first, or apron, stage was the build up of low-dipping, long lava flows and interbeds of tuff to a height of about 1,500 feet, surrounding a probable low central cone of ash, cinders, and rocks. These deposits constitute the **apron** of the volcano (Figures 3 &4).

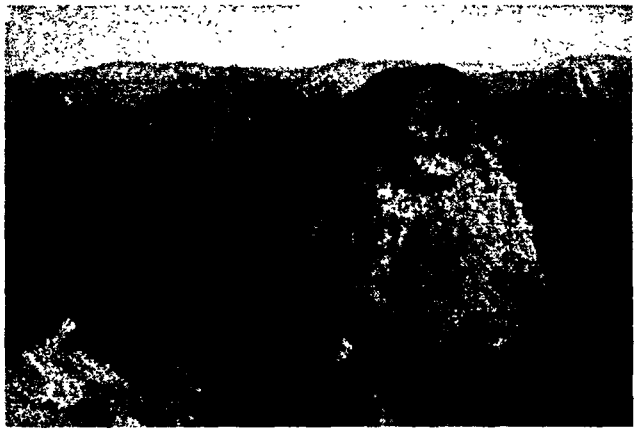

Figure 2. View of West, East, and Far East Peaks (after Beckey[1]) from the Northwest. Photo by P.E. Hammond.

The second, or coring-out, stage was a series of strong explosive (**coring out**) eruptions at several vents, which created deep craters and destroyed

the cone. Caving of their walls caused the craters to enlarge and coalesce to form the caldera. Coring-out eruptions were probably caused by accumulation of water within the volcano. Here water converted to superheated steam greatly augments the explosive power of volcanic eruptions, as shown in the Mount St. Helens eruption of May 18, 1980. Successive replenishes of magma eventually sealed off water from the conduits feeding the volcano, and the eruptive activity returned to a less-explosive, chiefly lava-emitting eruptive mode. (A cored-out caldera differs significantly from a collapse caldera like Crater Lake. In a collapse caldera a tremendous explosive eruption evacuates a deep-lying large magma [hot, molten rock] body, resulting in collapse of the crustal roof rocks.)

The third, or caldera-filling, stage consisted of lava-extruding eruptions, from several vents in and peripheral to the caldera, which filled the caldera to overflowing with rubbly lava flows and tuff. These deposits compose the caldera-fill. Several occurrences of thin-bedded lake beds occur within the fill deposits, indicating that lakes occupied the caldera at times. Most caldera fill consists of 600 to 1,000-foot thick beds of massive lithic (rock-bearing) breccia (unsorted angular to rounded fragments in a sandy matrix). This type of deposit forms the southwest spires and pinnacles (Figures 1 & 2) and the north cliffs (Figures 3, 4, & 5). Movement of water through the breccia caused chemical reaction between matrix and rock, in a process of silicification, which cemented the breccia to be strongly resistant to erosion, although "brittle rock" as noted by Beckey[1]. Lavas which overflowed onto the apron are generally thin and platy jointed, although at least two thick andesite lavas descended the north slope of the apron and are preserved at Raven Roost.

Dikes and sills Abundant dikes and sills cut through lava flows and tuff interbeds, as well as breccia of the caldera-fill deposits. Dikes range from 2 to 60 feet in width; sills are up to 100 feet thick. Many dikes occur in the area of the southwest spires and

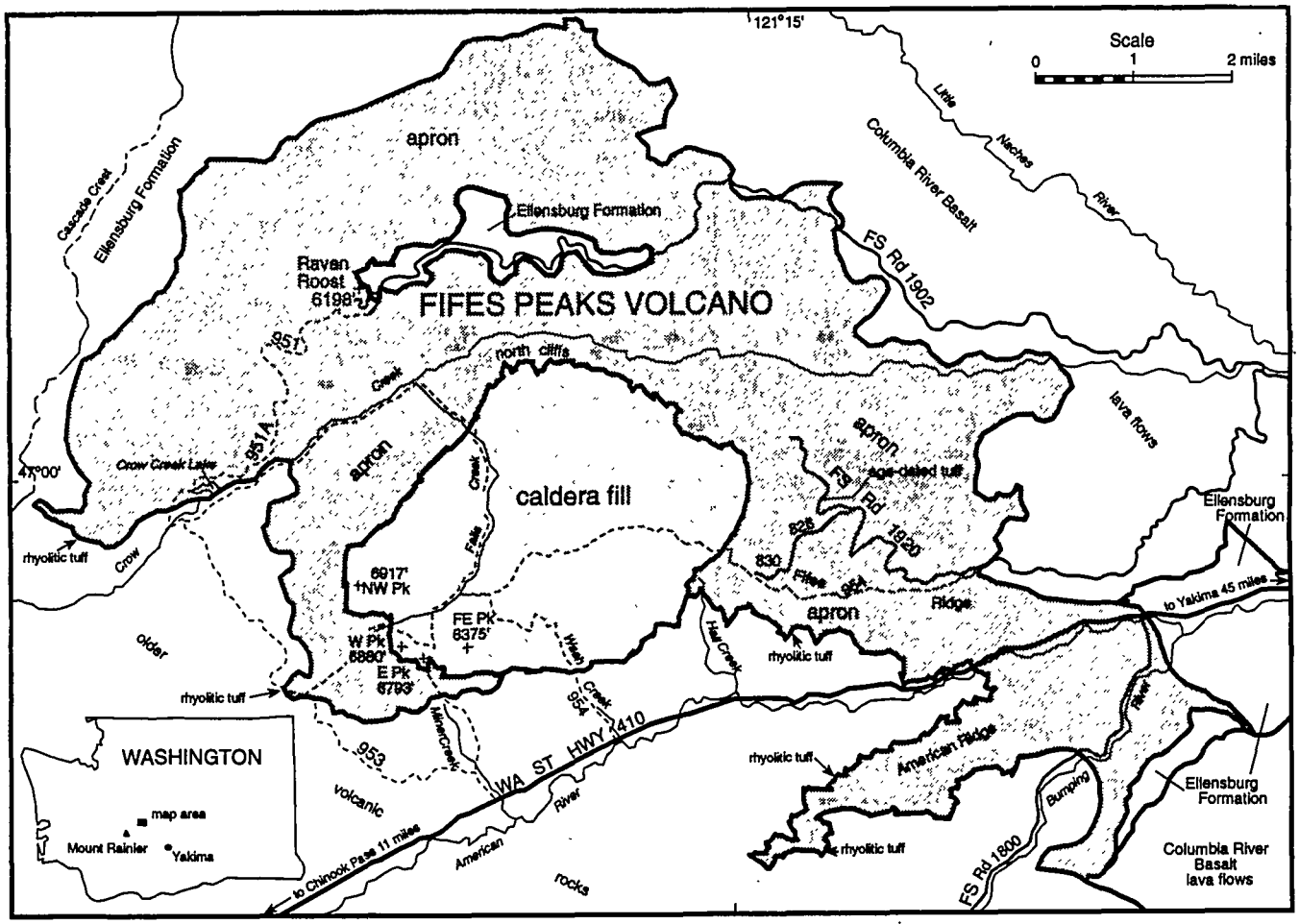

Figure 3. Map showing outline of Fifes Peaks volcano, its apron and caldera-fill deposits, and access roads and trails. E Pk, East Peak; FE Pk, Far East Peak; NW Pk, Northwest Peak; W Pk, West Peak (after Beckey[1])
Sketch by P.E. Hammond.

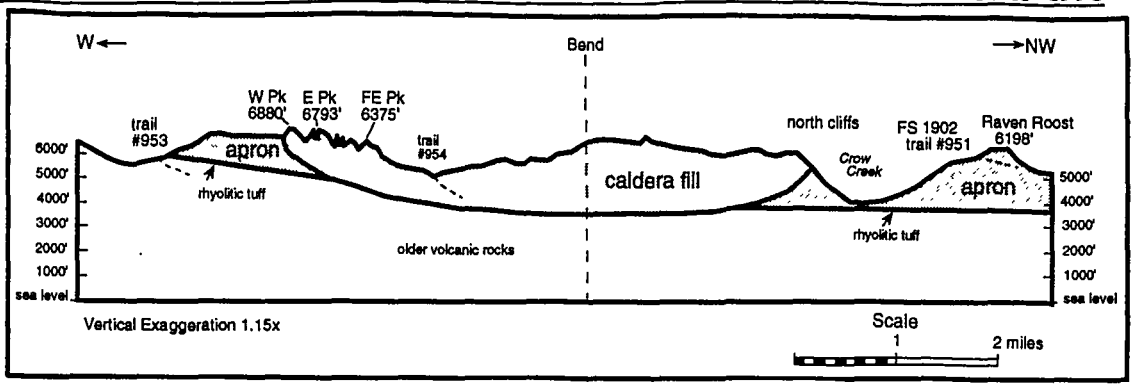

Figure 4. Schematic cross section through Fifes Peaks volcano, showing structure and rock climbing areas. Note bend and directions of section. Same abbreviations as in Figure 3. Sketch by P.E. Hammond

pinnacles. Several dikes can be seen in the eastern caldera fill leading into sills.

Age and Duration of Volcanic Activity Age of a rhyolitic tuff underlying the volcano is 27 million years; a 5-foot thick white pumice bed near the top of the apron, located along Forest Service Road 1920 on the east flank of the volcano, is 26 million years old[2,3], indicating that the apron of the volcano was built within 1 million years. Lack of evidence of a weathered, soil-bearing surface within the volcano indicates that eruptive activity was intermittently active, separated by intervals of several 100 to a few 1,000 years. At present it is not known how long the volcano remained in the coring-out eruptive and caldera-filling stages. The best bet is that the caldera was filled within 1 million years, and the life of the volcano was little more than 1 million years. Few if any present Cascade volcanoes were active for 1 million years; most are less than 500,000 years old.

Subsequent Erosion and Partial Burial Uplift of the Cascade Range in the last 10 million years has tilted the volcano about 10° to the northeast. Subsequent erosion has completely stripped the west and south flanks of the volcano, exposing older volcanic rocks. Erosion has also cut wide valleys in the north and east flanks of the volcano. These are filled with volcanic and sedimentary deposits of the Ellensburg Formation and covered by several lava flows of Columbia River Basalt, which lap onto Fifes Peaks volcano (Figure 3).

Significance of this Volcano Because of its deep dissection, well-exposed rocks, and ready access, study of Fifes Peaks volcano was undertaken to determine the construction of a stratovolcano, its size, how distant its deposits extend, and if this older volcano differs from the present volcanoes in the Cascade Range. Recognition of deposits in the construction of this volcano also aids in mapping volcanic deposits elsewhere in the range. Perhaps, most importantly, the study reveals that stratovolcanoes can undergo catastrophic eruptions to form calderas. Consequently, these volcanoes are to be respected.

Access A series of trails give access to the caldera fill (Figure 3). Fifes Ridge Trail #954, beginning at Wash Creek from Highway 410 or atop Fifes Ridge off Forest Service Road 1920, traverses through the eastern caldera fill and atop the east apron of the volcano, giving spectacular views of the volcano and surrounding landscape. A spur trail from #954 descends to a campsite at Falls Creek. From here a poorly marked and rarely used trail heads southwest to the steep valley slope, and switchbacks sharply to the base of the cliffs, from where climbing begins. From here the trail contours westward into upper Falls Creek basin, giving access to West and Northwest Peaks. A second trail, Crow Lake Way #953, beginning at Highway 410, gives access to the western edge of the volcano and the cliffs and spires of the caldera fill. Branching from this trail at Miner Creek is a crudely marked climber's trail, ascending the ridge to the east, to the base of East Peak1. The north cliffs of the caldera can be accessed via a hunter's trail from Crow Creek, or by descending into Crow

Figure 5. North cliffs as seen from Raven Roost. Photo by P.E. Hammond.

Creek Valley from Raven Roost. I know of no ascent of the cliffs; it would be a shady climb on a hot summer day. From the mouth of Falls Creek one can continue south via a series of disconnected elk trails to the campsite mentioned above.

References

[1]Beckey, Fred, 1987, 2d ed., *Cascade Alpine Guide, Climbing and High Routes, Volume 1: Columbia River to Stevens Pass:* The Mountaineers, Seattle, WA, 327 p.

[2]Hammond, P.E., Brunstad, K.A., and King, J.F., 1994, Mid-Tertiary Volcanism East of Mount Rainier: Fifes Peaks Volcano-caldera and Bumping Lake Pluton-Mount Aix caldera, v. 2, ch. 2J, p. 2J-19, *in* Swanson, D.A., and Haugerud, R.A., eds, Geological field trips in the Pacific Northwest: 1994 Geological Society of America Annual Meeting, Seattle, Washington.

[3]Vance, J.A., Clayton, G.A., Mattinson, J.M., and Naeser, C.W., 1987, Early and middle Cenozoic straigraphy of the Mount Rainier-Tieton River area, southern Washington Cascades, *in* Schuster, J.E., editor, Selected Papers on the Geology of Washington: Washington Division of Geology and Earth Resources Bulletin 77, p. 269-290.

[4]Wise, W.S., 1964, A guide to volcanic rocks of the Cascade Range: *Mazama*, v. XLVI, no. 13, p. 23-35.

The article's author, Dr. Paul E. Hammond, professor emeritus of geology at Portland State University, was the leader of our 1997 President's Campout, which included a geological tour of Fifes Peaks.

Our readers may find it interesting to note that Dr. Hammond was mentioned and quoted in *The Sunday Oregonian*, May 10, 1998, A15, in the article entitled "Many scientists join Robinson in global-warming skepticism". Dr. Hammond stated his concern regarding the difficulty of separating human-caused conditions from natural conditions in global-warming studies.

IN MEMORIAM

Virgil Scott, a long time member of GSOC, died April 28, 1998. He was born on November 28, 1904, in Elgin, Oregon. Virgil spent most of his childhood in Northeastern Oregon in the towns of Elgin and Joseph and on Smith Mountain where a family-owned sawmill was operated for several years. Virgil graduated from Oregon Agricultural College, now known as Oregon State University, in Corvallis, Oregon, in 1929, with a degree in electrical engineering. After working for Pacific Power and Light Company briefly, he returned to school to get a teaching certificate. He spent several years as a teacher and administrator in public education prior to working with Portland General Electric. He retired from PGE in 1972 after 31 years with the company. Virgil married Winifred Zylstra in 1929, who died in 1975. He then married Freda Whitley in 1983. His family always came first. What was important to Virgil was reflected through the lends of his camera. He was a member of Oregon Color Slide Club and won many awards. He loved geology and was an active member of the Geological Society of the Oregon Country. He climbed all the peaks in the Wallowa Mountains and to the top of Mt. Hood. He was a master woodworker and carpenter; his patience and skills led to quality craftsmanship. He is survived by his widow Freda, two daughters and many friends. He will be missed by GSOC.

(Excerpts included from the eulogy given by Scott Rasmussen at the memorial service)

-- Rosemary Kenney

DINO TOUR '98

Don Barr provided *The Geological Newsletter* with information regarding a July 11-19, 1998 trip which includes tours of Dinosaur Provincial Park near Brooks, Alberta and the Burgess Shale of Yoho National Park, near Field, British Columbia. Rosemary Kenney has the price list and itinerary. For direct information e-mail: PBobra@mcd.gov.ab.ca For Booking call: 1-888-440-4240 [Toll Free in Canada and the U.S. (excludes Alberta) 310-0000, then 823-7707]

JUL 98

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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THE GEOLOGICAL NEWSLETTER

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ACTIVITIES:

ANNUAL EVENTS: President's Field Trip--Summer or Fall; Picnic—August; Banquet—March; Annual Meeting—February. **FIELD TRIPS**: Usually one per month, private car, caravan, or chartered bus. **GEOLOGY SEMINAR**: Fourth Wednesday, excluding June, July, August, and holidays, 8:00 p.m., Rm. S17, Cramer Hall, PSU. GSOC Library: Rm. S7, Open 7:30 p.m. prior to meetings.
PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm 383, Cramer Hall, PSU, SW Broadway at SW Mill St., Portland, Oregon. NOON: Usually First Friday monthly except June, July, August, and holidays, usually at noon, Multnomah County Library, 801 SW 10th Ave., Portland. Suggest time and date be verified by phone: 235-5158 or 221-0757. **MEMBERSHIP**: per year from January 1: Individual-$20.00; Family-$30.00; Junior (under 18)/Student-$10.00
PUBLICATIONS: THE GEOLOGICAL NEWSLETTER (ISSN 0270 5451), published monthly and mailed to each member. Subscriptions available to libraries and organizations at $10.00 per year. Individual Subscriptions $13.00 per year. Single Copies: $1.00. Order from:

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THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY
P.O. BOX 907, PORTLAND, OR. 97207

VISITORS WELCOME AT ALL MEETINGS
INFORMATION: Beverly Vogt, 292-6939
Evelyn Pratt, 223-2601

VOL. 64, No. 7
JULY 1998

JULY ACTIVITIES

FRIDAY EVENING MEETING: Rm. 371 Cramer Hall, PSU

July 10, 8:00 PM: Sand Dunes in Oregon
Frank Reckendorf, engineering geologist, expert on soils and coastal processes

FIELD TRIP to MT. HOOD'S BURIED FORESTS

Leader: GSOC President Beverly Vogt
Guest expert: Ken Cameron, DEQ, formerly USGS
Meeting place & time: Saturday, July 11, 8:00 AM; SW corner of Cramer Hall, SW Mill St. & SW Broadway at PSU.
Trip description: Ken will take us to several sites around Mt. Hood to see ancient forests buried by mudflows and pyroclastic flows. He'll distribute copies of his Oregon Geology article (3/91) on the buried forests. There'll be some walking, but no long hikes.
What to bring: Boots, rain gear if appropriate, lunch, drinking water, camera.
Time: Tour will end at Timberline Lodge around 3:00 PM.
For more information: Call Beverly Vogt, 503-292-693, after June 29.

NO NOON MEETINGS OR WEDNESDAY SEMINARS UNTIL SEPTEMBER

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Next Month: ANNUAL PICNIC will be held Friday evening, August 14 from 6-9 p.m. at Alpenrose Dairy. The Picnic is a Potluck!

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Please submit calendar items to Evelyn Pratt by the 15TH of the month. 223-2601

Marlene sincerely apologizes for any inconvenience encountered from the delay in your receipt of the July Calendar and Newsletter.

Now is the Time to Sign Up for The President's Campout October 11-17 at Camp Hancock, Central Oregon

The 1998 President's Campout will be at the Oregon Museum of Science and Industry's Camp Hancock on October 11th through the 17th. Attendees will stay in A-frame dormitories at the camp and learn about the geology of central Oregon, study paleontology, collect fossils, collect rocks, and take tours to areas with interesting geology. There will also be opportunities for birdwatching, astronomy, and lapidary work.

The group will leave by bus on Sunday morning, October 11, and return to Portland on the afternoon of October 17. The cost of campout is based on the number of people attending, because the cost of the bus has to be covered. The cost will be $500 if at least 20 people register. If more register, the cost will go down, and refunds will be given to participants. If fewer than 20 participate, the cost may be higher. The cost includes bus transportation, tip to bus driver, lodging at Camp Hancock, all meals, and field trip guide.

The accommodations at Camp Hancock are A-frame dormitories with electricity. Bathrooms are in adjacent buildings with hot and cold running water, flush toilets, and hot showers. Because we will be sleeping in bunks with mattresses but no bedding provided, be sure to bring a sleeping bag, pillow, towel and washcloth, soap, and flashlight.

People interested in attending should contact Phyllis Thorne (503-292-6134) as soon as possible, but definitely before July 15 so that the exact cost of the trip can be determined. Payment for the Campout should be in the form of two checks, one for $204 payable to OMSI, the other for $296 (or more or less, depending on the number of participants) payable to Raz Transportation Co. The two checks should be sent by mail to: Geological Society of the Oregon Country, Field Trip, PO Box 907, Portland, OR 97207-0907. The checks must be at the GSOC Post Office Box no later than July 31. If there are any questions, contact Phyllis Thorne (503-292-6134), Rosemary Kenney (503-221-0757), or Beverly Vogt (503-292-6939).

Apology for Late July Calendar and Newsletter

I would like to extend my sincerest apology for the lateness of this month's Calendar and Newsletter. Its lateness is due soley to me, the Editor, Marlene Adams. All I can say is that June was a terribly crazy month for me, and I was not able to get out this edition as I had earlier planned. As I hand in this copy to Cecelia Crater and her helper for copying and mailing, it is my sincerest hope that **The Geological Newsletter** reaches you in time for your personal notification of July events and deadlines. I hope that no inconvenience to you occurs from this untimeliness of mine.

-- Marlene Adams

GSOC GOES FOR THE GOLD: QUARTZVILLE MINING DISTRICT FIELD TRIP

by Evelyn Pratt

On Saturday, May 16th, 36 field-trippers braved near-freezing rain to meet on Highway 20 six miles east of Sweet Home. Here an access road follows Quartzville Creek north through steep, heavily timbered ridges. The mineral geology of this area has been a life-long specialty of our guide, DOGAMI retiree **Jerry Gray**.

He pointed out that Roseburg is about in the middle of where faults associated with the pulling apart of the earth's crust in the Basin and Range Province to the east meet faults and folds resulting from subduction plate compression on the west. Magma rises and ground water circulates through this complex array of faults. The district's bedrock is a combination of Oligocene to Miocene volcanic flow rocks and scattered intrusives. Small stocks, dikes and plugs have aureoles of heat-altered rock around them. Many veins follow faults and shear zones in these areas, and this is where mineral searches have been conducted. Probably the most famous of these sought-after minerals has been gold.

Most metals are deposited in hot water systems. Minerals such as gold and quartz precipitate out when the superhot solution they're in (a) cools; (b) contacts something such as limestone that changes its pH; or (c) suddenly loses pressure, such as when a head of steam builds up under a silica plug and blasts out the plug. Hydrothermal alteration in this area, as in most mining districts, has produced epidote, chlorite and pyrite at the edges; clay minerals farther in; and quartz and flakes of muscovite-type white mica in the center. The epidote and chlorite are responsible for both greenish and bluish rocks around here, and for the name of Green Peter Dam.

Jerry Gray spent six years locating emery in this area. Emery boulders were uncovered at the bottom of the river during construction of the dam. The source was traced 36 miles up the Middle Fork of the Santiam River. **Emery** is a valuable industrial mineral made of high-grade aluminum oxides, and is the result of high pressure, high temperature metamorphism. These aluminum oxides eventually break down to white **kaolin clay**, of which fine china is made. In one roadcut we picked up golfball-size lumps of kaolin from a steep scree slope mostly made of yellow-brown pyrite byproducts.

We stopped and collected specimens at a stone quarry where silicized tuff contained **pyrite** and **tourmaline**, indicating a highly mineralized area. Traces of silver have also been found here.

At another stop a basalt flow conformably overlay a lakebed. Thin layers, or laminae, of lake sediment were interbedded with ashfall and occasional fragments of current-carried, partly-consolidated sediments called rip-up clasts.

The only recent basalt lavas and pyroclastics in this area are near where Canal Creek flows into Quartzville Creek. On Canal Creek Road, a quarry with columnar

basalt marks a small intracanyon flow. One source was probably a "logpile" dike on the other side of the creek. 20 to 30 feet under the basalt flow are Dry Gulch gravels, which originate a few miles east. Water is channeled down this aquifer to Canal Creek. Across the road and downhill from the quarry, the water emerges and flows into the creek from many little springs comparable to Idaho's Thousand Springs in miniature.

Farther on we saw one of the few volcanic cinder cones that have been found this far west of the High Cascades. The cone is less than 10,000 years old - too young to have had anything to do with Quartzville mineralization. It's probably related to pull-apart Basin and Range action.

The last stop was at Muntz's mine. Here we scrambled up to a tunnel driven into rhyolite breccia cemented with quartz. The rock is hard, strong, and won't cave in, so the mine is one of the few in the district which is safe to enter. As an ore-mineral neophyte, I found the blind, spindly-legged cave crickets hanging on one wall at least as intriguing as the wall itself.

But gold is the lure that brought people here. Ore with free gold can be be ground up and separated from its matrix. Gold bound to sulfides must be chemically processed, which gets expensive. By 1900 commercial mining in this area had stopped. To be profitable today a company would need to take a minimum of a million ounces of gold out of the ground.

Individual prospectors still work Quartzville Creek and its tributaries, even though snowpack and runoff make it inaccessible much of the year. They look for yellow and brown colors, indicating reducing conditions in which metals can be deposited, rather than red, which shows that iron has oxidized. Even neophytes could see plenty of the right stuff along the Quartzville Creek road!

Not Just Gold in Them Thar Hills! Readers who are interested in minerals, mining, and related environmental issues, might want to refer to the June 23, 1998, Metro section of *The Oregonian*, pages B1& B8, for an interesting and informative article entitled "Prospective miner steps into minefield in Siskiyous".

Its not the glitter of gold which has attracted the attention of mining entrepreneur Walt Freeman to 4,000 acres of federal land in southern Oregon near the town of O'Brien, but the nickel and chromium valued in the stainless steel industry and found as pellets in the red-colored dirt of local ridges in the Siskiyou National Forest. These mineral-rich ridges are part of an unusual serpentine rock formation which was fractured off from the ocean sea floor and thrust over the coastal range more than 100 million years ago as the Pacific and North American tectonic plates met and subduction occurred. [This may sound familiar to many readers, especially those who attended the 1997 President's Campout and/or Richard Bartels' seminars.]

Being proposed to access the nickel and chromium are pit-mines, which would cover a total of some 35 acres, and go to a depth of 12 feet. The process would require the hauling off of about half the mineral-rich soil for smelting.

Opponents to this mining proposal voice various concerns.

Environmentalists fear possible adverse affects to a nearby unique botanical area, the 22,000 acre Rough and Ready Creek watershed. The chemicals produced by the mineral-rich soil kill off many common plants, but they do support a group of rare plants, such as the Port Orford cedar, the insect-catching pitcher plant, and wild orchids, that have adapted to them and thrived in this unique soil.

A practical objection to the pit-mining is that there are no longer any nickel smelters in the United States. Hence the feasibility of the entire process is in question.

The Oregonian article also discusses how 1872 federal law is used by mining entrepreneurs to exploit the mineral riches of federal lands. -- M.A.

Centralia Coal Mine Tour

by Marlene Adams

Our Thursday, June 4th field trip group may have been smaller in number than our May field trip group—we numbered only a dozen--but we were certainly a whole lot less soggy group! I.e., it wasn't pouring rain—just the usual cloudy skies with maybe a minuscule momentary drizzle. In other words, for early June, perfect Northwest weather. Plus, we were chauffeured around various parts of the mine in a company bus, treated to a very informative and entertaining talk by a coal mine geologist, and had great views of coal seams and coal mining operations. And yes, we all were given samples of coal at the end of the mine tour.

Here's just some of what we learned:

The Centralia Coal Mine of Washington state is an open-pit or strip coal mine. It is fully owned and operated by Pacific Power. 4.5 tons of coal are produced by this mine each year. All of it is burned in the neighboring 2-unit power plant, which is owned by Pacific Power and seven other companies.

This coal mine produces sub-bituminous C-grade coal, which is the lowest coal grade. Its just above lignite in quality. Its coal seams are found in the Skukemchuck Formation. The swamps that formed this coal existed 40-45 million years ago in the late Eocene. This was a near shore environment of surrounding sandy-siltstone to silty sandstone. Shells found in the area indicate a depth of less than 50 feet. Fossils of warm water shells and palm fronds also indicate that this was a warmer environment than that of the present. [Those tour members who went in the office may have noticed a glass case containing quite a few samples of fossils found in the mining area. As I recall, they were of mostly bi-valves and snails.]

Our guide informed us that all West Coast coals, from Northern California to Vancouver, B.C., dated from swamps of the late Eocene. He also pointed out that the

closer these beds were to mountain building activity, the better quality of coal ultimately produced. This seems quite logical, since the greater the pressure and the higher the temperature, the more compressed the coal and the better its quality and the higher its BTU [British Thermal Units or the measuring units used to express the heat or energy locked into the coal]. Some of the pressure and heat which compressed Centralia coal apparently occurred 16-17 million years ago, when these beds were folded and faulted. After the mine tour, we were able to examine geological maps of the area which indicate a double plunging syncline and the faults of the area, including the Coal Creek, Newaukum, and Kopiah faults. As a result of all this folding and extensive faulting, the mineable coal beds are separated from each other, resulting in coal mining occurring in discrete areas, rather than in one vast contiguous pit.

While the heat or energy content of coal, expressed in and commonly referred to as BTU, is important in determining how much electricity each ton of coal will produce, the sulfur content of coal is another major consideration. The higher the sulfur content of the coal, the greater the amount of sulfur dioxide will be produced upon its combustion, and, absent environmental intervention, the greater the amount of acid rain that will be released into the ecosystem.

It is the sulfur content of the coal found in the Centralia coal beds that will determine the future of both coal mining operations and the nature of power production at this site. By the year 2001, the Centralia power plant must meet new low sulfur emissions standards promulgated by the state of Washington. While Centralia coal is low in sulfur compared to much of the coal mined in the eastern part of the nation, it is not low enough to meet these new regulations.

There are various options that are being considered by the mine and power plant's owners and operator, which include: 1. Construction of coal scrubbers, which would chemically mix the sulfur dioxide in the flue gas with a neutralizing and alkaline reagent, such as limestone or ammonia; 2.Closure of Centralia Coal Mine and conversion of the power plant to natural gas burners; or 3. Closure of the coal mine and the power plant.

It is because of this environmental problem that the estimated remaining life of the Centralia Coal Mine was described to us as either 2-3 years or 30 years, depending on the decision. Five hundred people work at the coal mine.

We learned a lot and saw a lot, but I think most of us would agree that the highpoint of the show was watching the Walking Drag Line in operation. This mechanical critter was just huge. And somehow it managed to have a personality. We all just marveled as it gallumped along and lifted slightly above its new shoe. Maybe those long-legged gizmos in Star Wars were more imaginative, but I bet they wouldn't last a day in a coal mine!

AUG 98

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INFORMATION: Beverly Vogt, 292-6939
Evelyn Pratt, 223-2601

VOL. 64, No. 8
AUGUST and SEPTEMBER 1998

AUGUST ACTIVITY

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ANNUAL PICNIC will be held Friday evening August 14, 6:00-9:00 PM. We'll meet at Alpenrose Dairy, 6149 SW Shattuck Road. It's potluck - please bring food to share, and your own plates and silverware. (Tablecloths are a good idea, too.) Hot water will be provided.

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SEPTEMBER ACTIVITIES

Now that summer's finally started, it's almost time to think about fall!

As part of the 1998-1999 series of talks on the geology and the geological hazards of the Cascades, September's first speaker will focus on Mt. Hood.

Friday, Sept. 11, 8:00 PM: Geological History of Mt. Hood
Dr. Willie Scott, Cascade Volcano Observatory, Vancouver, WA
Rm. 371 Cramer Hall, PSU

Two timely presentations deal with the area we'll be exploring during the President's Campout October 11-17.

MONDAY, Sept. 14, 12:30 PM:
The John Day Country
Don Barr, past president.
Central Library, 801 SW 10th, U. S. Bank Room on first floor

WEDNESDAY, Sept. 23, 8:00 PM:
SEMINAR: Geology of the John Day Country
Richard Bartels, geology instructor and past president
Rm. S-17 Cramer Hall, PSU

Calendar items must be given to Evelyn Pratt by the 15TH of the month. 223-2601

Carol Thayer Cole: 1929-1998

We are very sorry to announce the death of friend and club member, Carol Thayer Cole. Carol was taken from us very suddenly with a heart attack on July 13, 1998. She was 68 years old.

Carol was born Dec. 11, 1929, in Bethlehem, Pa., and moved to Portland as an infant. Her maiden name was Thayer. She attended Washington High School and graduated from Miss Catlin's School for Girls. She received her bachelor's degree in education from Stanford University and her master's degree in English from the University of Minnesota. She taught elementary school in Lake Oswego and Minnetonka, Minnesota, and high school English in Klamath Falls. As her son Charlie said, "She was always the teacher."

Carol lived in New York City in 1953 and then in Minneapolis until returning to Portland in 1973. She had been a secretary and office manager since 1979. She was a member of the First Unitarian Church. In1952, she married John Peck Cole; they later divorced.

Survivors include her sons: Christopher T. of Morris, Minnesota., George S. of Menlo Park, California, and Charles K., of New York City; sisters: Betsy Gunther of San Juan Island, Washington, and Mary Melissa Simpson of Fairbanks, Alaska; and two grandchildren.

Carol Cole was a member of GSOC as well as other groups of special interest, such as the Audubon Society and the Oregon Archaeological Society. Carol enjoyed lectures, seminars, and field trips, and was quick to introduce herself to newcomers and to enjoy a visit with them. She served as Secretary on the GSOC Board.

A memorial service was held Saturday, July 18th, at the First Unitarian Church. Interment was in Bayview Cemetery in Warren.

-Subitted by friend, Cecelia Crater
Additional Source: The Oregonian

Passages from a Geology Amateur's Field Trip Notebook: July 11, 1998—Mt. Hood's Buried Forests

by Marlene Adams

Memorial Note: Carol Thayer Cole was an active participant in GSOC right up to the weekend before her death. In Rosemary Kenney's absence, Carol helped her close friend, Cecelia Crater put together and mail our July newsletter in late June. Carol attended the Friday, June 10th Lecture on Sand Dunes in Oregon and, as she related, enjoyed it greatly. She went on our Saturday, July 11th Field Trip to the Lost Forests of Mount Hood. I had the pleasure of meeting and talking with her on Saturday; both Carol and the day could not have been sunnier and brighter. It appears that Carol enjoyed a wonderful field trip on her last Saturday with us. She will be greatly missed, but her friends feel fortunate to have shared in her time on this good earth.

Our Expert Guide. It was great to be on a geology walk led by someone who has done such intensive and recent field work on Cascade volcanoes as Ken Cameron. Ken, formerly of the USGS, was one of the dedicated geologists who researched Mount St. Helens in the 1980's subsequent to its May

1980 eruption. He has also conducted professional geological studies of Mount Hood. Currently with DEQ, he has been working on the monitoring of sites polluted by toxic substances and materials.

General Information. The story of Mount Hood is, like many of the geological tales of the Pacific Northwest, one of very recent times. The mountain is Plio-Pleistocene in age and is technically composed of two different volcanoes, each apparently with a slightly different location for their main magma chamber and thus their main vent for lava eruptions. We can separate these two different volcanoes in time courtesy of a magnetic reversal event, which took place about 730,000 years ago. The remains of the older, "pre-Mount Hood", dating back to some 1.3 million years ago, can best be seen from Ramona Falls trail. The younger, present Mount Hood dates back to some 700,000 years ago and has continued into very recent times, having had three major eruptive periods in just in the last 2,000 years, during which time the eruptive center was located high on the southwest flank of Mount Hood near Crater Rock

[These younger and older volcanic centers of Mount Hood should not be confused with the far greater time and location differences between the present-day High Cascades and the older Western Cascades, which resulted from a regional shift in the location of a growing coastline and the subduction zone responsible for regional mountain building and volcanic activity. The Western Cascades snuffed out some 25 million years ago, while, as already mentioned, the High Cascades reach back a mere million or so years, and, as we all know, are still active into present times.]

The last three major eruptive periods of Mount Hood are known as: the Timberline eruptive period, 1,800 to 1,400 years before the present (ybp); the Zigzag eruptive period, 600 to 400 ybp; and the Old Maid eruptive period, starting at about 1760 A.D. and ending about 1810 A.D. It should be noted that due to the error ranges for each data point determined under radio-carbon dating, the age ranges for these three most recent periods are approximate, and some dating confusion or overlap for particular events is possible between the close-together Zigzag and Old Maid eruptive periods.

It was by our guide that different volcanoes can have different styles of eruptions, and that the style of eruption can change over time for the same volcano. For example, Mount St. Helens' eruptions are characterized by a lot of ash, while Mount Hood's recent major eruptions feature less a pasty lava and less ash. [It appears from my notes, that it was stated that Mount Hood's style of eruption changed some 120,000 years ago.] Crater Rock is the last dome produced by Mount Hood, resulting from extrusions of a pasty dacitic lava. Mount Hood is composed greatly of dacite, over an andesite base.

The eruptive style of Mount Hood during the past 2,000 years has been highly consistent, These eruptions would feature the extrusion of a viscous dacitic lava, which formed the composite dome known as Crater Rock. When snow was present, avalanches of hot rock would create snow-melt water and volcanic debris flow mixtures, known as lahars, which could travel over 50 miles. Hotter and gas-rich eruptions would result in pyroclastic flows.

The Buried Forests. On steep upper slopes the velocities of these flows would be great enough to push over and snap off trees that would be carried away. But on gentler and lower slopes, farther away from the vent, and in areas of backwater flooding, velocities of volcanic debris flows would be lower, so that the trunks and roots of trees of then-living forests might be buried and preserved in place. These lost or buried forests left by these more recent eruptive events were the focus of our day outing to Mount Hood.

So far, six different prehistoric buried forests have been discovered on Mount Hood. We were told that the best example of these buried forests is to be seen at Ramona Falls, which requires a 5 mile round trip walk. To save time and permit the greatest access for all age and ability groups, we focused

on the most easily reached areas, found at the Lost Creek picnic area and at Clear Fork Creek. [Our scheduled stop 2 at Riley Horse Camp had to be curtailed due to a blocked road.]

This was one trip where an expert guide made all the difference in understanding what one was seeing. If I had just walked in these areas with no guide, I would not have recognized the tree snags I saw for the natural relics of volcanic events that they were. I probably would have just assumed that these tree snags, some of them standing where they originally grew, three and more feet above thin soil and the debris flows that killed them, were the total result of early logging. The origin of some tree snags is further masked by the fact that, well after these trees were killed and buried in place by volcanic events, early human inhabitants did cut off some of the snags near ground level, using them for fire-wood or, if cedar, shake bolts, thus making them easily confused with true sawed-off tree stumps left by human logging.

Some of the trip participants had had the impression that we were going to view petrified trees, but this, of course, was not the case. There was no mineralization in which silica had replaced living tree cells, wood, or bark.

Tree wells were another interesting feature of these buried forests. These are cylindrical casts left in the mudflow deposits after the tree trunks disappeared. Apparently, Douglas Fir trees rot especially rapidly and were prone to leave these wells. The deepest of these wells was cited as being 22' deep, although the ones we saw were far more modest in size.

Dating methods were discussed. Ken took a tree boring sample and discussed how dating is done from counting growth rings and how past weather can be analyzed from the size of the rings. I think many of us were impressed by how care must be taken to remove the boring instrument fairly quickly—Ken mentioned how a tree can start swelling around the instrument, locking it into place if left too long. The growth of some of these trees can be impressive, if they have enough room and favorable growing conditions. As much as a quarter of an inch can be added in a year. It was noted that some of larger living trees had visually mislead researchers to believe that the mudflows they grew up on must have been much older than they actually were.

Another dating method discussed was that of lichen dating. [Lichen results from a symbiotic relationship between fungus and algae.] A lichen phallus is an ever increasing circular growth pattern. There are even different lichen growth curves for age versus size based on whether the rock supporting the growth is andesite or dacite. Lichen growth found in the field can be fitted to these standard curves, thus telling the researchers the approximate ages of the lichen and when they first started their growth.

Some of the mechanics of these debris flows were discussed. For example, at Clear Fork Creek, back water deposits resulting from low energy mudflows were noted.

Geological "War" Stories and Quips. Lots of the fun of these trips consists of the side remarks and "war" stories told. One of the participants offered this joke:

Question: How do you tell a Hard Rock Geologist from a Glacial Geologist?
Answer: The Glacial Geologist always has his hand in the till.

Ken was able to pull some interesting tales from his field experiences during the post-eruption years of Mount St. Helens, confirming our suspicions that geologists, particularly those interested in volcanology are indeed a special breed. Example: After being properly issued hard hats to protect them from explosive fall out, when a minor venting finally did release some ejecta, the inquisitive scientists immediately took off their hard hats to collect precious samples.

Both Ken and his daughter, who accompanied her Dad on this outing, are sci fi buffs. I got clued into watching *Tremors*, which, as chance had it, was on cable later that same weekend. Ken likes the glitzie schlock of the movie, *Volcano*, in spite of its departure from geological reality, and defended a lot of *Dante's Peak* as being well-grounded in science. Example: natural springs and ponds apparently can increase in acidity quite quickly, as portrayed in that movie, and the pH can become incredibly low. Ken cited the example of a pool in New Guinea with a pH of 1, due primarily to the presence of sulfides, sulfites and sulfates, which were converted into a solution of sulfuric acid, and also, often due to the presence of hydrofloric acid, used traditionally in industry to etch glass.

Last Stop at Timberline Lodge and Our Walk along the Crest of the Cascades. The last leg of our day's journey was a relatively short, safe, and tame portion of this breathtakingly beautiful mountain trail, which can be entered from the parking lot near the newer ski lodge. It should be noted, however, that this is a higher altitude walk, being over 6,000 feet. Some in our general party, like Cecelia and Carol, decided to play it safe and sensibly decided to forego this part of the trip. We think this was a very wise and considerate decision on their part, and also a nice workable resolution for different age and ability groups. The vast majority of the day had been spent on lower and, almost level, easier to walk trials, which all participants were able to handle easily, while this last stop rewarded those with a bit more zip and energy with a safe alpine high! And even this, slightly more arduous walk was negotiated by a group with an approximate 60 year age range!

We were spread out a bit on this trail, which isn't too conducive to detailed note-taking, but here are some of my notes:

Radial Jointing: Rocks cooling from outside to inside will crack this hexagonal pattern on the outside surface. This is a feature of a thermal gradiant.

Xenoliths [literally "foreign rocks"] are sometimes broken off from below-ground cracks as fresh magma pushes through with hydrologic pressure toward the surface.

Autolite: This is the name for the rock that has samples of both new and old magma.

Freeze-Dried Effect: In 1810, as dated by dendrochronology, a mini-eruption resulted in a pyroclastic flow which went over the White River Glacier. Convective, hot air killed trees that were still standing. These trees in turn protected a stand of smaller living trees. When researchers took tree borings to date this event, they were impressed by the old age of these small, slow growing white pines.

Lewis and Clark's brush with a Mount Hood eruption: Although they could not see any direct evidence of an eruption over Hood, it appears that Lewis and Clark did see the effect of a mudflow down the Sandy River, similar to that which occurred down the Toutle River in 1980 from Mount St. Helens. Hence Lewis and Clark's own name for the Sandy River, namely, the Quicksand.

Nominees for Hallmark Hall of Fame for Terms: The word for the bent-over profile that trees assume that live in a strong prevailing wind from one direction is Krumholtz. And my personal award for a geologic spelling bee would go to Jokulhlaup, assuming, of course, that someone could find the definitive correct spelling. Jokulhlaup is what happens when water builds up behind a glacier, which then breaks up and results in rock-strewn floods.

While Ken called our attention to glacial deposits, including a medial morraine, left by the retreating White River Glacier in the White River Canyon, he also answered the question of what the difference is between an Ice Field and a Glacier. The difference is that a glacier moves down mountains

or over a continent under its own weight. Apparently, this difference is linked to a definitional controversy regarding the term "mountain". It is contended by some Cascade-advocates, that the Rockies are not true mountains because they do not have true glaciers on them, as do the Cascades. The Rockies team has thankfully come up with a meager, but true, glacier or two to rebuff this claim! No word on how inhabitants of the Appalachian "Mountians" are taking this.

While at this same overlook, Ken pointed out the very thin soil horizon sandwiched between some hundred feet of two different ash and debris eruptions from Mount Hood. It made present time seem very tenuous and fleeting.

Finally, it was pointed out that Mount Hood can in no way be considered dormant, even today, if we look close enough. Infrared shots of Mount Hood's Crater Rock, shows that it is still hot, and may be just temporarily plugging a still active vent. Even while many minor earthquake tremors are attributed to the contraction of Hood's magma chamber as it cools, there are indications in the Devil's Kitchen Thermal area that Mount Hood may be getting warmer.

Personally, I got a tremendous kick out of this last portion of the day. I couldn't believe that a middle-aged, out-of-shape, non-rock climber like me could get so close to a medial morraine [the first one I've ever seen that hasn't been just in a photograph], a Cascade ice field and Mount Hood's most recent dome/vent plug, Crater Rock. The slopes were dotted with clusters of mountain flowers and the weather was perfect for this alpine stroll. It was a great ending to a great day's field trip!

****

The primary reference for this report was personal field notes. Effort was taken to be as accurate as possible, however, science errors, as regrettable as they are, may indeed be present, since the author is just an amateur geologist. Hopefully, all GSOC members, whether expert or amateur, will always feel free to share their notes, writings, and reflections with *The Geological Newsletter*. We actively seek your contributions. Don't be shy to participate, whatever your knowledge level!

Also consulted was "Prehistoric buried forests of Mount Hood", by Kenneth A. Cameron and Patrick T. Pringle, and published in Oregon Geology, Vol. 53, No. 2, March 1991, pp 34-43. -- M.A.

GSOC THANKS. . .

All the guides on our Spring and Summer 1998 day trips; Ken Cameron for his invaluable expertise in guiding July's expedition; Ken's daughter for her youthful exuberance and patience with us creakier hikers; Bev Vogt, our President, who has devoted so much expertise and time into arranging these trips; Evelyn Pratt for her May trip report; and Cecelia Crater & friends who contributed extra efforts to assemble and mail the our newsletter during the Summer.

Never criticize someone until you have walked a mile in their shoes.
That way, if they get mad, you'll be a mile away from them.
And, you'll have their shoes.

--Sent by Ralf70@aol.com (Ralph and Ev Pratt)

SEP 98

THE GEOLOGICAL NEWSLETTER

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VISITORS WELCOME AT ALL MEETINGS
INFORMATION: Beverly Vogt: 292-6939
Evelyn Pratt: 223-2601

VOL. 64, No. 9
SEPTEMBER and OCTOBER 1998

REVISED SEPTEMBER ACTIVITIES

The theme of 1998-1999 Friday Night Programs will be:
"GEOLOGY AND GEOLOGIC HAZARDS OF THE CASCADE MOUNTAINS."

FRIDAY Sept. 11, 8:00 PM: Geological History of Mt. Hood
Dr. Willie Scott, Cascade Volcano Observatory, Vancouver, WA
Rm. 371 Cramer Hall, PSU

MONDAY Sept. 14, 12:30 PM: The John Day Country
Don Barr, past president
Central Library, 801 SW 10th, U. S. Bank Room on first floor

FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!

Friends Of the Pleistocene's Sept. 19-20 field trip is close (Willamette Valley), cheap ($20), and led with enthusiasm by two of the best - Scott Burns and Jim O'Connor. Camp Fri., Sat. nights at Champoeg St. Pk. Group Camp area, or come from home. Assemble 7:30 AM Saturday. See rhythmites, modern flood traces, Mazama ash, and more. Bring appropriate gear, lunch & supper. For Sat. night bring tuba, kazoo, yourself. Send $20 to Dr. Scott Burns, Dept. of Geology; PO Box 751, PSU; Portland, OR 97207, for Quaternary Geology of the Willamette Valley, OR trip; or call R. Bartels after 7 PM, 292-6939.

FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!FOP!

WEDNESDAY Sept. 23, 8:00 PM: This year's seminars: Topics in Physical Geology
1. Basic Geologic Concepts: Continental Drift & Plate Tectonics
Richard Bartels, geology instructor and past president
Rm. S-17 Cramer Hall, PSU

OCTOBER ACTIVITIES

FRIDAY Oct. 2, 1-2:30 PM Library Program: Toiyaki Mts. to the Sea of Cortez, by Jack Ostlind
A 2-projector presentation featuring Nevada and the Gulf of California.

Fri. Oct 9, 8:00 PM, Rm. 371 Cramer Hall, PSU: Volcanic Hazards of Mt. Hood Program
by Cynthia Gardner,
David A. Johnston Cascade Volcanic Observatory

The President's October 11-17 Campout has been canceled.

Calendar items must be given to Evelyn Pratt by the 15th of the month. 223-2601

LECTURE SUMMARY:
"Sand Dunes of Oregon"
GSOC Talk given by Frank Reckendorf
Friday July 10, 1998

Reported by E. Pratt

Thinking of investing in beach property? You might want to read this first!

This could be subtitled, "Don't Build Your House On Sand!" Frank Reckendorf is an engineering geologist who worked for the Soil Conservation Service for 31 years, and as a consultant after that. He specializes in streams, wetlands, floodplains, and sand. His talk was enlightening, especially for anyone who's interested in the impact of man on the Oregon coast, or who is considering the purchase of land or a home there.

In passing over a dune, wind erodes sand from a gentle upwind slope and deposits the same sand on a steep downwind slip face. Often several dunes will form in a row, one behind another. Transverse dunes are fairly straight, elongate dunes oriented perpendicular to the wind. Good examples are found between Highway 101 and the ocean, where transverse dunes tend to form perpendicularly to the southwest wind. Oblique dunes have been acted upon both by winter southwest and summer northwest winds, and show sawtooth edges. It takes a lot of sand, and wind coming mainly from one direction, to form long "fingers" of parabolic dunes. Their horns point upwind, and are apt to be anchored by vegetation. The precipitous downwind slip faces of all three types of dunes move forward and bury whatever is in front of them, including forests, roads, and houses.

Over half of the Oregon coastline has or has had sand dunes. In the '70's Reckendorf catalogued them as either unstable foredunes consisting of ridges of sand just above the water line, or as vegetated conditionally stable dunes resistant to wind erosion. Foredunes, he found, have been actively growing. Where hummocks with grass on top were in the 1930's, today we see dunes.

Clatsop Plains, the wide sand sheet from Tillamook Head to Astoria, has long, generally north-south parallel dunes. These represent foredunes that formed as ocean levels rose and fell during the last few thousand years. It is the one place in Oregon where foredunes formed naturally. In 1885 a jetty was built on the south side of the Columbia River to keep sand from impeding navigation through the estuary. Since then much more sand accumulates each year on the Clatsop Plains.

At Honeyman State Park's Cleawax Lake in the early 1900's the outflow to the sea, which kept the lake clean and fishable, was threatened by drifting sand. Between 1910 and the 1930's various controls were tried, including American beach grass and sand fences. The only thing that really worked was European beach grass. Today, all up and down the coast, foredune stabilization by European beach grass has had effects that are both good and bad. Wildlife-attracting wetlands have been created behind the foredunes. American beach grass has been reintroduced, and many acres, protected by foredunes from being covered with sand, show lush growth.

Problems arise when structures are built on foredunes. Public officials, overwhelmed by tremendous demand for development, have let hundreds of homes be built on top of and in these dunes. In the 1970's the Pacific City foredune was being bulldozed year after year after year to keep homes from being covered with sand. Houses built along Nestucca Spit during the past 20 years have been nearly covered by 30 to 35 feet of sand. In the late '70's LCDC's Goal 18 restricted, but wasn't able to stop completely, building on foredunes. After Salishan was constructed and erosion set in, homeowners wanted public money to pile riprap along the beach bank to keep houses above it safe.

Voters turned this down. Individuals who riprapped on their own found that such a barrier was futile unless their neighbors did the same.

El Nino generally raises the sea level along our side of the Pacific. On a beach which runs out to sea at a low angle the extra water may spread out and dissipate. But as waves roll in and up a steep slope, water level and consequent wave erosion along the shore can increase dramatically. Storm waves often cause rip currents which carry sections of beach out to sea. Then dunes or cliffs behind the beach are eroded back, threatening homes built on them.

Just before and during the latest El Nino 80 homes were built at The Capes in Oceanside, many of them on top of a sequence of landslides. Some houses slid, and several remedial actions have been proposed, including getting water out of the slide and piling sandbags at the base. Beach sand may come back when this El Nino wanes, but what about the next one?

When septic tanks are located in sandy soil above an impermeable clay layer, sewage flowing along the top of the clay can emerge from a bank and run down onto the beach below. At one time Clatsop County had to take remediation measures when this kind of situation was contaminating its water supply.

Tremendous amounts of wood were carried down rivers by floods in 1964, and deposited on beaches next to estuaries. For many years, in Netarts and other places, storms tossed the wood around and caused considerable damage.

Much has been learned, in the last 15 years, about the frequency of earthquake-generated tsunamis along the Pacific Northwest coast. They occur roughly every 450 years, plus or minus 150. The last one was 300 years ago. In a worst-case scenario, slippage along the Cascadia Subduction Zone can produce an earthquake leading to 40-foot high waves at Seaside and slightly lower ones elsewhere. There would be, at the most, 20 minutes to get to high ground.

In future human use of the coast, what should be taken into account? One factor is the impact of jetties on sand accumulation. Another is that younger sand dunes should not be built on. Older dunes which have had enough time to develop soil layers on top of them are conditionally stable, although builders have to be careful how far down they dig. Today hundreds of homes along the coast are situated on very young foredunes. Climatologists tell us the last 50 years in Oregon have been dry, but that we're now entering a 20-year wet spell. We're probably in a much more hazardous situation than we are willing to admit.

Public agencies simply can't handle the volume of demand for building. Often the only input a county gets is from those most interested in new construction. What is needed is an independent review. Also, county planners should be given the ability to defer construction for at least 60 days. This could give time for early investigation.

Most coastal hazards are recognized. Frank Reckendorf's message seems very clear - geology, rather than politics, should govern what gets built along the coast. And the frightening question is, what will it take to make that happen?

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VISITORS WELCOME AT ALL MEETINGS VOL. 64, No. 10

CALENDAR FOR OCTOBER and Early NOVEMBER 1998

FOR INFORMATION: In Oregon: Evelyn Pratt (503) 223-2601; or Beverly Vogt at (503) 292-6939
In Clark County, Washington: Marlene Adams at (360) 574-9650
E-Mail: Ralf70@aol.com (Ev Pratt Calendar); ArnoldA100@aol.com (M Adams)

OCTOBER ACTIVITIES

The theme of 1998-1999 Fri. night programs will be:
"GEOLOGY AND GEOLOGIC HAZARDS OF THE CASCADE MOUNTAINS."

FRIDAY OCT. 2, 1-2:30 PM Central Library program: "Toiyaki Mts. to the Sea of Cortez," by Jack Ostlind. This is a Two-projector presentation featuring Nevada and the Gulf of California

FRIDAY OCT. 9, 8:00 PM, Rm. 371 Cramer Hall, PSU: "Volcanic Hazards of Mt. Hood," by Cynthia Gardner, David A. Johnston Cascade Volcanic Observatory

WEDNESDAY OCT. 28, 8:00 PM: This year's Seminar Series: "Topics in Physical Geology"
Lecture # 2 in Basic Geologic Concepts
Richard Bartels, geology instructor and past president
Rm. S-17 Cramer Hall, PSU

FIELD TRIP SATURDAY, OCT. 17: "Knowing Home: A Look at Portland's Geological Underpinnings" Leader: Evelyn Pratt, 223-2601. (In case of hurricane or blizzard, trip will be re-scheduled.) Meet in parking lot just north of West Side Max zoo station, 8:30 AM. Bring lunch, clothes appropriate for weather and for a little hiking, and lunch.

If you know someone who's willing to give a good geology field trip, PLEASE LET ME KNOW!!!
Thanks! EP, 223-2601

Early NOVEMBER ACTIVITIES

MONDAY, NOV. 2: 12:00, Central Library - "Drowned Forests on the Oregon Coast," by Ray Crowe, GSOC Board Member

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Calendar items must be given to Evelyn Pratt by the 15TH of the month. Call 223-2601.

A Too-Long Letter from the Editor

Dear Reader,

What, another late newsletter!

Well that does it! I've been looking for a good reason to fire me for a mighty long time now, and I've finally found it. Imagine how outraged I am at my own sloth!

So there! I've had just about enough of me! You are all witnesses. . .

"I hereby fire me as the Editor of *The Geological Newsletter*!"

"No way! I can't fire me, 'cuz I quit!"

"Can not! I fired me first!"

"Okay. Have it my own way. I'm fired!"

Please forgive my little outburst of schizophrenia. But, honestly, I'm pooped! And, to be even more honest, more than a little frustrated.

I can no longer continue to be responsible for cranking out a newsletter, each and every month, under present conditions. I'll be glad to hold on, at least until the end of this calendar year, acting as layout department, typist, chief writer, e-mail contact, Clark County phone contact, and researcher. But no thanks, after this issue, I can't be nominal editor.

Yes, I know that I could, and maybe should, have made things easier for myself by continuing to devote the bulk of our newsletter to re-prints of articles written by professional geologists. That isn't a bad way of doing a newsletter, or a way I innately eschew on moral grounds. It just isn't my way. And in the words of Old Blue Eyes, I just have to do things 'my way'! Of course my mother would say this all amounts to stubbornness on my part, and that I am way too much like Tina Turner for my own good, as in I just never could seem to do anything 'nice and easy'.

'My way', which is not so 'nice and easy' for me, or for others working with me, was to try to create a mostly-original, hopefully fun-and-informative, and timely (more-or-less) newsletter.

I have gradually discovered that I just can't do this newsletter 'my way' each-and-every month, into infinity. Moreover, I've begun to wonder if anyone should crank out a monthly newsletter, in any way, as an unpaid volunteer. It has been my experience that the more and more one does for free, the less and less one is respected. Perhaps this is just the way of our present dog-eat-dog capitalistic nation, where the dollar sign is our most revered symbol. No matter what an individual's ideals, sooner or later, at least for my Baby Boomer generation and those younger, you eventually just feel like a damned fool for giving anything away for free, including your own creativity and labor.

Like everyone, however, I can freely give suggestions. And here's one:

I strongly suggest that GSOC abandon its 12-issue per year, monthly, printed-and-mailed Newsletter and Calendar, effective January 1, 1999, and that our Society convert to a 6-issue, every-other-month, printed-and-mailed format. These six issues can be supplemented with special issues or emergency mailings, when absolutely necessary.

I understand that my suggestion will raise quite a bit of fuss, at least in reference to Evelyn Pratt's Calendar of Events.

I do think that an every-other-month, mailed Calendar is quite doable. The hardest regular meeting to schedule in advance is the "Noon" Meeting, held at the Central Library in Portland, near the beginning of non-summer months. Cecilia Crater is very diligent in this regard, and has been able to schedule this event two months in advance.

But won't this cramp the "spontaneous" nature of scheduling last minute walks and day field trips? While we wouldn't want to chill any one's volunteering as an expert or host by requiring an overly rigid deadline for announcements, [and remember this would only start in 1999], I doubt if we really are going to lose anyone who is willing to volunteer in the first place. Moreover, at least part of the money saved in postage and photocopying could be used to pay experts some money for their services that day.

[Further, might I suggest that we consider charging non-GSOC members small fees for attending our day or annual field trips, or at least for any informational handouts. We really have not been increasing our membership rolls very well, recently. The maxim that comes to mind is: If you give away the milk for free, no one will buy the cow! Isn't it about time that our members get some financial benefit for the cost of their membership?]

As for last minute emergency re-scheduling, remember, we can contact our members/subscribers in other, cheaper ways than by mailings. Last minute Calendar updates can be announced at all meetings, and if necessary, revised interim Calendars can be handed out at those meetings [We would still save on postage.] Those members who have computers, are on-line, and have provided us with their e-mail addresses, can be contacted quickly via e-mail. And if absolutely necessary for some major revision, a special emergency mailing can be used.

Now, although some of the advantages of switching to a 6 issue format is obvious, I will tediously list all of those advantages I could immediately think of:

- Saving on postage & photocopying costs.
- Maintaining quality of writing & work from happier volunteers, by reducing quantity of work. Since we do not pay our contributing writers/artists, workers, or the editor, it is often difficult to inspire others or even myself to do any writing, let alone maintain a moderately high level of quality.
- More respect for GSOC volunteers. I think newsletter staff has been driving itself crazy, and perhaps giving too much for our membership/subscription fees, and getting too little respect in the process. Sorry, but I think some people have forgotten that this is not a subsidized enterprise which has paid staff.

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- Greater participation in GSOC walks and trips. If people are given notice further in advance of walks and trips, they might give GSOC events higher priority in their own personal scheduling, and we will get better participation.
- Less writing may result in more doing. This may only apply to future editors, and writers, like me, but I didn't originally join this organization to sit on my fanny at a computer screen. Less lay-out work, composing, typing, and begging for copy, would give people, or at least me, more time to enjoy walks and field geology. And remember, more money for trip experts to induce them to lead said walks!

So much for my pitch. Let me add this strained geological/evolutionary analogy:

Most species that don't have the capacity to adapt to a changing environment generally don't survive. Oh, sure, you have some exceptions, some odd-ball creatures that are so well adapted to a particular stable environmental niche that they can get along quite swimmingly for millions of years, without even one new pair of genes. But for most of us, its "Adapt or Die".

Put a bit more kindly, may I suggest that we grasshoppers might prefer bending like the willow in the face of unrelenting social and economic changes, rather than toppling over like the unrelenting, and overly rigid oak?

Well, the position of Editor is hereby open! Remember, that I will be glad to stay on, helping out as much as I can for as long as I can and for as long as I am needed.

Thanks to those who actually read this swan song, with its suggestions. And thanks to all those who have contributed articles, notices, photos, drawings, and their time and services in creating over a year's worth of issues under my nominal & inefficient editorship!

Happy Halloween and Remember to Vote!

Sincerely,

Marlene Adams

****

Lecture Notes, by Evelyn Pratt, of the GSOC September Friday Talk, follow on the next page. Please forgive their unedited form, as I am late again in getting copy to Cecelia Crater & Rosemary Kenney to commencce this already tardy printing of the October issue. BTW, Welcome Back, Rosemary

-- M.A.

Lecture Notes, by Evelyn Pratt, of the GSOC September Friday Talk

GEOLOGICAL HISTORY OF MT. HOOD

-Lecture given by Dr. Willie Scott, CVO - 9/11/98
-Notes taken by Evelyn Pratt

Volcanic centers in the Cascades can be divided into long-term [andesitic and/or rhyolitic], from Mt. St. Helens to Lassen, and short-term (basaltic) from Rainier north. (Mt. McLoughlin in southern Oregon is a basaltic exception.) These centers tend to show high activity for millennia, then slow down and be [dormant] for a long time. Today Mts. Shasta, Rainier, and Glacier Peak are quite active.

This year in mid-July many more earthquakes than usual were recorded on Mt. St. Helens. At one time there were up to 25 earthquakes a day, several of magnitude 2. The mountain was releasing 1000 tons per day of CO2! Was this due to new magma releasing gas as pressure increased? The magma chamber under Mt. St. Helens is about 9 km down, and must be less than a km wide, since it's too small to detect. Pinatubo is somewhat similar to Mt. St. Helens and to Mt. Mazama, but its eruption was about 1/5 that of the latter volcano.

Volcanoes rise, then get torn apart by glaciers, landslides, and eruptions. For at least a million years some sort of volcano has been located where Mt. Hood is now. Today's Mt. Hood is dominated by lava, lava domes, and pyroclastic flows.

In the last 600 ka there have been half a dozen glacial episodes. The White River Glacier on Mt. Hood is fed by snowdrifts to the west of it. Right now the concern is that glacial outbursts may take out bridge piers on Hwy 35. Debris flows such as the one that is coming down from White River Glacier tend to occur late in the season after a warm summer as a result of glacial outbursts, or after heavy rains.

Andesitic lava flows, unlike basaltic lava flows, are moving heaps of big blocky rocks. St. Helens had andesite flows in the 16th century. Magmas in Mt. St. Helens and Mt. Hood look similar, but gases escape from Mt. Hood's magma and don't from Mt. St. Helens'. Cathedral Ridge, Yocum Ridge, and Barrett Spur are lava flows that filled in old valleys. The sides of the valleys then tend to get eroded away, and new valleys form. Unlike flood basalts, Mt. Hood strata can't be easily traced from one site to another.

Crater Rock sits on a steep 25o slope. It can't grow without falling apart. When such blocks are in hot pyroclastic flows and collapse, they tend to form very fine ash. Like the south side of Mt. Hood, Montserrat has a lava dome, had pyroclastic flows, and has a wide apron of very fine ash below a narrow neck.

The geologic features of Mt. Hood can be separated by age:

1. Older than 300,000 ya (K40-Ar) Sandy Glacier Volcano west of Mt. Hood: The lower part is basaltic, possibly 2 Ma. The upper is pyroclastic, with 1 Ma lava to the north. 450 ka Mt. Hood buried the Sandy River Volcano. Cloud Cap Volcano: mainly basaltic rather than andesitic; many basaltic andesite flows took place ~425 ka; some can be seen along Hwy 35
2. 300-150 ka Eruptions took place on the east side of Mt. Hood - Gnarl Ridge, Lamberson Butte, Zigzag canyon ~ 225 ka. Visible in Zigzag canyon walls: the contact between 900,000 and 250,000 ya pyroclastics.
3. <150,000 ya. Many pronounced ridges around Mt. Hood; Ramona Falls is ~130-140 ka. Hood River Valley scenic railroad cuts through a very large landslide less than 100 ka, similar to Toutle River. The slide crossed the Columbia River, created a 300-foot high dam, and traveled 4 km north of the river.

Prismatic, radially jointed rocks must have cooled in place, otherwise they would have fallen apart as they moved. A lava flow on the north side has peculiar tiny glassy columns. These have been found on other Cascade

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Prismatic, radially jointed rocks must have cooled in place, otherwise they would have fallen apart as they moved. A lava flow on the north side has peculiar tiny glassy columns. These have been found on other Cascade volcanoes. It is hypothesized that they form when lava contacts ice. Recent volcanic activity has been mainly on the south side. Crater Rock is only about 200 years old. It rises above an apron of 1500 year old or younger debris, probably from a landslide. Highway 26 travels through Wemme and Welches on the flat surface of a lahar. The summit rocks are probably less than 50 ka. Mt. Hood Meadows is covered with 50-25 ka deposits. Are these from a lava dome? Collapsing lava domes are responsible for a lot of volcanic material. A long apron of material extends down below Newton Peak and Eliot glacier, the result of the collapse of the Steel Cliff lava dome. Volcanoes are very dynamic. Northwest volcanoes have been both higher and lower than they are at present. A common occurrence in andesitic volcanoes is that lava domes will build up a summit, then collapse. The Dalles Formation originated from the collapse of lava domes. Volcano-earthquake correlations are not good. The Landers earthquake, however, did produce shaking in the Long Valley caldera.

****

From Our Secretary-Treasurer, Phyllis Thorne: The following revisions to the By-Laws were approved by a vote of the membership and are effective as of July 1, 1998:

(PROPOSED REVISION)
Article V, Section 1

Section 1. The officers of the Society shall be President, Vice President, Secretary and Treasurer. They also shall serve as members of the Board of Directors.

(PROPOSED REVISION)
Article IX, Section 2
Meetings

Section 2. The annual business meeting of this Society shall be held during its February meeting. The results of the election of officers and balloting on by-laws revisions shall be announced at that time. Ten percent of the membership shall constitute a quorum at any meeting of the Society.

(PROPOSED REVISION)
Article XI
Nomination and Election of Officers

Section 1. During the month of October, with the approval of the Board of Directors, the President shall appoint three members as a Nominating Committee. The Chair of this Committee shall serve on the committee for one year after the term as Chair has expired. The Committee will report its nominees for office at the November meeting. Additional nominations may be made from the floor at the November and December meetings, providing the persons making the nominations have previously secured the consent of the persons being nominated. Nominations shall be closed after the December meeting and the list of nominations shall be published in the January Newsletter.

If more than one person has been nominated for any position, voting for that office shall be by ballot at the February meeting; otherwise the report of the Nominating Committee may be accepted by motion for adoption. Officers shall be elected by a majority of the members present at the meeting.

Section 2. All persons elected shall take office as of the first of March.

NOV 98

THE GEOLOGICAL NEWSLETTER

GSOC

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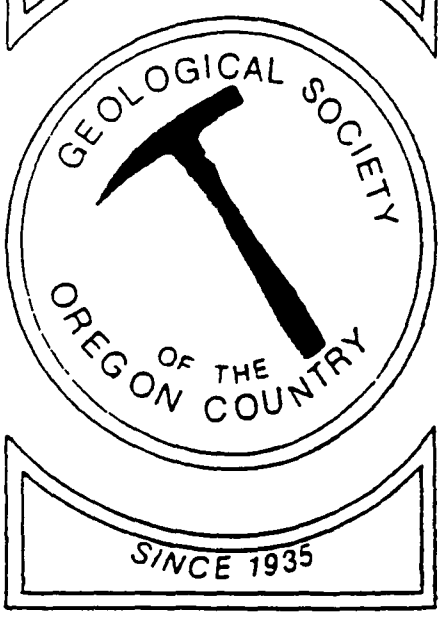

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY
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Beverly Vogt	292-6939	Richard Donelson	(3 years)	654-1098
Vice-President:		Robert Richmond	(2 years)	282-3817
Carol Hasenberg	282-0547	Ray Crowe	(1 year)	640-6581
Secretary-Treasurer:		Immediate Past Presidents:		
Phyllis Thorne	292-6134	Dr. Paul Brown		227-2136
		Richard Bartels		292-6939

****

THE GEOLOGICAL NEWSLETTER

[e-mail: ArnoldA100@aol.com]

Editor:		Business Manager:	
		Rosemary Kenney	221-0757
Calendar:		Assistant Business Manager:	
Evelyn Pratt	223-2601	Cecelia Crater	235-5158

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Geological Interests and Hobbies: _____
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VISITORS WELCOME AT ALL MEETINGS
INFORMATION: Beverly Vogt, 292-6939
Evelyn Pratt, 223-2601

VOL. 64, No. 11
NOVEMBER 1998

NOVEMBER ACTIVITIES

The theme of the1998-1999 Friday night programs will be GEOLOGY AND GEOLOGIC HAZARDS OF THE CASCADE MOUNTAINS.

Monday Nov. 2, 12:00, Central Library: Drowned Forests on the Oregon Coast
Presenter: Ray Crowe, GSOC Board Member

Fri. Nov. 13, 8:00 PM, Rm. 371 Cramer Hall, PSU: Buried Forests of Mt. Hood
Presenter: Ken Cameron, Oregon DEQ

Wed. Nov. 18, 8:00 PM: This year's seminars: TOPICS IN PHYSICAL GEOLOGY.
3. Plate Tectonics
Richard Bartels, geology instructor and past president
Rm. S-17 Cramer Hall, PSU

I'm coordinating field trips this year. If you know someone who's willing to give a good geology field trip, PLEASE LET ME KNOW. Thanks! Evelyn Pratt, 223-2601

DECEMBER ACTIVITIES

Wednesday Dec. 2, 12-1:30 PM, Central Library: Hawaii - Land Born of Fire
Presenter: Carol Hasenberg, GSOC Vice-President

Fri. Dec. 11, 8:00 PM, Rm. 371 Cramer Hall: Geology & Geologic Hazards of Mt.Rainier
Presenter: Carolyn Driedger, Cascade Volcano Observatory, USGS

Our thanks to cookie providers Marlene Adams, Tom and Diane Gordon.

Please give calendar items to Evelyn Pratt by the 15TH of the month. 223-2601; ralf70@aol.com

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VOLUNTEERS NEEDED

We urgently need a Newsletter Editor. No experience is necessary, but a computer would be helpful. The main duty is to assemble information; there would be no production tasks required: folding, stapling, mailing, since someone else does those tasks. Anyone interested or even partially interested either as Editor or Assistant Editor should call Cecelia Crater at 235-5158 or Rosemary Kenney at 221-0757. Inquiries welcome.

NEWS ABOUT GSOC MEMBERS - PSU

Dr. Scott Burns has announced that his book, *Environmental Groundwater and Engineering,* has been printed.
He has been using the book this spring to teach case histories class in engineering geology. It has been well received,not only locally, but nationally.

Dr. Burns has been very busy this year. "I have survived being the Associate Dean of the College of Liberal Arts and Sciences, too!" He has just finished his year as president of the Oregon section of AEG and the Ferdinand Society at PSU. Next year he will be the national vice president of the Engineering Division of GSA and the following year its president.

Beverly Vogt is going to help the PSU Geology Department with their fund raising activities this year.

NEW GSOC MEMBERS

Bradford and Cynthia Kenyon
Elizabeth Schillberg
Robert Gamer
Jerolynne Hawthorne
Ted Walling
Steven Simmons
Sharon Wood
Victor and Vivian Wynkoop

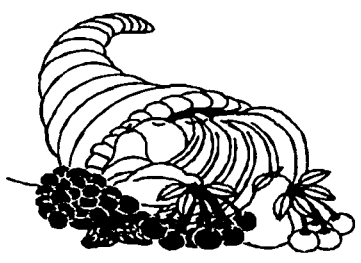
CANDIDATES FOR GSOC ELECTION OF OFFICERS

The Nominating Committee has submitted the names of the following candidates for the offices indicated for the coming year. All have expressed a willingness to serve the Society. In accordance with the Revised By-Laws adopted July 1, 1998, the Nominating Committee will also report its nominees for office at the November meeting. Additional nominations may be made from the floor at the November and December meetings, providing the persons making the nominations have previously secured the consent of the persons being nominated. Nominations will be closed after the December meeting and the final list of nominations will be published in the January Newsletter.

President	Carol Hasenberg
Vice President	Ray Crowe
Secretary—Treasurer	Phyllis Thorne
Director, 3 years	Archie Strong
Director, 2 years	Richard Donelson
Director, 1 year	Robert E. Richmond

DUES REMINDER:

Annual dues for 1999 are due January 1, 1999. Please mail check or money order to GSOC, P. 0. Box 907, Portland OR 97207. Dues are: Individual, $20; Family $30, Junior(under 18) or student $10.



VOLCANIC HAZARDS OF MT. HOOD

Cynthia Gardner of the Cascades Volcano Observatory (USGS) presented the second of a series of lectures about the Cascades on Friday, October 9,1998. Her presentation utilized the information presented about the geology of Mt. Hood by Willie Scott in the previous month's presentation.

Each Cascade volcano is unique in its geologic history and its past performance is the only realistic way to evaluate its potential geologic hazards of today. During the last ten thousand years, Mt. St. Helens has been continually active while Mt. Hood had an eruptive period in the late 18th century (Old Maid eruptive period) and 1,500 years ago (Timberline eruptive period).

Cynthia outlined all potential volcanic hazards in general. These included:

(1) Actual eruptions that generate abundant volcanic ash and tephra. Her slides showed the abundant ash cloud covering Yakima Washington during the Mt. St. Helens eruption, the collapse and burial of buildings, the impact on machinery, and the effect on the KLB jetliner that crossed the path during the eruption of Mt. Redoubt Volcano in Alaska.

(2) Lava flows which can destroy buildings but can be out runned.

(3) Lava-dome eruptions. Pasty mass of lava that oozes out of vents and develops dome-like masses that can become gravitationally unstable. Collapse of these domes will generate pyroclastic flows that can travel down slope up to 100 mph.

(4) Debris avalanches. These can be generated by oversteepening of slopes due to erosion (glacial and running water) into hydrothermally altered volcanic rocks and may be triggered by earthquakes. The landslide during Mt St Helens eruption was the first time this phenomena was observed and recorded by geologists. The hummocky surface that resulted from the landslide has been observed at other volcanoes and may indicate similar processes are more common than previously believed.

(5) Lahars or volcanic mudflows. Water is an important component in these "floods". Debris avalanches can cover glacial ice or snowfields causing flash melting. The Toutle River lahar was the excellent example of this type of lahar. However excessive rainfall or sudden melts can also trigger these floods. Eruptions of ash or lava flows over glacial ice or snowfields can also generate lahars.

Mount Hood is a recent volcano that has been built by a succession of lava-flow and lava-dome eruptions. The lack of widespread pumiceous tephra deposits suggests that the volcano has not produced explosive plinian eruptions like Mt St. Helens. Utilizing its recent behavior, the greatest hazards posed by Mount Hood would be (1) collapse of growing lava domes and generation of pyroclastic flows, which in turn would melt snow and ice to form lahars that would flow down valley, (2) landslides of hydrothermally altered material from steep upper slopes of the volcano that spawn debris avalanches and lahars, and (3) the long-term adjustment of river channels to large volume of sediment dumped into valleys. During dormant periods only the landslides would pose a threat.

The immediate problem relating to hazards is adequate warning time. The distal portions on the hazard map (Sandy River to Troutdale, Hood River to the Columbia River, and the White River to Tygh Valley) requires a warning system within a short time. Obviously, no warning system will work for evacuations near the mountain itself. The threats posed by actual eruptions are being continuously monitored by CVO and would allow for weeks to months of lead time.

Richard Bartels, Past GSOC president

ABOUT THE SPEAKER:

Cynthia Gardner is a geologist with the U.S. Geological Survey at the David A. Johnston Cascade Volcano Observatory in Vancouver, WA. She has a Bachelor degree from the University of Vermont and a Master's degree from University of Colorado.

She joined the Volcano Hazards group in Denver, CO in 1983 and was transferred to the Cascade Volcano Observatory (CVO) May 1987.

(continued page 63)

(continued from page 62)
Most of her field work has been centered in the Cascades: Mt. Bachelor, Mt. Hood, and Mt. St. Helens.

The emphasis of her work has been petrology and paleomagnetism as tools used in mapping and done primarily in conjunction with Willie Scott.

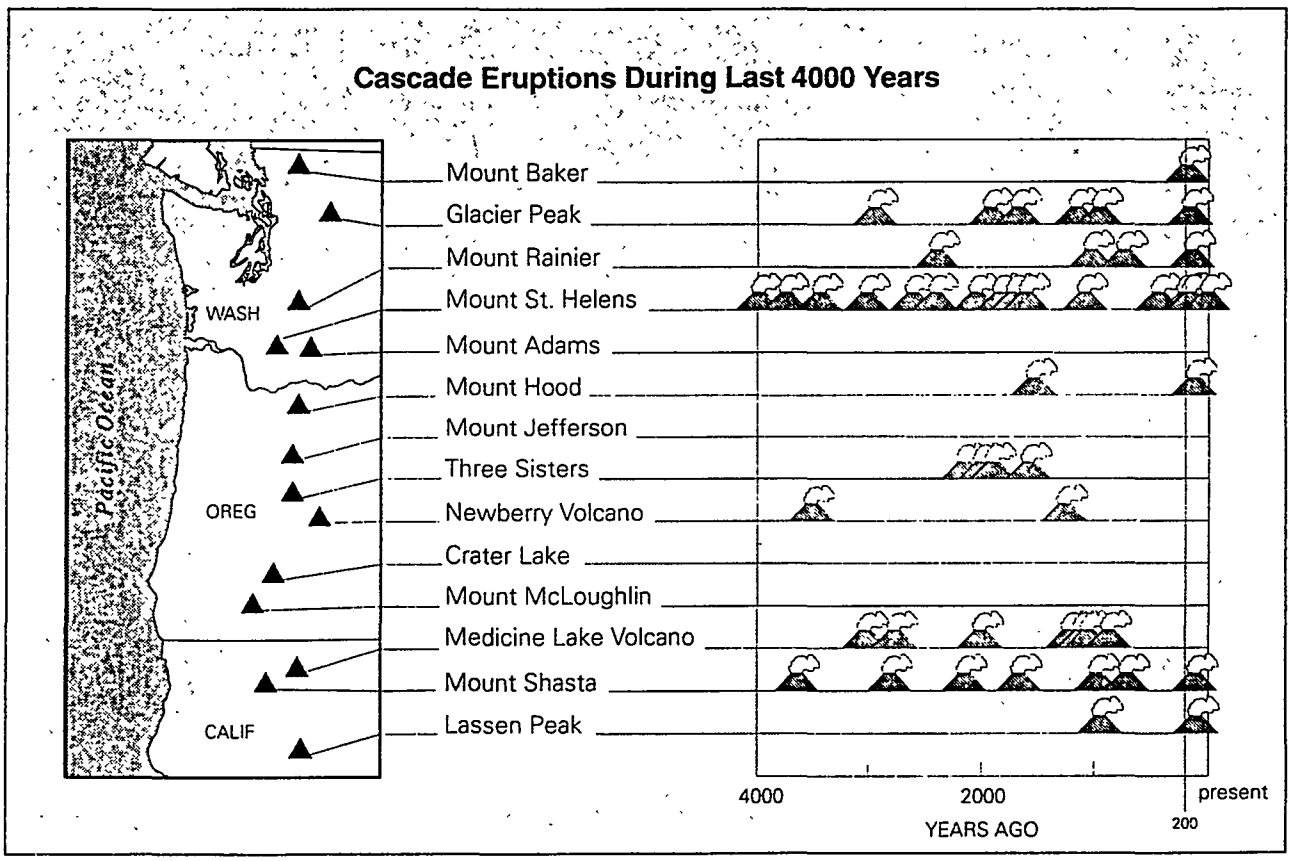
She has been involved in three crisis responses: the 1989-1990 eruption of Redoubt Volcano in Alaska, the 1992 eruption of Crater Peak/Mt. Spurr in Alaska, and the 1995 eruption of Soufriere Hills, Montserrat, West Indies.

Her current work includes geologic studies at Augustine Volcano in Alaska, at Mt. Hood, and on a volcano hazards report on Mt. Jefferson.

Her presentation , "Volcanic Hazards of Mt. Hood", was given October 9, 1998.

CASCADE VOLCANOES

Eruptions in the Cascades have occurred at an average rate of 1-2 per century during the last 4000 years, and future eruptions are certain. Seven volcanoes in the Cascades have erupted since the first U. S. Independence Day a little more than 200 years ago. Four of those eruptions would have caused considerable property damage and loss of life if they had occurred today without warning. As population increases in the Pacific Northwest, areas near the volcanoes are being developed and recreational usage is expanding. As a result, more and more people and property are at risk from volcanic activity. The next eruption in the Cascades could affect hundreds of thousands of people.



Graph from the USGS OPEN-FILE 94-585, "Preparing for the Next Eruption in the Cascades"

CAMP-OUT (PRESIDENT'S ANNUAL FIELD TRIP) QUESTIONNAIRE

We need your help to plan future field trips and would like to have your input. Please answer the questions. **Fold according to numbers on reverse side, seal, stamp and mail. Or, bring to the next GSOC meeting and save 32 cents, plus hear a good program.**

1. What kind of transportation for the field trip do you prefer?
   a. commercial bus_____ b. private car_____ c. rental vans_____ d. other (specify)_____

2. What time of year do you prefer to go? List the months.
   a. spring months: _____ b. summer months:_____
   c. fall months_____

3. How long do you want the field trip to last?
   a. several days (specify)_____
   b. a few days including a weekend?_____
   c. a weekend?_____
   d. one week?_____
   e. two weeks?_____
   f. other?_____

4. Do you think GSOC should continue to sponsor annual field trips?_____
   If yes, would you attend?_____
   Where would you like to go?

5. Where do you want to stay during a camp-out?
   a. motel_____ b. campground_____ c. mixture of both_____
   d. other (specify)

6. How much are you willing to spend?
   a. $100-200 _____ b. $300-400_____c. $500-600_____
   d. more than $600_____ Specify how much_____

7. D o you think a prepared field trip guide is essential to a good campout?_____

8. Have you ever attended a "campout" (President's Annual Field Trip)?_____
   a. If yes, approximately how many_____and where?

9. How far do you wish to walk per day?
   a. easy, 1-2 miles, level ground _____ b. moderate, 3-4 miles, some up and down _____
   c. strenuous 5-6 miles, up and down

10. Additional comments (use reverse side if necessary)

Additional comments:

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THE GEOLOGICAL NEWSLETTER

[e-mail: barrd15@uswest.net

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D Donald Barr		Rosemary Kenney	221-0757
Calendar:		Assistant Business Manager:	
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INFORMATION: Beverly Vogt, 292-6939
Evelyn Pratt, 223-2601

VOL. 64, No. 12
DECEMBER 1998

DECEMBER ACTIVITIES

(*Weather-watch season:* If schools are closed, meetings are postponed to a later date.)

Wednesday Dec. 2, 12-1:30 PM, Central Library: Hawaii - Land Born of Fire
Presenter: Carol Hasenberg, GSOC Vice-President

Fri. Dec. 11, 8:00 PM, Rm. 371 Cramer Hall: Geology & Geologic Hazards of Mt.Rainier
Presenter: Carolyn Driedger, Cascade Volcano Observatory, USGS

Wednesday seminars will continue in January.

If you know someone who's willing to give a good geology field trip, PLEASE LET ME KNOW. Thanks! Evelyn Pratt, 223-2601

Happy Holidays!

****

PREVIEW OF COMING ATTRACTIONS: **JANUARY**

Wed. Jan. 6, 12-1:30 PM, Central Library: Oregon's Spectacular Forgotten Corner
Presenter: Evelyn Pratt, past GSOC president

Fri. Jan. 8, 8:00 PM, Rm. 371 Cramer Hall: Recent Rock Avalanches at Mt. Adams
Presenter: Dick Iverson, Cascade Volcano Observatory, USGS

****

Please give calendar items to Evelyn Pratt by the 15TH of the month. 223-2601; ralf70@aol.com

---

DR RUTH HOPSON KEEN

Ruth Hopson Keen was born June 19, 19006 in Sayre, Oklahoma and died in Portland, Oregon , October 17, 1998 At the age of four she moved with her family to Marshfield (now Coos Bay), Oregon. She graduated from Marshfield High School in 1924. She received a B.A. degree in 1933 and an M.A. degree in 1935 from the University of Oregon In 1946 she received PhD degree from Cornell University.

She taught public school in Marshfield and Salem. after receiving her PhD, she taught Statewide Classes for the Division of Continuing Education of the State System of Higher Education. The classes were in Geology, Natural History and Conservation of Natural Resources, After teaching Statewide classes for fifteen years Ruth moved to Portland to teach night classes at Portland State University Before retiring, Ruth was a Professor of General Science,

An avid photographer, Ruth traveled to Yosemite twice to study with Ansel Adams. She used her photography through the years as an aid in her teaching. She was an active member in the Portland Photographic Society.

On May 6, 1966, Ruth married Albert J. Keen. They spent seventeen happy years together photographing, backpacking, traveling and gathering minerals. Ruth was a member of Mandolin Orchestra, Vancouver Pops, Oregon Agate and Mineral and Portland Photographic Society She was a long time member of
the Geological Society of the Oregon Country and served as president in 1982 and 1990.

Ruth is survived by stepdaughter Carolyn Keen Schmidt of Washington, D.C. and numerous friends.

Ruth's legacy is her influence in the lives of many students and friends.

EDITOR NEEDED

We urgently need a Newsletter Editor. No experience is necessary, but a computer would be helpful. The main duty is to assemble information: there would be no production tasks required: folding, stapling, mailing, since someone else does those tasks. Anyone interested or even partially interested either as Editor or assistant should call Cecelia Crater at 235-5158 or Roasemary Kenney at 221-0757. Inquires welcome.

Dues reminder

Annual dues for 1999 are due january 1, 1999. Please mail check or money order to GSOC, P.O. Box 907, Portland, OR 97207. Dues are: individual, $20; Family $30, Junior(under 18) or student $10.

COMPLETELY FRACTURED GEOLOGY

By Evelyn Pratt

1.**ichnofossil**: what you say when you go to pick up what you think is a fossil slug and it isn't
2.**frustule**: a small red spot that one gets from having problems with a Microsoft program
3.**insulosity**: (1) sauciness (2) abnormal rays of sun in Oregon
4.**iridium**: waxy substance found in the ear
5.**limnology**: what a naughty Victorian gentleman liked to study
6.**hypsographic curve**: a vivid description, using hand motions, of a film star's anatomy below waist level
7.**purl**: what an oyster would make if it were a happy cat
8.**xenic**: important Swiss city where watches are made
9.**coesite**: a place decided upon by two people working together
10.**detritus**: what you tell a pollster just before an election, when he/she asks you to support a measure you don't like; 'Cnetritus already, and we still won't vote for it!"

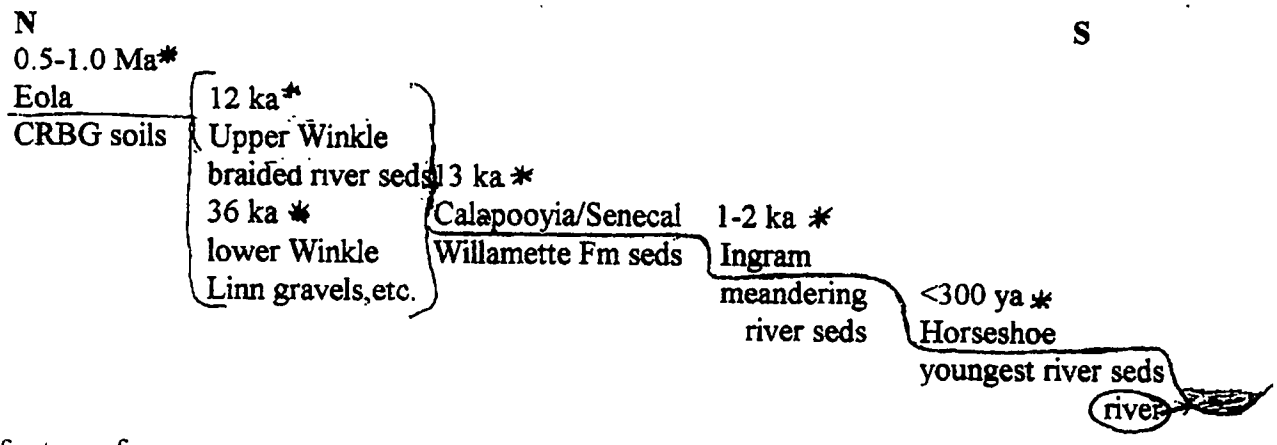
GETTING DEEP DOWN AND DIRTY WITH THE FOP: 1998

by E. Pratt
Trip leaders: Drs. Scott Burns and Jim O'Connor

This year's Friends of the Pleistosene field trip was, as usual, interesting+educational, The campground was at Champoeg which, besides its historical importance as the onetime capitol of the Oregon Territory, is a beautiful riparian park with good views of the river, huge oak and ash trees, flush toilets, and hot showers.

The Willamette Valley has been lowland for at least 15 million years. It is really two basins, sep arated south of Salem by hills of Columbia River Basalt Group rocks. The northern basin from Salem to Portland is bounded mostly by CRBG, and shows evidence of a lot of tectonic movement. The southern depression has Cascade volcanics to the east, early Tertiary marine rocks to the west, and a calmer tectonic history. Major Cascade rivers have built fans out into the valley.

For those of us who view soil as the stuff that covers up rocks, FOP trips are eyeopeners. First thing I found was that geomorphic surfaces have one set of names, and the soils that underlie them have another. The Eola surface is Pleistocene, but its soil is weathered 15-16 Ma CRBG. This chart is my own rough interpretation. For any soil scientist reading it, I apologize in advance for mistakes and stepped-on toes!



*Ages refer to surfaces

The Eola Suface is seen mostly on hills and valley side terraces. The soils underlying it are the really red ones on hills near Dundee and south of Salem, and under a lot of vinyards. In the southern part of the valley the Dolph surface (not shown) also tops reddish soils, and is a bit younger than the Eola. These soils developed in a Mediterranean-like climate. The upper Winkle Surface is the site of Missoula flood channels' Lake Labish. Lower Winkle Surface often covers Troutdale-like gravel. Calapooyia/Senecal Surfaces are very flat, derived when lakes from Missoula floods dried up and left fine-grained sediments behind. The Willamette Formation that they are built on shows over 60 layers of flood deposits (rhythmites), and is great soil for farming. The Horseshoe surface represents what the Willamette River and its feeders have left lately.

The best places to see western Oregon sediments are in gravel pits, and we were given entry to several. I found Delta Sand & Gravel, just north of Eugene, the most interesting. Excavation has exposed a mudflow which filled in a river channel. The mudflow evidently came from somewhere near Willamette Pass. In it we found pieces of obsidian from pea- to baseball-size, and someone saw leaf fossils.

A high (or low?) spot on the trip was at Irish Bend, on the Willamette River between Corvallis and Eugene. 55 of us descended a ladder to the muddy shore of the river. The vertical cut, maybe 15-20 feet high, exposed layers of Linn gravel lower down, and many Willamette Fm. rhythmites from the Missoula

floods above them. Rhythmites are harder to count this time of year than they would be in spring, but we did see some. Then it started to rain. As it fell, two experts debated at length whether one 6" thick Greenback Member of the Willamette Formation was eolian (windblown) or alluvial (waterlaid). We observed that Willamette mud sticks to boot soles like glue. A speedboat zipped in close. It was the sheriff, investigating the goings-on.. Scott Burns gave him a big smile and waved. He waved back, then sped away. Probably figured we were a bit loony, but harmless.

Near Dayton we stopped at the home of Ray and Mary Geller. In Feb.1996 a massive landslide left a clifflike slope that drops from their yard to the river, exposing 30 Missoula flood rhythmites. A well-anchored rope helped us more or less rappel down to get a better look at some 1 to 2 foot thick layers. Each rhythmite grades upward from coarser sediments such as sand, laid down when first flooding pours in, to finer and finer as floodwaters become still lakes. Analysis of sediments at Geller's has shown a major difference between the older 15 rhythmites and the newer ones.

On Day 2 we ate lunch and basked in sunshine at Queener Fruit Farm on a terrace near Stayton. As we munched on Vandercamp's fresh tomatoes and Gala apples, Peter told us how farming on 1/2 to 1 Ma weathered basalt terraces offers more challenges than growing crops on the rich sediments of the Willamette valley floor. Terrace soil is very acid, and must be limed every 2 to 3 years. It is deficient in magnesium, potassium, boron and zinc, and is low in organic material. A couple of feet down is a cemented basalt gravel layer, and below that, highly weathered material which tends to be impermeable. A nearby road cut showed all three layers. In the lowest one we could cut cobbles with a shovel.

All in all, it was a most rewarding field trip. The GSOC library has a copy of the field guide, which includes Jim O'Connor's brand-new map of the Willamette Valley. The map shows much more about Quaternary soils than was known previously. Do you remember geologist/archeologist Alex Bourdeau's excellent GSOC presentation in January? He'll be the leader of next year's FOP trip, which will be based at Oxbow Park. He's both knowledgeable and enthusiastic - it should be a great trip.

And Scott Burns has volunteered to give us a program on Willamette Valley wine country, complete with winetasting. is an opportunity which shouldn't be missed.

GEONOTES - By Ray Crowe

* Meteorite Hits Car. Item from San. '98 issue of Pegmatite. the San Diego Mineral and Gem Society. On October 9th, 1992, millions on the east coast enjoyed the fireworks show as a meteor flashed from south to north. A chunk fell out of the sky and hit Michelle Knapp's 1980 Chevy Malibu in the trunk as it was sitting in the driveway of her home in Peekskill, N.Y. The 27 pound, 11.5 X 6.5 X 4.5 inch meteorite punched a hole in the trunk of the car, smashing through into the ground where it left a three inch crater.

* Bolivian Dinosaurs Found. Paleontologists have located in 1995, and have been excavating in Bolivia, a new area that promises to yield some new dinosaur species, and a wealth or dinosaur footprints. The area is in the Kila Kila region, near Sucre and Cal Orcko, a mountainous region some 400 miles southeast of La Paz. There are some fifty sites, from 68 million years ago, that are spread over a large area at altitudes between 8,000 and 10,000 feet above sea level.

David Keremba, president of the Paleontology Society of the San Francisco's Xavier University, has made numerous expeditions and found the square-in-shape footprints that belong to a quadruped up to 66 feet long. Besides the footprints, there are known dinosaur species such astheropods and omithopods, and traces of several non-classified species. Keramba said that it appears that a new species has been found.

The area appears to have the largest number of dinosaur footprints in the world...some 3000 of them in 250 different track-ways. There appear to be, besides the large quadruped, tracks of two other separate smaller quadrupeds that are of a new species. Information from Internet.

* Studies Indicate T-rex Didn't Have Any Lips. An Ohio University paleontologist, Lawrence Witmer, suggested that lips were probably absent from Tyrannosaurus rex, and that Triceratops didn't have any cheeks. This supposition should have an effect, if true, on toy manufacturers and movie set producers, says an article from the Internet.

Witner's research was presented at the Society for Vertebrate Paleontology, Sept. 30th to Oct. rd, in Snowford, Utah. He is an assistant professor of anatomy at the College of Osteopathic Medicine at Ohio University, and the principal investigator of a National Science Foundation grant o study the soft tissues of dinosaurs.

Triceratops, long had been believed to have had fleshy cheeks due to the way scientists believe the creatures ate, as compared to modem-day mammals like sheep. Cheeks were believed to be an important facial feature affecting the efficiency with which Triceratops and sheep chewed. The teeth ere found to beset in from the surface of the skull, the presence of cheeks containing muscles explaining the jaw structure.

Wittner found the comparison to be false though, modem mammals with muscular cheeks do not ave the same indented area in the upper and lower jaw seen in dinosaurs. The suspected conclusion that jaw features supported an extended beak, like on eagles or crocodiles.

Apparently a false assumption was also made with *Tryrannosaums rex* in assigning lips to the creature. Modern day lizards have muscular lips with scales hanging off their mouths to hide the teeth. Tyrannosaur had skin, rather than scales, that probably didn't cover the teeth, but extended to the edge of the jaw.

Witmer started his study two years ago and has cat-scanned dozens of dinosaur fossils, and done the same with modem animals for comparison. As birds and crocodiles are probably closest to dinosaurs, its surprising, Wittner says, that scientists haven't made more comparisons with these animals. Please send any comment you might have to the editor of the GSOC newsletter.

* West Seattle Petroglyphs printed some information concerning fossils in Vol.33, #9. They are supporting the Fossil Preservation Act of 1995, and want you to write your congressman in support. The 1992 Baucus legislation would have banned fossil collecting on public lands except by degreed academics, and in 1994 the US Forest Service proposed rules making all fossil collecting illegal. Protest killed both, but the proposed legislation caused the American Lands Access Assn. to be formed of two of the largest amateur fossil and mining associations to keep it from happening again, starting out with a plan called The Paleontological Resources Preservation Act. Copy of present bill and information from Ms. M. Zenker, C\O Black Hills Inst., PO Box 643, Hill City, SD 57745.

Tree ring studies established A.D. 1700 as year of huge Cascadia earthquake

By Shannon Priem, Oregon Department of Geology and Mineral Industries

Growth rings of ancient trees confirm that an earth-quake in North America sent ocean waves to Asia almost three centuries ago, according to two groups of American scientists.

The scientists, in reports that have recently appeared in the journals Nature aarnaguchi and others, 1997) and Geology (Jacoby and others, 1997), present tree-ring dates for an earthquake and tsunami that had been previously inferred from geologic observations in the northwestern United States and adjacent Canada. Scientists have compared these dates with the time of a tsunami known from village records in Japan. The agreement is so remarkable, the scientists say, that the Japanese records become written proof that the earth-quake really happened.

At issue is the threat posed by an active fault that dwarfs the San Andreas fault and underlies a mostly offshore area from southern British Columbia to northern California. This fault the Cascadia Subduction Zone caused little concern until the late 1980s, when scientists began to recognize geologic evidence that the fault has produced earthquakes of magnitude 8 or larger. The most recent of these events was soon dated by radiocarbon methods to the decades between A.D. 1680 and I 720.

These dates caught the attention Japanese researchers, who checked Japanese village records for signs of an "orphan" tsunami between 1680 and 1720 They found just one candidate, and they used its size and date to calculate that the Pacific Northwest had hac an earthquake close to magnitude 9 in January of 1700 Their report was published early last year, in Nature (Satake and others, 1996).

American scientists responded by setting out to learn whether their Japanese colleagues had identified the correct year and season of a huge

Pacific Northwest earthquake. One team, led by David Yamaguchi of the University of Washington in Seattle, studied trees killed by an earthquake near the mouth of the Columbia River Another team, led by Gordon Jacoby of Lamont-Doherty Earth Observatory in Palisades, New York, focused on trees that barely survived it.

Each tree-ring team concludes that a huge Pacific Northwest earthquake occurred in the months between August 1699 and May 1700~dates that indeed converge on the time of the January 1700 tsunami in Japan.

The scientists report that trees killed by the earthquake died sometime after the 1699 growing season ended, but before the 1700 growing season began. In addition, the Jacoby team describes signs of trauma that begin with the 1700 ring of several of the trees that survived the earthquake.

The Yamaguchi team also addresses the controversy about the maximum size of the Pacific Northwest earthquakes. Previously, some earth scientists had inferred nothing less than magnitude 8, while others proposed magnitude 9, which is many times larger in terms of energy released, geographic area, and duration of shaking.

Writing in Nature! the researchers contend that a huge earthquake is now more plausible, because the new tree-ring dates fail to show that the 1700 event was smaller than magnitude 9.

REFERENCES CITED

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Jacoby, G.C., Bunker,D.E., and Benson, B.E., Tree-ring evidence for an A.D. 1700 Cascada earthquake in Washington and northern Oregon: Geology,v.25, no.11, p. 999-1002

Satake, K., Shimazaki, K., Tsuji, Y., and Ueda, K., 1996, Time and size of a great earthquake in Cascadia inferred from Japamese tsunami records of January 1700: Nature, v.379, p. 246-249.

COMPLETELY FRACTURED GEOLOGY

Definitions modified from AGI's 3rd Ed. By Bates and Jackson& Random House Unabridge d Dictionary: by Evelyn Pratt.

1. ichnofossil: trace fossil
2. frustule: the cell wall of a diatom, made of silica and consisting of two microscopic boxlike halves
3. insulosity: of a lake that is covered by islands
4. iridium: a platinum-type metallic element associated with meterorites and other bodies from space
5. limnology: the study of fresh water such as that in lakes and ponds
6. hypsographic curve: a profile usually showing the statistical distrubtion of the earth's soliid surface at various elevvations above, or depths below, sea level
7. purl: to flow with curling or rippling motion, as a shallow stream does over stones
8. xeric: pertaining to a dry envi:onment
9. coesite: a very dense form of quartz found in impact craters such as those produced by meteeors
10. detritus: debris such as loose rocks and minerals produced by disintegration or abrasion and removed from its place of origin.