THE GEOLOGICAL NEWSLETTER

GSOC

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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1999-2000 ADMINISTRATION
BOARD OF DIRECTORS

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, by 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. 371, 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 02705451),** 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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Carol Hasenberg, 503-282-0547 or
Evelyn Pratt, 503-223-2601

VOL. 66, No. 1
JANUARY 2000

JANUARY ACTIVITIES

Fri. Jan. 7, 12-1:30 PM: Dangerous Volcanoes of the World - A Study from the Space Shuttle through the Advanced Technology of Side-Looking Radar
Taylor Hunt Central Library, 801 SW 10th St.

Fri. Jan. 14, 8:00 PM: Geology and Lifeforms of Mars Sandra Adamson, ex-NASA
Rm. 371 Cramer Hall, PSU, 1721 SW Broadway

Wed. Jan. 26, 8:00 PM: Seminar (1) *Did Life Form on Clay?* Richard Bartels
(2) *The World's Oldest Fossils* Evelyn Pratt
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(2) TBA
February Field Trip: Sat. Feb. 12: Dave Taylor - Triceratops, other OMSI exhibits.
BANQUET IN MARCH.

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Calendar items must be received by 15TH of preceding month. Evelyn at 503-223-2601; ralf70@aol.com

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USGS/Cascades Volcano Observatory, Vancouver, Washington

DESCRIPTION:
Glacial Lake Missoula and the Missoula Floods

From: Waitt, 1985, Case for periodic, colossal jokulhlaups from Pleistocene glacial Lake Missoula: GSA Bulletin v.96, p.1271-1286.

The only outlet of the 2,500-cubic-kilometer **glacial Lake Missoula** was through its great ice dam, and so the dam became incipiently buoyant before the lake could rise enough to spill over or around it. Like Grimsvotn, Iceland, Lake Missoula remained sealed as long as any segment of the glacial dam remained grounded; when the lake rose to a critical level around 600 meters in depth, the glacier bed at the seal became buoyant, initiating underflow from the lake. Subglacial tunnels then grew exponentially, leading to catastrophic discharge. Calculations of the water budget for the lake basin (including input from the Cordilleran ice sheet) suggest that the lakes filled every three to seven decades. The hydrostatic prerequisites for a jokulhlaup were thus re-established scores of times during the 2,000- to 2,500-year episode of last-glacial damming. ...

Proof that only one graded backflood rhythmite is produced per **Missoula flood** permits revisions in the inferred age of the floods. Earlier speculations such as the notion of an "early Pinedale" flood 18,000 to 20,000 years ago (Richmond, et.al., 1965; Bretz, 1969, Baker, 1973), are now suspect because of limiting ages on the **Cordilleran ice sheet, Lake Missoula**, and the **Missoula floods. Glacial Lake Missoula** could have existed only within the broad limits between preglacial Carbon-14 dates as young as approximately 17,200 years B.P. and postglacial dates as old as 11,000 years B.P. in southernmost British Columbia (Clague, 1981). If the **Purcell Trench lobe** took a millennium to advance 100 kilometers from there to the Bitterroot Range and a millennium to retreat back into British Columbia, then Lake Missoula existed only between about 16,000 and 12,000 years B.P. The lake probably existed for only about half this period, for the known varves within Lake Missoula bottom sediment or between flood-laid beds in other glacial lakes sum up to less than 2,500 (Chamber, 1971; Atwater, 1983).

The age of the later Missoula floods into southern Washington is limited by the intercalated 13,000-years B.P. Mount St. Helens ash (Mullineaux, et.al., 1978), which overlies at least 28 flood rhythmites and underlies at least 11 (Waitt, 1980b). A new radiocarbon date from a shelly dune at the top of the third Missoula-flood rhythmite below the ash bed at Mabton is 14,060+/-450 years B.P. (USGS-684). The 11,250+/-250-year Glacier Peak ash-layer G (Mehringer, et.al., 1984) postdates ice-sheet retreat in Washington and Montana (Waitt and Thorson, 1983); it overlies deposits of one huge flood but not those of small floods that followed deglaciation of the Columbia valley (Waitt, 1982a, 1982b). All considered, the various limits on the ice sheet and floods suggest that glacial Lake Missoula existed for 2,000-2,500 years between 15,300 and 12,700 years B.P.

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Glacial Lake Missoula, an immense water body dammed in the upper Clark Fork valley by the Purcell Trench lobe, was the source of floodwater that catastrophically swept across the Channeled Scabland (Bretz, et.al., 1956; see also Baker, 1982). Shorelines near and west of Missoula (Pardee, 1942) record successive stands of the lake as much as 300 meters below its highest level. The many sparsely developed shorelines argue that no one level records a lengthy stand of the lake; consistent with this relation is the absence of evidence for a lake spillway around the ice dam (Bretz, et.al., 1956).

Until recently there were thought to have been only a few Fraser-age fillings and emptyings of the lake (Pardee, 1942; Bretz et.al., 1956; Richmond, et.al., 1965; Bretz, 1969; Baker, 1973, 1978b), but Chambers (1971) and Waitt (1980a) inferred as many as 40 successive fillings and drainings. **Lake Missoula** bottom sediment is rhythmically bedded (Chambers, 1971; Curry, 1977, Waitt, 1980a). Thin-bedded silt at the base of a typical rhythmite passes upward to progressively thinner varves, the record of a gradually deepening lake. Complementary rhythmic slack-water sediment reveals evidence for about 40 separate catastrophic backfloodings of Columbia River tributaries in southern Washington and northwestern Oregon (Waitt, 1980a). These stratigraphic and sedimentologic relations indicate that glacial Lake Missoula was hydrostatically controlled by the thickness of the ice dam; the lakes periodically emptied as great jokulhlaups that discharged down the Columbia River valley and Channeled Scabland. Just south of Spokane, 16 beds of gravel deposited by floods that ascended Latah Creek valley are each capped by a bed of varved clay at least as high as altitude 610 meters, evidence that at least 16 of the jokulhlaups that swept into the Spokane area from the Rathdrum valley emptied into **glacial Lake Columbia I (or Lake Spokane ?).** In several places far north of Spokane, the intercalation of similar flood deposits with thin clay beds at least as high as altitude 690 meters indicates that some of the floods that swept through the highlands south of the Pend Oreille River valley also disgorged into glacial Lake Columbia I. ...

As the **Purcell Trench lobe** retreated to north of the Bitterroot Range, **glacial Lake Missoula** was succeeded by **glacial Lake Clark.** During further retreat of the ice margin, Lake Clark merged to the north with the expanding **glacial Lake Kootenay.** Alden (1953) recognized no significant recessional moraines built during retreat of the lobe.

Superposed rhythmites of individual floods in southern Washington and the absence of weathering between the rhythmites indicate that the huge jokulhlaups from glacial Lake Missoula occurred repeatedly during the entire episode of ponding (Waitt, 1980a). Because the lake was ponded near the terminus of the **Purcell Trench lobe,** the long interval of ponding implies that the lobe maintained its near-maximal position for millennia. As the ice dam eventually began to thin, Lake Missoula filled to successively lower levels after each discharge (Waitt, 1980a). During the glacial maximum and initial retreat, glacial Lake Missoula lapped against tongues of the **West Kootenai** and **East Kootenai glaciers.** The paucity of sand and silt in the upper Lake Missoula rhythmites suggests that these glaciers receded from the north margin of the lake while the Purcell Trench ice dam was thinning (Waitt, 1980a). As these glaciers retreated, the successively lowering Lake Missoula eventually became separated from the lake basins to the north by the emerging divide.

Varved clay and silt deposits of moraine-dammed **glacial Priest Lake** are regularly interrupted by 14 beds of sand having upvalley-directed paleocurrents, apparently the record of 14 large Lake Missoula jokulhlaups that backflooded into a long-lived glacial lake (R.B.Waitt, Jr., unpublished report). Varved lake deposits near Spokane are interpreted by many as 16 beds of bed-load flood gravel (E.P.Kiver and D.F.Stradling, personal commun., 1981; R.B.Waitt, Jr., unpublished report), evidence that at least 16 of the last Lake Missoula jokulhlaups discharged into the eastern end of **glacial Lake Columbia I.** As many as 11 of these floods in southern Washington postdated the 13,000 years B.P. (Mullineaux, et.al., 1978) Mount St. Helens set-S tephra (Waitt, 1980a, 1980b). Lake Missoula drained for the last time when the **Purcell Trench lobe** at last withdrew from the north end of the Bitterroot Range. The **Clark Fork drainage** remained ponded, as **glacial Lake Clark** by the retreating **Pend Oreille River sublobe.** Glacial Lake Clark drained with the combined **Colville River sublobe** and **Columbia River lobe** withdrew a few kilometers north of the international boundary and thus deglaciated the lower Pend Oreille River valley.

Polar dinosaurs in Australia?

As a meteorologist, Alfred Wegener was fascinated by questions such as: Why do coal deposits, a relic of lush ancient forests, occur in the icy barrenness of Antarctica? And why are glacial deposits found in now sweltering tropical Africa? Wegener reasoned that such anomalies could be explained if these two present-day continents -- together with South America, India, and Australia -- originally

were part of a supercontinent that extended from the equator to the South Pole and encompassed a wide range of climatic and geologic environments. The break-up of Pangaea and subsequent movement of the individual continents to their present positions formed the basis for Wegener's continental drift theory.

Recently, *paleontologists* (specialists in studies of fossils) have carefully studied some well-preserved dinosaur remains unearthed at Dinosaur Cove, at the southeastern tip of mainland Australia. Dinosaurs found in most other parts of the world are believed to have lived in temperate or tropical regions, but these Australian species, popularly called "polar" dinosaurs, seemed well adapted to cooler temperature conditions. They apparently had keen night vision and were warm-blooded, enabling them to forage for food during long winter nights, at freezing or sub-freezing temperatures. The last of the dinosaurs became extinct during a period of sharp global cooling toward the end of the Cretaceous period (about 65 million years ago). One current theory contends that the impact of one or more large comets or asteroids was responsible for the cooling trend ("impact winter") that killed off the dinosaurs; another theory attributes the sudden cooling to global climate change brought on by a series of huge volcanic eruptions over a short period of time ("volcanic winter"). The discovery of the polar dinosaurs clearly suggests that they survived the volcanic winter that apparently killed other dinosaur species. This then raises an intriguing question: Why did they become extinct if they were well adapted to a cold climate? Paleontologists do not have the answers. Regardless, this recently acquired paleontologic evidence convincingly demonstrates that Australia has drifted north toward the equator during the past 100 million years. At the time when the Australian polar dinosaurs thrived, their habitat was much farther south, well within the Antarctic Circle.

In 1991, paleontologists discovered the *Cryolophosaurus elliotí,* a previously unknown dinosaur species and the only one found on the continent of Antarctica. *Cryolophosaurus* fossils were found at Mount Kirkpatrick, located only 600 km from the present-day South Pole. This newly discovered carnivorous dinosaur probably was similar in appearance to the *Allosaurus*, except for a distinctive bony crest on its head, another meat-eating species found at Dinosaur Cove, Australia. Studies show that the *Cryolophosaurus* lived about 200 millions years ago, when Antarctica was still part of Gondwana and had a climate similar to that of Pacific Northwest--mild enough to support large plant-eating animal life, upon which the *Cryolophosaurus* preyed. With the break-up of Gondwana, *Allosaurus* and *Cryolophosaurus* parted company, as Australia drifted northward toward the equator and Antarctica drifted southward to the South Pole.

Had the Australian polar dinosaurs and the *Cryolophosaurus* been discovered while he was alive, the embattled Alfred Wegener would have been delighted!

URL: http://pubs.usgs.gov/publications/text/polar.html
Last updated: 12.13.99
Contact: jmwatson@usgs.gov

Rocks and Minerals needed for the Rock Sale at the March Banquet
If you have *nice* rocks and minerals that you would like to offer for sale at the Annual GSOC Banquet in March, please contact **Archie Strong, 244-1488.**

In Memorium

Lidija Balodis died October 5, 1999 at age 78 after a two-year bout with Multiple Myeloma. She was born in Latvia, in 1921, and immigrated to the United States in 1947. She became an architect and earned a master's degree in civic planning. She worked for Bonneville Power Administration for 22 years, designing high tension towers and sub-station buildings. Her hobby was painting, mostly in water colors because she was allergic to oil paints.

She was a member of Oregon Association of Artists, Oregon Agate and Mineral Society, and the Geological Society of the Oregon Country. For several years she attended the GSOC work parties at Camp Hancock, putting her architectural skills to good use.

She is survived by her husband in Tigard and a daughter who lives in Seattle.

Letter to the editor

This fall, my wife and I took a trip through parts of Pennsylvania, Virginia, and Delaware to see the fall colors, do some antiquing, and to visit relatives in Washington, D.C.

Near Lancaster, Pennsylvania, we saw a sign pointing to the Oregon Pike Road. This aroused our curiosity because we couldn't understand why such a name should be applied to a place so far from our state. That afternoon we visited the Landis Valley Museum (well-worth seeing, by the way) and asked one of the guides if he could tell us how the Oregon Pike got its name. Although he couldn't remember how it had happened, he promised to do some research on it and let us know. We just received his report.

The first road laid out from Lancaster to Jacob Bear's Mill at Oregon began in 1739. This road lay to the west of today's Oregon Pike. By 1860 the road had been extended from Lancaster to Reading, Pennsylvania, approximately 35 miles to the east. In 1903, the first automobile traveled from Lancaster to Reading along the Oregon Pike. In about 1926, the state highway department took over the road and it became toll-free for the entire distance.

Why is Oregon, Pennsylvania called Oregon? I have enclosed a Xerox copy of the report I received which apparently gives the answer. So far as Jean and I could determine, the town of Oregon no longer exists (nor the post office) as the name does not appear on the latest map of Pennsylvania. If you are ever traveling in eastern Pennsylvania, we recommend that you search out the Oregon Pike Road and drive along it. In the fall the country around there is beautiful as it winds through rolling hills past well-kept farmsteads.

Enclosed information: "Why is Oregon, Pennsylvania called Oregon? ... It happens that this area was first known as Catfish, because the fishing was so good that wealthy gentlemen from Lancaster City would spend lazy weekend afternoons fishing here. As more and more small villages got their own post offices along developing post road systems, the villagers of Catfish decided in 1840's they would petition for their own post office.

"Keep in mind that at this time the big national news event was a border dispute between the United States and Great Britain on the U.S.-Canadian border. Both sides had been arguing for years over which land belonged to the United States and which belonged to the Dominion of Canada. Eventually it was decided that Oregon should stretch up to the 49th parallel. Now let's relate that bit of historic trivia back to the post office in Catfish.

"The villagers of Catfish decided that Catfish was not an appropriate name if they were going to petition for a federal post office. Debate began on a new name for the village. Noting the important border dispute out west, Henry Lehman of the famous Lehman Rifle Works led a movement to rename the village Oregon. As we see on maps and road signs today, Lehman was successful in his efforts."

Sincerely, "Andy" Corcoran November 17, 1999

The Last Word: Please pay membership dues by January 1. Thanks!

JAN 00

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As the **Purcell Trench lobe** retreated to north of the Bitterroot Range, **glacial Lake Missoula** was succeeded by **glacial Lake Clark**. During further retreat of the ice margin, Lake Clark merged to the north with the expanding **glacial Lake Kootenay**. Alden (1953) recognized no significant recessional moraines built during retreat of the lobe.

Superposed rhythmites of individual floods in southern Washington and the absence of weathering between the rhythmites indicate that the huge jokulhlaups from glacial Lake Missoula occurred repeatedly during the entire episode of ponding (Waitt, 1980a). Because the lake was ponded near the terminus of the **Purcell Trench lobe**, the long interval of ponding implies that the lobe maintained its near-maximal position for millennia. As the ice dam eventually began to thin, Lake Missoula filled to successively lower levels after each discharge (Waitt, 1980a). During the glacial maximum and initial retreat, glacial Lake Missoula lapped against tongues of the **West Kootenai** and **East Kootenai glaciers**. The paucity of sand and silt in the upper Lake Missoula rhythmites suggests that these glaciers receded from the north margin of the lake while the Purcell Trench ice dam was thinning (Waitt, 1980a). As these glaciers retreated, the successively lowering Lake Missoula eventually became separated from the lake basins to the north by the emerging divide.

Varved clay and silt deposits of moraine-dammed **glacial Priest Lake** are regularly interrupted by 14 beds of sand having upvalley-directed paleocurrents, apparently the record of 14 large Lake Missoula jokulhlaups that backflooded into a long-lived glacial lake (R.B.Waitt, Jr., unpublished report). Varved lake deposits near Spokane are interpreted by many as 16 beds of bed-load flood gravel (E.P.Kiver and D.F.Stradling, personal commun., 1981; R.B.Waitt, Jr., unpublished report), evidence that at least 16 of the last Lake Missoula jokulhlaups discharged into the eastern end of **glacial Lake Columbia I**. As many as 11 of these floods in southern Washington postdated the 13,000 years B.P. (Mullineaux, et.al., 1978) Mount St. Helens set-S tephra (Waitt, 1980a, 1980b). Lake Missoula drained for the last time when the **Purcell Trench lobe** at last withdrew from the north end of the Bitterroot Range. The **Clark Fork drainage** remained ponded, as **glacial Lake Clark** by the retreating **Pend Oreille River sublobe**. Glacial Lake Clark drained with the combined **Colville River sublobe** and **Columbia River lobe** withdrew a few kilometers north of the international boundary and thus deglaciated the lower Pend Oreille River valley.

Polar dinosaurs in Australia?

As a meteorologist, Alfred Wegener was fascinated by questions such as: Why do coal deposits, a relic of lush ancient forests, occur in the icy barrenness of Antarctica? And why are glacial deposits found in now sweltering tropical Africa? Wegener reasoned that such anomalies could be explained if these two present-day continents -- together with South America, India, and Australia -- originally

were part of a supercontinent that extended from the equator to the South Pole and encompassed a wide range of climatic and geologic environments. The break-up of Pangaea and subsequent movement of the individual continents to their present positions formed the basis for Wegener's continental drift theory.

Recently, *paleontologists* (specialists in studies of fossils) have carefully studied some well-preserved dinosaur remains unearthed at Dinosaur Cove, at the southeastern tip of mainland Australia. Dinosaurs found in most other parts of the world are believed to have lived in temperate or tropical regions, but these Australian species, popularly called "polar" dinosaurs, seemed well adapted to cooler temperature conditions. They apparently had keen night vision and were warm-blooded, enabling them to forage for food during long winter nights, at freezing or sub-freezing temperatures. The last of the dinosaurs became extinct during a period of sharp global cooling toward the end of the Cretaceous period (about 65 million years ago). One current theory contends that the impact of one or more large comets or asteroids was responsible for the cooling trend ("impact winter") that killed off the dinosaurs; another theory attributes the sudden cooling to global climate change brought on by a series of huge volcanic eruptions over a short period of time ("volcanic winter"). The discovery of the polar dinosaurs clearly suggests that they survived the volcanic winter that apparently killed other dinosaur species. This then raises an intriguing question: Why did they become extinct if they were well adapted to a cold climate? Paleontologists do not have the answers. Regardless, this recently acquired paleontologic evidence convincingly demonstrates that Australia has drifted north toward the equator during the past 100 million years. At the time when the Australian polar dinosaurs thrived, their habitat was much farther south, well within the Antarctic Circle.

In 1991, paleontologists discovered the *Cryolophosaurus ellioti,* a previously unknown dinosaur species and the only one found on the continent of Antarctica. *Cryolophosaurus* fossils were found at Mount Kirkpatrick, located only 600 km from the present-day South Pole. This newly discovered carnivorous dinosaur probably was similar in appearance to the *Allosaurus*, except for a distinctive bony crest on its head, another meat-eating species found at Dinosaur Cove, Australia. Studies show that the *Cryolophosaurus* lived about 200 millions years ago, when Antarctica was still part of Gondwana and had a climate similar to that of Pacific Northwest--mild enough to support large plant-eating animal life, upon which the *Cryolophosaurus* preyed. With the break-up of Gondwana, *Allosaurus* and *Cryolophosaurus* parted company, as Australia drifted northward toward the equator and Antarctica drifted southward to the South Pole.

Had the Australian polar dinosaurs and the *Cryolophosaurus* been discovered while he was alive, the embattled Alfred Wegener would have been delighted!

URL: http://pubs.usgs.gov/publications/text/polar.html
Last updated: 12.13.99
Contact: jmwatson@usgs.gov

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In Memorium

Lidija Balodis died October 5, 1999 at age 78 after a two-year bout with Multiple Myeloma. She was born in Latvia, in 1921, and immigrated to the United States in 1947. She became an architect and earned a master's degree in civic planning. She worked for Bonneville Power Administration for 22 years, designing high tension towers and sub-station buildings. Her hobby was painting, mostly in water colors because she was allergic to oil paints.

She was a member of Oregon Association of Artists, Oregon Agate and Mineral Society, and the Geological Society of the Oregon Country. For several years she attended the GSOC work parties at Camp Hancock, putting her architectural skills to good use.

She is survived by her husband in Tigard and a daughter who lives in Seattle.

Letter to the editor

This fall, my wife and I took a trip through parts of Pennsylvania, Virginia, and Delaware to see the fall colors, do some antiquing, and to visit relatives in Washington, D.C.

Near Lancaster, Pennsylvania, we saw a sign pointing to the Oregon Pike Road. This aroused our curiosity because we couldn't understand why such a name should be applied to a place so far from our state. That afternoon we visited the Landis Valley Museum (well-worth seeing, by the way) and asked one of the guides if he could tell us how the Oregon Pike got its name. Although he couldn't remember how it had happened, he promised to do some research on it and let us know. We just received his report.

The first road laid out from Lancaster to Jacob Bear's Mill at Oregon began in 1739. This road lay to the west of today's Oregon Pike. By 1860 the road had been extended from Lancaster to Reading, Pennsylvania, approximately 35 miles to the east. In 1903, the first automobile traveled from Lancaster to Reading along the Oregon Pike. In about 1926, the state highway department took over the road and it became toll-free for the entire distance.

Why is Oregon, Pennsylvania called Oregon? I have enclosed a Xerox copy of the report I received which apparently gives the answer. So far as Jean and I could determine, the town of Oregon no longer exists (nor the post office) as the name does not appear on the latest map of Pennsylvania. If you are ever traveling in eastern Pennsylvania, we recommend that you search out the Oregon Pike Road and drive along it. In the fall the country around there is beautiful as it winds through rolling hills past well-kept farmsteads.

Enclosed information: "Why is Oregon, Pennsylvania called Oregon? ...It happens that this area was first known as Catfish, because the fishing was so good that wealthy gentlemen from Lancaster City would spend lazy weekend afternoons fishing here. As more and more small villages got their own post offices along developing post road systems, the villagers of Catfish decided in 1840's they would petition for their own post office.

"Keep in mind that at this time the big national news event was a border dispute between the United States and Great Britain on the U.S.-Canadian border. Both sides had been arguing for years over which land belonged to the United States and which belonged to the Dominion of Canada. Eventually it was decided that Oregon should stretch up to the 49^{th} parallel. Now let's relate that bit of historic trivia back to the post office in Catfish.

"The villagers of Catfish decided that Catfish was not an appropriate name if they were going to petition for a federal post office. Debate began on a new name for the village. Noting the important border dispute out west, Henry Lehman of the famous Lehman Rifle Works led a movement to rename the village Oregon. As we see on maps and road signs today, Lehman was successful in his efforts."

Sincerely, "Andy" Corcoran November 17, 1999

The Last Word: Please pay membership dues by January 1. Thanks!

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ANNUAL BANQUET

Plans for the Sixty-fifth Annual Banquet are progressing. It will be held at the Elks Lodge, 3500 S.W. 104th, Beaverton, on Sunday, March 12, 2000. (The Lodge is located about four blocks north of Canyon Road on 104th). Bus 58 runs on Canyon Road but only every hour on Sundays. The MAX station is several miles away from the Elks Lodge. We are pleased to announce our speaker will be Dr. Scott F. Burns, Professor of Geology, Portland State University. His topic will be "Oregon--A Geological Wonderland." Doors will open at 1:00 p.m. and dinner will be served at 1:45 p.m. There is lots of parking at the rear of the building and there is entry to the banquet room from this parking area. We would appreciate receiving your reservation as soon as possible so a final count can be submitted to the Chef by March 1st. Send your reservations to GSOC, P. O. Box 907, Portland, Oregon 97207. Archie Strong will be manning the rock sales table and would welcome some of your rocks for sale. Call Archie about getting the rocks to him. Rosemary will also be selling publications.

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Dues for 2000 are due January 1, 2000. Members whose dues are received prior to April 1, 2000 will be included in the 2000-2001 Membership Directory. If you would like your email address in the Directory, please advise the Secretary.

ANNUAL BANQUET

Plans for the Sixty-fifth Annual Banquet are progressing. It will be held at the Elks Lodge, 3500 S.W. 104th, Beaverton, on Sunday, March 12, 2000. (The Lodge is located about four blocks north of Canyon Road on 104th). Bus 58 runs on Canyon Road but only every hour on Sundays. The MAX station is several miles away from the Elks Lodge. We are pleased to announce our speaker will be Dr. Scott F. Burns, Professor of Geology, Portland State University. His topic will be "Oregon--A Geological Wonderland." Doors will open at 1:00 p.m. and dinner will be served at 1:45 p.m. There is lots of parking at the rear of the building and there is entry to the banquet room from this parking area. We would appreciate receiving your reservation as soon as possible so a final count can be submitted to the Chef by March 1st. Send your reservations to GSOC, P. O. Box 907, Portland, Oregon 97207. Archie Strong will be manning the rock sales table and would welcome some of your rocks for sale. Call Archie about getting the rocks to him. Rosemary will also be selling publications.

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THE GEOLOGICAL NEWSLETTER

GSOC

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

1999-2000 ADMINISTRATION
BOARD OF DIRECTORS

THE GEOLOGICAL NEWSLETTER

email address: gsoc@teleport.com

ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Picnic—August; Banquet—March; Annual Meeting—February. **FIELD TRIPS:** Usually one per month, by 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. 371, 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 02705451),** 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:

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. **WEBSITE:** www.gsoc.org

APPLICATION FOR MEMBERSHIP- THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Name______________________________ **Spouse**____________________
Children under age 18______________________________

Address __________________________ **City** __________ **State** ___ **Zip**______-___
Phone (____)____-________ **Email address**____________________

Geologic Interests and Hobbies______________________________

____

Please indicate Membership type and include check for appropriate amount:
Individual $20.00 ________ **Family $30.00** ________ **Student $10.00** ________

Make Check Payable to: **The Geological Society of the Oregon Country**
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VISITORS WELCOME AT ALL MEETINGS
INFORMATION: www.gsoc.org *or* gsoc@teleport.com
Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

VOL. 66, No. 3
MARCH 2000

MARCH ACTIVITIES

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IF YOU HAVE *NOT* RECEIVED CONFIRMATION FROM PHYLLIS THORNE FOR THE BANQUET ON SUNDAY MARCH 12 AT 1 PM, CALL HER AT 292-6134 ASAP - zip code should have been 97207. Don't miss the dinner and Dr. Scott Burns' presentation: OREGON - A GEOLOGICAL WONDERLAND.

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Fri. March 3, 12-1:30 PM: Rock Art in the NW & Use of Natural Microgeological Features George Poetschat, past president, OR Archeological Society
Central Library, 801 SW 10th St.

Wed. March 22, 8:00 PM: Seminar
(1) "Uprooting the Tree of Life" - review of 2/00 Scientific American article - Sandra Adamson
(2) "Gold Bugs and Oil Wells" - review of 7/99 Discover article - Taylor Hunt
Rm. S-17 Cramer Hall, PSU, 1721 SW Broadway

March Field Trip: Sat. March 25: Flood Features in the Willamette Valley - call Taylor Hunt, 503-662-4790 for details.

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PREVIEW OF COMING ATTRACTIONS:
Mon. April 3, 12-1:30 PM: Northern Mojave Desert Don Barr Central Library
Fri. April 14, 8:00 PM: Pacific Northwest Glaciation Frank Granshaw Rm. 371 Cramer
Wed. April 26, 8:00 PM: Seminar - "Extremophiles" Rosemary Kenney S-17 Cramer H.
Sat. April 29: **Field Trip - Mt. Adams area ice caves** Taylor Hunt, 503-662-4790

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Calendar items must be received by 15TH of preceding month. Evelyn at 503-223-2601; ralf70@aol.com

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GSOC Field Trip, Reynolds Aluminum Plant Tour, by Clyde Kellay

On January 28, twenty GSOC members gathered at the Reynolds Metal Company Reduction Plant in Troutdale where we were met by Kristin Nadermann, Environmental Manager. Kristin who is personable, and knowledgeable, led us on a cold and windy tour of the facilities. We toured the carbon plant where the carbon anodes are made, the pot room where the alumina is smelted, and the cast house where the molten aluminum is cast, cooled and prepared for shipment. Additionally, she told us a little of the history of the plant and explained the steps that Reynolds Metals have taken to reduce the environmental impact of the operation.

Prior to arriving at Troutdale, raw bauxite—mainly from Australia—has been refined to a white powder form of alumina (aluminum oxide) which will be smelted in one of Reynolds Troutdale 420 operating pots or cells.

To produce aluminum from the alumina requires the passing of a direct electrical current from an carbon anode through the cell where it will separate the aluminum from the oxygen in the aluminum oxide. To achieve this process, basically four ingredients are required, electricity, carbon, alumina, and a bath consisting of molten cryolite. Due to the nature of the aluminum smelting, the plant is in production 24 hours a day, 365 days a year.

The consumption of carbon anodes is rather high as each pot has 24 anodes, each of which has to be replaced every seven to ten days; therefore, a rather large area of the plant is devoted to the production of these carbon blocks. The carbon plant, where these anodes are made, consists of numerous rows of well-like molds below floor level. Carbon, produced from coke, with approximately 15% pitch (a coal-tar product used for binding) is pressed into these molds to form "green" blocks measuring 19" by 22" by 15" and weighing 360 lbs. each. These green blocks are subsequently placed in a gas-fired oven where they are baked a couple of days until a temperature of 1200 ° C. is reached. Following the baking process, the blocks are cleaned and a copper bar is secured in their centers by applying melted metal. The resulting carbon block with its copper bar is then placed in the molten "bath", connected to a direct current and will act as an anode.

The "pot room" where the actual smoking takes place, is the heart of the plant. Here there are five potlines with a total of 700 pots, however, only three potlines (420 pots) are presently on line. The smelting process used in the Reynolds plant is the Hall-Heroult Reduction process. In this process large steel tanks are lined with carbon, an electrolyte solution of molten cryolite, called a bath, is added and the electricity is applied. Alumina is then added on top of the bath. After it is preheated by the cell (which has a temperature of about 950° C.) and the moisture is driven off, a large bar is lowered, breaking the crust of the bath and the alumina is mixed into the bath. The carbon lining of the pot act as a cathode conducting direct current into the cells and separates the aluminum from oxygen in the alumina. The oxygen is attracted to the carbon anode producing carbon dioxide, which is released to the atmosphere through the pot room emissions control system, and the pure liquid aluminum will drop to the bottom, where it will be "tapped", that is siphoned off into a large crucible and transported to the cast house.

In the cast house, some of the molten aluminum is cast directly into molds where it will cool and be prepared for shipment. The cast house also has several gas-fired holding furnaces where the molten aluminum is held at high temperatures, cleansed of impurities and alloys are added. From these furnaces, the molten metal is poured into vertical, water-cooled molds, the bottoms of which are slowly lowered until huge ingots weighing as much as 37,000 pounds are produced. At this point, both the small and the large ingots are prepared for shipping to the end users, who produce the myriad of aluminum products that our modern society depends so heavily upon.

We also learned that the plant was built in 1941 as part of the war-time effort to supply the Allies with aluminum. Reynolds Metal company took it over in 1946 and bought it in 1949. Although, like all modern industries, all of their operations depend on computers, we saw no evidence of automation. In fact we were told that, with the exception of environment control systems, the plant works essentially as it did in the late 1940's. Now the plant has two fume control systems; the first, where emissions from the carbon plant are ducted through two wet conditioning towers to a wet electrostatic precipitator (ESP) that removes the particulate matter and the second where the emissions from the pot room are ducted to a dry alumina scrubber. This unit injects fresh alumina into the air stream to purify it. The alumina is then captured in the scrubber and returned to the pot rooms as raw material for the pots.

The Reynolds plant uses about 2 million gallons of water a day which is produced by their seven on-site wells. This water usage results from the casting process, the wet scrubbing process and the production of green carbon blocks. This used water is processed through a series of settling ponds, where, after meeting state and federal standards, it is returned to the Columbia River. The other essential part of the plant is the rectifier station where electricity received from the Bonneville Power Administration is transformed from AC to DC. In response to the question of "How much electricity does the plant use". the answer was " A LOT!"

As a postscript, did you ever wonder what the relationship between an aluminum company and a tobacco company is or why a foil-producing company bought an Eskimo pie company? If so go to the web address: www. rmc. com.

Welcome

We welcome the following new members to the Geological Society of the Oregon Country

Alison Stenger	Charles Hibbs
Bo and Ellen Nonn	John Newhouse
Sally Neill	John Teskey
Bonnie Artmann	Susan Hebert
Jill Betts	Robert Schumacher
Duane and Dana Diller	Paul Russell
Jackie Carmack	Martha Brown

Special Notice:

If you do not receive confirmation for your Banquet ticket, please call Phyllis Thorne, telephone 292-6134.

About this time of year with the clouds weighing heavily on my spirit, my thoughts turn to being out on a field trip. Here is an article gleaned from the internet. It was published in 1989 in Oregon Geology – it is reprinted here to encourage us toward those days when we can be out again under blue skies looking for fossils.

COLLECTING FOSSILS IN OREGON

INTRODUCTION

Hanging on my study wall is a clock I have made from a flat slab of rock that has on its surface a magnificent large fossil leaf from an ancient sycamore tree. Of course, the clock is a delight to me, yet each time I look at it, I experience a tinge of regret because I know that this lovely and significant fossil will never be where it properly belongs--in a research collection to record the development of the sycamore family. It is not now suitable for such a collection because no one knows for sure its age or where it was found. An old friend collected this and many other quality specimens but did not put any identifying marks on this one. At his death, his son gave me several pieces from the collection. I think that I know where this one came from, for I know his collecting habits, and the rock matrix is familiar to me. In the field of science, however, "I think," "probably," and "I guess" are enough to fling a shadow of doubt that reduces evidence to worthlessness. Therefore, this beautiful fossil is reduced to being "only a curiosity." Lesson: Immediately upon collecting a fossil, number and reference it in some permanent manner so that locality and other important information pertaining to it are not lost. A fossil collection can be a source of pleasure in many ways. The specimens themselves are beautiful. As evidence of evolution as well as changing ecological conditions through time, they provide food for thought. The collecting process itself gets the collector outdoors to many different areas and provides healthful exercise. Beyond these purely selfish concerns, however, your collection can serve a useful purpose. If you are careful as you collect and identify your fossils, if you keep good records, and if you share your information with other fossil collectors--both amateur and professional--as well as with others interested in learning about paleontology, your fossils can also serve to advance knowledge. This article tells you how to get started in fossil collecting--and how your fossils may be useful to others.

BASICS OF FOSSIL FINDING If all of the readers of this article were to start driving their cars at the same time, and then if they all were to stop their cars at the same moment, get out, and spend two hours digging for fossils wherever they happened to be, Las Vegas oddsmakers should be able to make a lot of money by betting that none would find a fossil--even in Oregon, one of the premier fossil grounds of the world. Yet, armed with proper knowledge, any person living in Oregon could probably drive to a fossil site in less than an hour from his or her home. A paleontologist friend from Indiana is envious. "Why, you could ride a bicycle from your house to this site," he exclaimed of a locality near my home. So, how do you locate fossils? First off, don't waste your energy digging for fossils unless you have been given good reason to believe there are some at hand. In Oregon, you can rule out huge expanses of two kinds of geologic environments. You can be fairly certain, for example, that you will find no fossils in lava rock. It should be noted, however, that most rules have exceptions. For instance, Lava Cast Forest near Bend has fossil impressions of tree trunks that were buried in lava, and near Blue Lake in Washington, a mold of the bloated carcass of a rhinoceros exists in a basalt flow. Furthermore, areas of topsoil, the loose, find-grained dirt that collects in valley floors, are not prime sites. On rare occasions, topsoil preserves fossils, but generally it does not. The processes that move a fossil from bed rock into topsoil usually also reduce the fossil to dust--or at least to fragments. So, what are the likely areas? Wood, leaves, flesh, bones, and even teeth, if exposed to the elements, will decompose with time. It is no surprise, then, that most well-preserved fossils are found in rocks that originally were a mud that protected the organic material from oxygen and therefore bacterial decay. If the remains survive this initial step of burial, minerals in ground water may permeate and harden them. Fine-grained sandstone (or siltstone, mudstone, or shale) is one of the fossil-hunter's favorite rocks. For marine fossils, another likely tomb is limestone. Most limestone is composed of remains of sea creatures. The third promising type of host material in Oregon (mainly central and eastern) is what was originally light-colored volcanic ash that rapidly buried plants and animals with thick deposits. Because of the flat structure of minerals in fine-grained mudstones and shales, these rocks often split into flat slabs. A paleontologist's right foot automatically eases off the gas pedal when he or she passes a roadside exposure of platy, sedimentary rocks. Many are fossiliferous. Diligent searching in favorable areas will, at length, probably lead to the discovery of fossils. However, there is a short cut used by most fossil finders. Somebody shows or tells them where to find the quarry (pun intended)! Other collectors know of likely sites and are willing to share their knowledge. Hunters, farmers, ranchers, and geologists all spend a lot of time on foot in out-of-the-way places. They frequently locate new areas and often will, if asked, help the paleontologist. Additionally, as geologists publish the results of their field work and often give exact locality coordinates, time spent reading geological papers will often produce helpful information for you. A two-line mention in a geological paper can take you an exciting find.

HELPFUL PUBLICATIONS There are even books that will direct you to fossil sites. A reference, informally known as the "Blue Book" among fossil collectors, is entitled "Fossils in Oregon." Edited by geologist Margaret L. Steere, the 227-page book was published by the Oregon Department of Geology and Mineral Industries as Bulletin 92 and can be purchased from its main office (editor's note: Be advised that the glue binding the book is not very durable, so that the book, while filled with useful information, tends to fall apart easily). The book contains directions to and descriptions of fossils from more than 35 fossil locations in Oregon. It is copiously illustrated. Two other books on Oregon paleontology are indispensable to anyone interested in the state's fossils. The wife-and-husband team of Elizabeth L. and William N. Orr (University of Oregon paleontologist) authored both the "Handbook of Oregon Fossils (1981)(available at private bookstores and from the authors at PO Box 5286, Eugene, Oregon 97405) and the "Bibliography of Oregon Paleontology, 1792-1983" (1984) (available as Special Paper 17 from DOGAMI). Although it does not contain precise locality directions, the 285- page "Handbook of Oregon Fossils" is a gold mine of well-organized information. Generalized discussions of fossil plants, pollen, invertebrates, trace fossils, arthropods, fresh-water fish, birds, marine vertebrates, and land vertebrates include many illustrations that will help you in identification of your fossils. The bibliography at the end of the book can help you find new localities to explore. "Bibliography of Oregon Paleontology, 1792-1983," also by the Orr's, is a compilation of references containing information about Oregon fossils up to 1984. Its 82 pages list more than 1,200 references, most of which will help guide the collector to at least one specific locality.

OTHER INFORMATION SOURCES Visits to museums can lead you to more information. Many small local museums exhibit a few local fossils and often include the name of the collector. Natural history exhibits will help familiarize you with what is available and what you should be looking for. You can ask other collectors about associations or societies where you can meet people with interests similar to your own. You can subscribe to local or state publications such as "Oregon Geology" that publish papers related to local paleontology. If you are really serious about your fossil collecting, you can contact local community college geology teachers or university professors for information about fossil collecting sites.

PROSPECTING TECHNIQUES A few paleontologists publish such complete locality directions, including photographs, that they enable the collector to drive or walk directly to the site and begin collecting. More commonly, however, directions will consist of coordinates (township, range, section, and quarter section) and perhaps a brief description of strata above and below the site. This will get the collector to within about an eighth of a mile of the locality, still leaving a vast area to be covered in the search. A common technique followed by collectors in searching the terrain for a fossil site, which may be only a small exposure, is similar to the process often used by precious-metals prospectors. Unless it is known that the exposure is actually a stream bed, it is better to search the sides of the hills a little bit above the valley floor. A fossil-bearing ledge uncovered by erosion in the valley bottom is likely to be covered by topsoil to a considerable depth. On a side-hill site, as the fossils weather out, they are moved downslope along with other rocks and soil. On their journey to the bottom of the hill, the fossils are constantly being reduced by weathering and abrasion to smaller and smaller pieces and eventually, of course, are no longer recognizable as fossils. The fossil hunter needs to traverse back and forth on the hillside, starting just above the valley floor, and gradually climb the hill while scanning the ground closely. Usually, the first sign of the object of the search is a small fragment, so the collector must closely examine the surface of promising rocks. What should one look for? Usually regular shapes or lines, smooth surfaces and contours; curves rather than jagged edges; contrasting color patterns on rock surfaces; and repeating segments such as ribs, growth lines, and leaf veins. Actually, any rock that stands out as being somehow different from the other local rocks bears a second look. A previous excavation pit, though grassed over and partially filled, often tattles as to the location of the site. In the case of vertebrate fossils, teeth are the hardest components of the skeleton, and smaller fragments may have settles to the bottom of the drainage area. Color is often used to distinguish fossils from rock matrix. Cape Blanco is so named because of the white Pleistocene shells exposed there. Vertebrate fossils of calcium phosphate often pre- serve with a typical caramel brown or even bluish color. After the first fragmentary find, the collector needs to slowly work uphill, following a trail of increasingly larger fragments to the fossil bearing outcrop, the bonanza! Sometimes the outcrop itself is covered by topsoil, and the only evidence as to its location is the fact that at a given point, the uphill trail of fragments gives out. Digging is now warranted. Fossil-bearing outcrops may be found at any point on a hillside, but it is remarkable how often they occur at the brow of a knob--and, in Oregon, how often they occur in strata just below a lava flow. Light conditions can affect the visibility of fossils in the field. Low, slanting light seems to emphasize the flat and curved surfaces of the specimens. Morning and evening hours provide this condition. How serendipitous it is that these hours also allow one to avoid the heat of the day. "You find what you are looking for" is a truism that is abundantly illustrated in fossil collecting. Earlier large-vertebrate collectors by passed some areas rich with small specimens, eggs, and nests. They were looking for large bones and skulls, and they found them. Now that the significance of the smaller items is recognized, they too are being recovered in quantity. Another "old geologist" saying is, "I wouldn't have seen it if I hadn't believed it." A friend who is an avid and very successful big-game hunter says he envies me because in all his life he has never recovered a single artifact or fossil, while I have found many. When we hunted together, he always got the game, and I always came away with a few interesting rocks in my pockets. When I guide a class to a fossil site, members often express puzzlement as to just what it is for which they should be looking. My verbal descriptions help a little, but once the students have actually seen a specimen, others usually turn up, with no more help needed.

HOW TO COLLECT Only rarely does a fossil site produce quality material lying loose on the surface of the ground. When such a place is located, however, collecting is easy, and few tools are needed. A backpack or sack to carry the specimens, some newspaper for wrapping them, a permanent-ink felt-tip pen for marking them, and a geologists' hammer will do nicely. More commonly, light digging is necessary. Removing partially visible specimens from exposed ledges will require some sort of sharp-edged bar or chisel and possibly even a shovel and pick. You will note that whisk brooms, fine chisels, knives, plaster of Paris, and surveying equipment have not been mentioned. There are times, of course, when all of the above, and more, are needed. If you are lucky enough as an amateur to come across a really significant find, such as a partial skeleton fossilized in place, for example, that might call for more sophisticated methods of collecting, the best service you can do for yourself and for science is to (1) enjoy your find ("Oh," "Wow," and "Just look at that," are in order); (2) write down directions to your find and mark the location with something such as a handkerchief on a bush or spray paint on a rock so that it is easily visible; (3) photograph the exposure; and (4) refer your information to a professional paleontologist. It is unlikely that you will get everything right if you try to remove the fossil yourself. Without a doubt, the professional who comes out to collect the specimen will welcome your help in its recovery. You will get the thrill of collecting and learn how it is properly done, and the fossil will be removed intact with the proper documentation. More importantly, the orientation of a fossil in the matrix may be a significant piece of research information. The fossil should not be disturbed until this is recorded. Where do you find the professionals? There are at least eight actively working in the state of Oregon. William Orr, Department of Geology, University of Oregon, Eugene; Guy Rooth, Department of Geology, Western Oregon State University, Monmouth; David Taylor, Northwest Museum of Natural History Association, Portland; Richard Thoms, Geology Department, Portland State University, Portland; Theodore Fremd, Paleontologist, John Day Fossil Beds National Monument, John Day; Jane Gray, who specializes in the study of pollen and spores (micropaleobotany), Departments of Geology and Botany, University of Oregon, Eugene; Gregory Retallack, an expert on paleosols (fossil soils), paleobotany, and fossils in general, Geology Department, University of Oregon, Eugene; and A.J. Boucot, who has an extensive background of work with marine invertebrate fossils, Departments of Geology and Zoology, Oregon State University, Corvallis.

WORD OF WARNING Do not accidentally walk on fossils if you find fossil fragments on the surface of the ground, carefully scan the area before doing any more prospecting. Small vertebrate fossils are often carelessly destroyed by foot crushing.

HANDLING FOSSILS Your first charge, after recovering fossils, is to return them to your home without damaging them. Careful and tight wrapping in newspaper is the usual method of protection. Before you wrap them, however, you should mark them with the location. In your laboratory area, if you have unmarked boxes of fossils from more than one site, being sure of the source is a problem. Take a permanent-ink felt-tip pen with you on your collecting trips. Mark specimens directly, and again mark the outside of the box or sack before leaving the site. Large museums hire technicians, called "preparators," who do the demanding detailed work of trimming, cleaning, and repairing fossils. In your jack-of-all-trades capacity, however, you will do this. In the case of vertebrate and invertebrate fossils or petrified wood, this usually means removing the fossil completely from the matrix. An exception might be when you plan to exhibit the fossil partially exposed but remaining attached to its rock matrix, which is an effective technique. In either event, exposure of the fossil demands careful and sometimes tedious work. In the case of vertebrate fossils, the amateur would do well to consult a professional paleontologist before tackling this specialized task. Much of such a job is often done with sharp metal edges, such as small chisels, picks, knives, vibrator tools, engraving tools, and drills. Water or other solvents are sometimes a help in softening the rock. Trial and error will help determine which of these tools to use, and advice of other collectors is an aid. In the case of leaf imprints on rock, trimming away excess matrix is usually the main task and is accomplished with hammer and chisel, pliers, vises, and rock saws. Leaf fossils with a relatively soft matrix can be trimmed on a table saw with a masonry blade. Harder specimens must be worked with a lapidarist's diamond-edged saw, using water, not oil, as a coolant. Specimens that have been coated with shellac or similar clear finishes are often seen on display. You should be aware that such treatment often enhances the contrast and appearance of the fossil but can detract from its scientific usefulness. When you put such a specimen under a microscope, you have to look through the coating, and some detail is lost. Some fossils are so highly fractured that it is necessary to coat and impregnate the material with bonding agents to hold the pieces together. In such cases, you must be careful that surface details are not obscured. A dilute solution of polyvinyl acetate in acetone is superb for soaking a fossil and binding it together without leaving a thick residue on the surface.

LABELING AND RECORDING In order to be able to positively relate a fossil to its locality, an organized form of marking and recording is needed. Commonly, museums and collectors alike use permanent ink on a small spot of white paint to mark specimens in a type of shorthand code. Typewriter "whiteout" is sometimes used for this purpose but may flake off unless covered by shellac. Each of your localities should be given a number that is recorded in a notebook along with a complete set of locality directions. This locality number is marked on the appropriate specimens. It should be prefixed with the initials of the collector or the institution housing the collection. An example is "UO-1407," which is University of Oregon Museum of Natural History locality number 1407. If the specimen is an important item, such as a type specimen cited in the literature, it should also be marked with a catalog number. As you record your locality information, photographs, written directions, and maps are helpful. Indispensable are geographic coordinates. To determine the coordinates, find the site on the largest scale topographic map available and mark it on the map with a small "x" or dot. This will enable you to determine which quarter of which section it occupies. The coordinates consist of (1) the quarter of the quarter section in which the site is located, if the map scale permits such precise location; (2) the quarter section in which the site is located; (3) the section number; (4) the township number; and (5) the range number. An example is SW1/4 NE1/4 sec. 10, T. 12 S., R. 18 E., which means the southwest quarter of the northeast quarter of section 10 of Township 12 south of the Willamette Base Line and in Range 18 east of the Willamette Meridian.

IDENTIFICATION Once you have collected and prepared your specimens, they should be classified and identified. Identification of some specimens, such as those of new species, for example, or those whose features are not readily assignable to a particular taxon, may require the resources of our professional allies. The common genera and species can often be identified by comparison to either the illustrations and descriptions in the helpful volumes previously mentioned or by referring to special studies in published papers found in science libraries at major universities in the state. Two other publications are also helpful in your identification of fossils. "Fossil Mollusks of Coastal Oregon," by Ellen James Moore (1971), is indispensable to anyone collecting invertebrate fossils of the area. Its 64 pages are crammed with excellent photographs of specimens. Moore's book is published by the Oregon State University Press, Corvallis, and may also be found in science libraries. "Common Fossil Plants of Western North America," by William Tidwell (1975), is a fine treatment of the subject. It is aimed at the amateur but is widely found on professional paleobotanists' bookshelves as well. It has 197 pages of illustrations, descriptions, and discussions of fossil plants and may be purchased at university bookstores, museum giftshops, and bookstores in general. Professional paleontologists are usually willing to help the serious amateur in identification, provided the collector does not overload these busy and highly trained people. Partly this is because many of them are generous souls and partly because this sharing is a two-way street. Amateur collectors sometimes make significant finds that are a tremendous help to professionals.

PHOTOGRAPHING Among the reasons for keeping a photographic file of selected fossils in your collection are the following; (1) Folios of photographs are compact. It is quicker to refer to a well-organized photo file than bulky trays of specimens. (2) Photos are useful for publication and lecture. (3) A certain number of your specimens will inevitably be lost because they may deteriorate or break, they may be misplaced, some may be borrowed and never returned, or some may be given to a colleague. A good photograph, however, keeps the needed data available. Presently, publishers of scientific papers seldom print color photo- graphs. Black-and-white glossy photographs with the best possible contrast and detail and including an object (often part of a metric ruler) for scale are used. Color slide are fine for lecturing. Two floodlights (250 to 500 watts each) aimed at the subject from opposite sides at low angles provide effective lighting. A slow shutter speed combined with a small aperture opening and the use of slow film (low ASA number) help to get maximum detail. For publication, where possible, showing the specimen at natural size is desirable. Microscopic specimens, of course, need enlargement, and very large specimens must be reduced in size. You should use a tripod or camera stand to avoid blurring of the image due to vibration.

SHARING YOUR INFORMATION No matter what your collection holds, it will not advance the field of paleontology until its contents are known by other students of the past. Some collectors give talks to schools and civic groups. Many eventually donate significant finds or entire collections to museums. Another worth- while method of disseminating information on what you have found is through publication. Many serious collectors have published papers in scientific publications, and by doing so have made contact with specialists who have been able to use information from their collections and in turn have helped with identification.

WHAT WILL EVENTUALLY HAPPEN TO YOUR COLLECTION? If you do not dispose of your collection while you are alive, it will be done later by someone else. No one knows as well as you do where the specimens will be best used. Don't wait too long. I have been made uncomfortable at times by seeing good collections left to the care of heirs who allow them to languish, become scattered, and eventually be lost. Some heirs do not place a great deal of significance on the collections and allow them to be removed piecemeal as curiosities. Some have ended as playthings of children.

WHAT IS THE MONETARY VALUE OF YOUR COLLECTION? The main value of a collection is in the information it provides. Its actual value on the market is highly overrated by most laymen. Life- time collections of large size and significant finds have sold for less than the actual out-of-pocket expenses involved in collecting them. If the collector's time were added into the collecting cost, probably no sale of collections would show a break-even figure. Because of these facts and the public's general misconception of fossil dollar values, museum curators are often put in the uncomfortable position of being asked to appraise the value of a collection and then finding themselves maligned for supposedly trying to under-value the items so they can get the collection cheaply.

LAWFUL COLLECTING Collecting of fossils on public lands by be restricted by the local or regional administrator of the supervising agency. No collecting is permitted in national parks except by qualified institutional groups or their representatives. In USDA Forest Service (USFS) or U.S. Bureau of Land Management (BLM) areas, permission to collect is usually granted if the specimens collected are to be used for hobby or scientific purposes. How much collecting should be allowed on federally owned lands has long been an unsettled issue. The balancing of five different needs is a thorny problem. Those needs are (1) the need to protect scientifically important or rare specimens from perpetual loss; (2) the need to protect fossil deposits from massive overcollecting by commercial collectors; (3) the need of scientific researchers to have access to fossils; (4) the need of the tax-paying public for recreational or hobby collecting of limited numbers of fossils; and (5) the need to avoid destruction of fossils by weathering. Despite years of conference within and between federal agencies, the issue remains unsettled and is mostly dealt with by individual land managers. A spokesman for the Portland, Oregon, BLM office stated, "There is a prohibition against collecting vertebrate fossils except for scientific purposes. A permit is required from the surface management agency. On BLM lands, there is a limit of 25 pounds plus one piece per day for petrified wood collection, with an annual limit of 250 pounds per person. Collection of small, noncommercial quantities of hobby materials is allowed free of charge. Gathering or collecting for the purpose of sale or barter is prohibited unless especially authorized. Collection on recorded mining claims is not advised without the mining claimant's consent because of legal problems that might arise between the claimant and the collector." USFS regulations prohibit excavating, damaging, or removing any vertebrate fossil or removing any paleontological resource for commercial purposes without a special-use permit. If you have any questions about whether you may collect at a specific site, be sure you contact the local office of the appropriate federal agency if you are on federal land, the appropriate state agency if you are on state land, and the property owner if you are on private property.

GRAB YOUR ROCK HAMMER, AND GO! If you know of a spot where fossils are found and may be collected, you are ready to start. If not, hit the nearest library to get a clue, and then make a try. You are sure to enjoy your experience. As with other adventures, getting off and running may be a bit confusing, but remember, "The longest of journeys begins with but one step." Have fun. Before long, you will be looking for room to house your collection and will be proudly showing it to the public. Just be sure none of your finds ends up as a clock on a study wall for lack of identification marking.

******** By Melvin S. Ashwill, amateur paleontologist, 940 SW Dover Lane, Madras, Oregon 97741 Mel Ashwill maintains a private fossil museum behind his home, which is at the northwest corner of the intersection of Dover Lane and Highway 97 about 2 miles south of Madras. He is willing to show the museum to interested persons or groups by phone appointment only. His phone number is (503) 475-2907.**
Acknowledgments: The author thanks reviewers William N. Orr, Steven R. Manchester, David G. Taylor, and Theodore Fremd for their suggestions and contributions.
References cited: Moore, E. J., 1971. Fossil mollusks of coastal Oregon (Oregon State Monographs, Studies in Geology 10); Corvallis, Oregon, Oregon State University Press, 64 p. Orr, W. M., and Orr, E. L., 1981. Handbook of Oregon plant and animal fossils; Eugene, Oregon 285 p. 1984, Bibliography of Oregon paleontology, 1792-1983; Oregon Department of Geology and Mineral Industries Special Paper 17, 82 p. Steere. ML, 1977; Fossils in Oregon; A collection of reprints from the Ore Bin, Oregon Department of Geology and Mineral Industries Bulletin 92, 227 p. Tidwell, WD, 1975. Common fossil plants of western North America; Provo, Utah, Brigham Young University Press, 197 p.
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THE GEOLOGICAL NEWSLETTER

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, by 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. 371, 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 02705451),** 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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INFORMATION: www.gsoc.org *or* gsoc@teleport.com — MARCH 2000
Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

MARCH ACTIVITIES

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IF YOU HAVE *NOT* RECEIVED CONFIRMATION FROM PHYLLIS THORNE FOR THE BANQUET ON SUNDAY MARCH 12 AT 1 PM, CALL HER AT 292-6134 ASAP - zip code should have been 97207. Don't miss the dinner and Dr. Scott Burns' presentation: OREGON - A GEOLOGICAL WONDERLAND.

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Fri. March 3, 12-1:30 PM: Rock Art in the NW & Use of Natural Microgeological Features George Poetschat, past president, OR Archeological Society
Central Library, 801 SW 10th St.

Wed. March 22, 8:00 PM: Seminar
(1) "Uprooting the Tree of Life" - review of 2/00 Scientific American article - Sandra Adamson
(2) "Gold Bugs and Oil Wells" - review of 7/99 Discover article - Taylor Hunt
Rm. S-17 Cramer Hall, PSU, 1721 SW Broadway

March Field Trip: Sat. March 25: Flood Features in the Willamette Valley - call Taylor Hunt, 503-662-4790 for details.

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PREVIEW OF COMING ATTRACTIONS:
Mon. April 3, 12-1:30 PM: Northern Mojave Desert Don Barr Central Library
Fri. April 14, 8:00 PM: Pacific Northwest Glaciation Frank Granshaw Rm. 371 Cramer
Wed. April 26, 8:00 PM: Seminar - "Extremophiles" Rosemary Kenney S-17 Cramer H.
Sat. April 29: **Field Trip - Mt. Adams area ice caves** Taylor Hunt, 503-662-4790

****

Calendar items must be received by 15TH of preceding month. Evelyn at 503-223-2601; ralf70@aol.com

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GSOC Field Trip, Reynolds Aluminum Plant Tour, by Clyde Kellay

On January 28, twenty GSOC members gathered at the Reynolds Metal Company Reduction Plant in Troutdale where we were met by Kristin Nadermann, Environmental Manager. Kristin who is personable, and knowledgeable, led us on a cold and windy tour of the facilities. We toured the carbon plant where the carbon anodes are made, the pot room where the alumina is smelted, and the cast house where the molten aluminum is cast, cooled and prepared for shipment. Additionally, she told us a little of the history of the plant and explained the steps that Reynolds Metals have taken to reduce the environmental impact of the operation.

Prior to arriving at Troutdale, raw bauxite—mainly from Australia—has been refined to a white powder form of alumina (aluminum oxide) which will be smelted in one of Reynolds Troutdale 420 operating pots or cells.

To produce aluminum from the alumina requires the passing of a direct electrical current from an carbon anode through the cell where it will separate the aluminum from the oxygen in the aluminum oxide. To achieve this process, basically four ingredients are required, electricity, carbon, alumina, and a bath consisting of molten cryolite. Due to the nature of the aluminum smelting, the plant is in production 24 hours a day, 365 days a year.

The consumption of carbon anodes is rather high as each pot has 24 anodes, each of which has to be replaced every seven to ten days; therefore, a rather large area of the plant is devoted to the production of these carbon blocks. The carbon plant, where these anodes are made, consists of numerous rows of well-like molds below floor level. Carbon, produced from coke, with approximately 15% pitch (a coal-tar product used for binding) is pressed into these molds to form "green" blocks measuring 19" by 22" by 15" and weighing 360 lbs. each. These green blocks are subsequently placed in a gas-fired oven where they are baked a couple of days until a temperature of 1200 ° C. is reached. Following the baking process, the blocks are cleaned and a copper bar is secured in their centers by applying melted metal. The resulting carbon block with its copper bar is then placed in the molten "bath", connected to a direct current and will act as an anode.

The "pot room" where the actual smoking takes place, is the heart of the plant. Here there are five potlines with a total of 700 pots, however, only three potlines (420 pots) are presently on line. The smelting process used in the Reynolds plant is the Hall-Heroult Reduction process. In this process large steel tanks are lined with carbon, an electrolyte solution of molten cryolite, called a bath, is added and the electricity is applied. Alumina is then added on top of the bath. After it is preheated by the cell (which has a temperature of about 950° C.) and the moisture is driven off, a large bar is lowered, breaking the crust of the bath and the alumina is mixed into the bath. The carbon lining of the pot act as a cathode conducting direct current into the cells and separates the aluminum from oxygen in the alumina. The oxygen is attracted to the carbon anode producing carbon dioxide, which is released to the atmosphere through the pot room emissions control system, and the pure liquid aluminum will drop to the bottom, where it will be "tapped", that is siphoned off into a large crucible and transported to the cast house.

In the cast house, some of the molten aluminum is cast directly into molds where it will cool and be prepared for shipment. The cast house also has several gas-fired holding furnaces where the molten aluminum is held at high temperatures, cleansed of impurities and alloys are added. From these furnaces, the molten metal is poured into vertical, water-cooled molds, the bottoms of which are slowly lowered until huge ingots weighing as much as 37,000 pounds are produced. At this point, both the small and the large ingots are prepared for shipping to the end users, who produce the myriad of aluminum products that our modern society depends so heavily upon.

We also learned that the plant was built in 1941 as part of the war-time effort to supply the Allies with aluminum. Reynolds Metal company took it over in 1946 and bought it in 1949. Although, like all modern industries, all of their operations depend on computers, we saw no evidence of automation. In fact we were told that, with the exception of environment control systems, the plant works essentially as it did in the late 1940's. Now the plant has two fume control systems; the first, where emissions from the carbon plant are ducted through two wet conditioning towers to a wet electrostatic precipitator (ESP) that removes the particulate matter and the second where the emissions from the pot room are ducted to a dry alumina scrubber. This unit injects fresh alumina into the air stream to purify it. The alumina is then captured in the scrubber and returned to the pot rooms as raw material for the pots.

The Reynolds plant uses about 2 million gallons of water a day which is produced by their seven on-site wells. This water usage results from the casting process, the wet scrubbing process and the production of green carbon blocks. This used water is processed through a series of settling ponds, where, after meeting state and federal standards, it is returned to the Columbia River. The other essential part of the plant is the rectifier station where electricity received from the Bonneville Power Administration is transformed from AC to DC. In response to the question of "How much electricity does the plant use". the answer was " A LOT!"

As a postscript, did you ever wonder what the relationship between an aluminum company and a tobacco company is or why a foil-producing company bought an Eskimo pie company? If so go to the web address: www. rmc. com.

Welcome

We welcome the following new members to the Geological Society of the Oregon Country

Alison Stenger	Charles Hibbs
Bo and Ellen Nonn	John Newhouse
Sally Neill	John Teskey
Bonnie Artmann	Susan Hebert
Jill Betts	Robert Schumacher
Duane and Dana Diller	Paul Russell
Jackie Carmack	Martha Brown

Special Notice:

If you do not receive confirmation for your Banquet ticket, please call Phyllis Thorne, telephone 292-6134.

About this time of year with the clouds weighing heavily on my spirit, my thoughts turn to being out on a field trip. Here is an article gleaned from the internet. It was published in 1989 in Oregon Geology – it is reprinted here to encourage us toward those days when we can be out again under blue skies looking for fossils.

COLLECTING FOSSILS IN OREGON

INTRODUCTION

Hanging on my study wall is a clock I have made from a flat slab of rock that has on its surface a magnificent large fossil leaf from an ancient sycamore tree. Of course, the clock is a delight to me, yet each time I look at it, I experience a tinge of regret because I know that this lovely and significant fossil will never be where it properly belongs--in a research collection to record the development of the sycamore family. It is not now suitable for such a collection because no one knows for sure its age or where it was found. An old friend collected this and many other quality specimens but did not put any identifying marks on this one. At his death, his son gave me several pieces from the collection. I think that I know where this one came from, for I know his collecting habits, and the rock matrix is familiar to me. In the field of science, however, "I think," "probably," and "I guess" are enough to fling a shadow of doubt that reduces evidence to worthlessness. Therefore, this beautiful fossil is reduced to being "only a curiosity." Lesson: Immediately upon collecting a fossil, number and reference it in some permanent manner so that locality and other important information pertaining to it are not lost. A fossil collection can be a source of pleasure in many ways. The specimens themselves are beautiful. As evidence of evolution as well as changing ecological conditions through time, they provide food for thought. The collecting process itself gets the collector outdoors to many different areas and provides healthful exercise. Beyond these purely selfish concerns, however, your collection can serve a useful purpose. If you are careful as you collect and identify your fossils, if you keep good records, and if you share your information with other fossil collectors--both amateur and professional--as well as with others interested in learning about paleontology, your fossils can also serve to advance knowledge. This article tells you how to get started in fossil collecting--and how your fossils may be useful to others.

BASICS OF FOSSIL FINDING If all of the readers of this article were to start driving their cars at the same time, and then if they all were to stop their cars at the same moment, get out, and spend two hours digging for fossils wherever they happened to be, Las Vegas oddsmakers should be able to make a lot of money by betting that none would find a fossil--even in Oregon, one of the premier fossil grounds of the world. Yet, armed with proper knowledge, any person living in Oregon could probably drive to a fossil site in less than an hour from his or her home. A paleontologist friend from Indiana is envious. "Why, you could ride a bicycle from your house to this site," he exclaimed of a locality near my home. So, how do you locate fossils? First off, don't waste your energy digging for fossils unless you have been given good reason to believe there are some at hand. In Oregon, you can rule out huge expanses of two kinds of geologic environments. You can be fairly certain, for example, that you will find no fossils in lava rock. It should be noted, however, that most rules have exceptions. For instance, Lava Cast Forest near Bend has fossil impressions of tree trunks that were buried in lava, and near Blue Lake in Washington, a mold of the bloated carcass of a rhinoceros exists in a basalt flow. Furthermore, areas of topsoil, the loose, find-grained dirt that collects in valley floors, are not prime sites. On rare occasions, topsoil preserves fossils, but generally it does not. The processes that move a fossil from bed rock into topsoil usually also reduce the fossil to dust--or at least to fragments. So, what are the likely areas? Wood, leaves, flesh, bones, and even teeth, if exposed to the elements, will decompose with time. It is no surprise, then, that most well-preserved fossils are found in rocks that originally were a mud that protected the organic material from oxygen and therefore bacterial decay. If the remains survive this initial step of burial, minerals in ground water may permeate and harden them. Fine-grained sandstone (or siltstone, mudstone, or shale) is one of the fossil-hunter's favorite rocks. For marine fossils, another likely tomb is limestone. Most limestone is composed of remains of sea creatures. The third promising type of host material in Oregon (mainly central and eastern) is what was originally light-colored volcanic ash that rapidly buried plants and animals with thick deposits. Because of the flat structure of minerals in fine-grained mudstones and shales, these rocks often split into flat slabs. A paleontologist's right foot automatically eases off the gas pedal when he or she passes a roadside exposure of platy, sedimentary rocks. Many are fossiliferous. Diligent searching in favorable areas will, at length, probably lead to the discovery of fossils. However, there is a short cut used by most fossil finders. Somebody shows or tells them where to find the quarry (pun intended)! Other collectors know of likely sites and are willing to share their knowledge. Hunters, farmers, ranchers, and geologists all spend a lot of time on foot in out-of-the-way places. They frequently locate new areas and often will, if asked, help the paleontologist. Additionally, as geologists publish the results of their field work and often give exact locality coordinates, time spent reading geological papers will often produce helpful information for you. A two-line mention in a geological paper can take you an exciting find.

HELPFUL PUBLICATIONS There are even books that will direct you to fossil sites. A reference, informally known as the "Blue Book" among fossil collectors, is entitled "Fossils in Oregon." Edited by geologist Margaret L. Steere, the 227-page book was published by the Oregon Department of Geology and Mineral Industries as Bulletin 92 and can be purchased from its main office (editor's note: Be advised that the glue binding the book is not very durable, so that the book, while filled with useful information, tends to fall apart easily). The book contains directions to and descriptions of fossils from more than 35 fossil locations in Oregon. It is copiously illustrated. Two other books on Oregon paleontology are indispensable to anyone interested in the state's fossils. The wife-and-husband team of Elizabeth L. and William N. Orr (University of Oregon paleontologist) authored both the "Handbook of Oregon Fossils (1981)(available at private bookstores and from the authors at PO Box 5286, Eugene, Oregon 97405) and the "Bibliography of Oregon Paleontology, 1792-1983" (1984) (available as Special Paper 17 from DOGAMI). Although it does not contain precise locality directions, the 285- page "Handbook of Oregon Fossils" is a gold mine of well-organized information. Generalized discussions of fossil plants, pollen, invertebrates, trace fossils, arthropods, fresh-water fish, birds, marine vertebrates, and land vertebrates include many illustrations that will help you in identification of your fossils. The bibliography at the end of the book can help you find new localities to explore. "Bibliography of Oregon Paleontology, 1792-1983," also by the Orr's, is a compilation of references containing information about Oregon fossils up to 1984. Its 82 pages list more than 1,200 references, most of which will help guide the collector to at least one specific locality.

OTHER INFORMATION SOURCES Visits to museums can lead you to more information. Many small local museums exhibit a few local fossils and often include the name of the collector. Natural history exhibits will help familiarize you with what is available and what you should be looking for. You can ask other collectors about associations or societies where you can meet people with interests similar to your own. You can subscribe to local or state publications such as "Oregon Geology" that publish papers related to local paleontology. If you are really serious about your fossil collecting, you can contact local community college geology teachers or university professors for information about fossil collecting sites.

PROSPECTING TECHNIQUES A few paleontologists publish such complete locality directions, including photographs, that they enable the collector to drive or walk directly to the site and begin collecting. More commonly, however, directions will consist of coordinates (township, range, section, and quarter section) and perhaps a brief description of strata above and below the site. This will get the collector to within about an eighth of a mile of the locality, still leaving a vast area to be covered in the search. A common technique followed by collectors in searching the terrain for a fossil site, which may be only a small exposure, is similar to the process often used by precious-metals prospectors. Unless it is known that the exposure is actually a stream bed, it is better to search the sides of the hills a little bit above the valley floor. A fossil-bearing ledge uncovered by erosion in the valley bottom is likely to be covered by topsoil to a considerable depth. On a side-hill site, as the fossils weather out, they are moved downslope along with other rocks and soil. On their journey to the bottom of the hill, the fossils are constantly being reduced by weathering and abrasion to smaller and smaller pieces and eventually, of course, are no longer recognizable as fossils. The fossil hunter needs to traverse back and forth on the hillside, starting just above the valley floor, and gradually climb the hill while scanning the ground closely. Usually, the first sign of the object of the search is a small fragment, so the collector must closely examine the surface of promising rocks. What should one look for? Usually regular shapes or lines, smooth surfaces and contours; curves rather than jagged edges; contrasting color patterns on rock surfaces; and repeating segments such as ribs, growth lines, and leaf veins. Actually, any rock that stands out as being somehow different from the other local rocks bears a second look. A previous excavation pit, though grassed over and partially filled, often tattles as to the location of the site. In the case of vertebrate fossils, teeth are the hardest components of the skeleton, and smaller fragments may have settles to the bottom of the drainage area. Color is often used to distinguish fossils from rock matrix. Cape Blanco is so named because of the white Pleistocene shells exposed there. Vertebrate fossils of calcium phosphate often pre- serve with a typical caramel brown or even bluish color. After the first fragmentary find, the collector needs to slowly work uphill, following a trail of increasingly larger fragments to the fossil bearing outcrop, the bonanza! Sometimes the outcrop itself is covered by topsoil, and the only evidence as to its location is the fact that at a given point, the uphill trail of fragments gives out. Digging is now warranted. Fossil-bearing outcrops may be found at any point on a hillside, but it is remarkable how often they occur at the brow of a knob--and, in Oregon, how often they occur in strata just below a lava flow. Light conditions can affect the visibility of fossils in the field. Low, slanting light seems to emphasize the flat and curved surfaces of the specimens. Morning and evening hours provide this condition. How serendipitous it is that these hours also allow one to avoid the heat of the day. "You find what you are looking for" is a truism that is abundantly illustrated in fossil collecting. Earlier large-vertebrate collectors by passed some areas rich with small specimens, eggs, and nests. They were looking for large bones and skulls, and they found them. Now that the significance of the smaller items is recognized, they too are being recovered in quantity. Another "old geologist" saying is, "I wouldn't have seen it if I hadn't believed it." A friend who is an avid and very successful big-game hunter says he envies me because in all his life he has never recovered a single artifact or fossil, while I have found many. When we hunted together, he always got the game, and I always came away with a few interesting rocks in my pockets. When I guide a class to a fossil site, members often express puzzlement as to just what it is for which they should be looking. My verbal descriptions help a little, but once the students have actually seen a specimen, others usually turn up, with no more help needed.

HOW TO COLLECT Only rarely does a fossil site produce quality material lying loose on the surface of the ground. When such a place is located, however, collecting is easy, and few tools are needed. A backpack or sack to carry the specimens, some newspaper for wrapping them, a permanent-ink felt-tip pen for marking them, and a geologists' hammer will do nicely. More commonly, light digging is necessary. Removing partially visible specimens from exposed ledges will require some sort of sharp-edged bar or chisel and possibly even a shovel and pick. You will note that whisk brooms, fine chisels, knives, plaster of Paris, and surveying equipment have not been mentioned. There are times, of course, when all of the above, and more, are needed. If you are lucky enough as an amateur to come across a really significant find, such as a partial skeleton fossilized in place, for example, that might call for more sophisticated methods of collecting, the best service you can do for yourself and for science is to (1) enjoy your find ("Oh," "Wow," and "Just look at that," are in order); (2) write down directions to your find and mark the location with something such as a handkerchief on a bush or spray paint on a rock so that it is easily visible; (3) photograph the exposure; and (4) refer your information to a professional paleontologist. It is unlikely that you will get everything right if you try to remove the fossil yourself. Without a doubt, the professional who comes out to collect the specimen will welcome your help in its recovery. You will get the thrill of collecting and learn how it is properly done, and the fossil will be removed intact with the proper documentation. More importantly, the orientation of a fossil in the matrix may be a significant piece of research information. The fossil should not be disturbed until this is recorded. Where do you find the professionals? There are at least eight actively working in the state of Oregon. William Orr, Department of Geology, University of Oregon, Eugene; Guy Rooth, Department of Geology, Western Oregon State University, Monmouth; David Taylor, Northwest Museum of Natural History Association, Portland; Richard Thoms, Geology Department, Portland State University, Portland; Theodore Fremd, Paleontologist, John Day Fossil Beds National Monument, John Day; Jane Gray, who specializes in the study of pollen and spores (micropaleobotany), Departments of Geology and Botany, University of Oregon, Eugene; Gregory Retallack, an expert on paleosols (fossil soils), paleobotany, and fossils in general, Geology Department, University of Oregon, Eugene; and A.J. Boucot, who has an extensive background of work with marine invertebrate fossils, Departments of Geology and Zoology, Oregon State University, Corvallis.

WORD OF WARNING Do not accidentally walk on fossils if you find fossil fragments on the surface of the ground, carefully scan the area before doing any more prospecting. Small vertebrate fossils are often carelessly destroyed by foot crushing.

HANDLING FOSSILS Your first charge, after recovering fossils, is to return them to your home without damaging them. Careful and tight wrapping in newspaper is the usual method of protection. Before you wrap them, however, you should mark them with the location. In your laboratory area, if you have unmarked boxes of fossils from more than one site, being sure of the source is a problem. Take a permanent-ink felt-tip pen with you on your collecting trips. Mark specimens directly, and again mark the outside of the box or sack before leaving the site. Large museums hire technicians, called "preparators," who do the demanding detailed work of trimming, cleaning, and repairing fossils. In your jack-of-all-trades capacity, however, you will do this. In the case of vertebrate and invertebrate fossils or petrified wood, this usually means removing the fossil completely from the matrix. An exception might be when you plan to exhibit the fossil partially exposed but remaining attached to its rock matrix, which is an effective technique. In either event, exposure of the fossil demands careful and sometimes tedious work. In the case of vertebrate fossils, the amateur would do well to consult a professional paleontologist before tackling this specialized task. Much of such a job is often done with sharp metal edges, such as small chisels, picks, knives, vibrator tools, engraving tools, and drills. Water or other solvents are sometimes a help in softening the rock. Trial and error will help determine which of these tools to use, and advice of other collectors is an aid. In the case of leaf imprints on rock, trimming away excess matrix is usually the main task and is accomplished with hammer and chisel, pliers, vises, and rock saws. Leaf fossils with a relatively soft matrix can be trimmed on a table saw with a masonry blade. Harder specimens must be worked with a lapidarist's diamond-edged saw, using water, not oil, as a coolant. Specimens that have been coated with shellac or similar clear finishes are often seen on display. You should be aware that such treatment often enhances the contrast and appearance of the fossil but can detract from its scientific usefulness. When you put such a specimen under a microscope, you have to look through the coating, and some detail is lost. Some fossils are so highly fractured that it is necessary to coat and impregnate the material with bonding agents to hold the pieces together. In such cases, you must be careful that surface details are not obscured. A dilute solution of polyvinyl acetate in acetone is superb for soaking a fossil and binding it together without leaving a thick residue on the surface.

LABELING AND RECORDING In order to be able to positively relate a fossil to its locality, an organized form of marking and recording is needed. Commonly, museums and collectors alike use permanent ink on a small spot of white paint to mark specimens in a type of shorthand code. Typewriter "whiteout" is sometimes used for this purpose but may flake off unless covered by shellac. Each of your localities should be given a number that is recorded in a notebook along with a complete set of locality directions. This locality number is marked on the appropriate specimens. It should be prefixed with the initials of the collector or the institution housing the collection. An example is "UO-1407," which is University of Oregon Museum of Natural History locality number 1407. If the specimen is an important item, such as a type specimen cited in the literature, it should also be marked with a catalog number. As you record your locality information, photographs, written directions, and maps are helpful. Indispensable are geographic coordinates. To determine the coordinates, find the site on the largest scale topographic map available and mark it on the map with a small "x" or dot. This will enable you to determine which quarter of which section it occupies. The coordinates consist of (1) the quarter of the quarter section in which the site is located, if the map scale permits such precise location; (2) the quarter section in which the site is located; (3) the section number; (4) the township number; and (5) the range number. An example is SW1/4 NE1/4 sec. 10, T. 12 S., R. 18 E., which means the southwest quarter of the northeast quarter of section 10 of Township 12 south of the Willamette Base Line and in Range 18 east of the Willamette Meridian.

IDENTIFICATION Once you have collected and prepared your specimens, they should be classified and identified. Identification of some specimens, such as those of new species, for example, or those whose features are not readily assignable to a particular taxon, may require the resources of our professional allies. The common genera and species can often be identified by comparison to either the illustrations and descriptions in the helpful volumes previously mentioned or by referring to special studies in published papers found in science libraries at major universities in the state. Two other publications are also helpful in your identification of fossils. "Fossil Mollusks of Coastal Oregon," by Ellen James Moore (1971), is indispensable to anyone collecting invertebrate fossils of the area. Its 64 pages are crammed with excellent photographs of specimens. Moore's book is published by the Oregon State University Press, Corvallis, and may also be found in science libraries. "Common Fossil Plants of Western North America," by William Tidwell (1975), is a fine treatment of the subject. It is aimed at the amateur but is widely found on professional paleobotanists' bookshelves as well. It has 197 pages of illustrations, descriptions, and discussions of fossil plants and may be purchased at university bookstores, museum giftshops, and bookstores in general. Professional paleontologists are usually willing to help the serious amateur in identification, provided the collector does not overload these busy and highly trained people. Partly this is because many of them are generous souls and partly because this sharing is a two-way street. Amateur collectors sometimes make significant finds that are a tremendous help to professionals.

PHOTOGRAPHING Among the reasons for keeping a photographic file of selected fossils in your collection are the following; (1) Folios of photographs are compact. It is quicker to refer to a well-organized photo file than bulky trays of specimens. (2) Photos are useful for publication and lecture. (3) A certain number of your specimens will inevitably be lost because they may deteriorate or break, they may be misplaced, some may be borrowed and never returned, or some may be given to a colleague. A good photograph, however, keeps the needed data available. Presently, publishers of scientific papers seldom print color photo- graphs. Black-and-white glossy photographs with the best possible contrast and detail and including an object (often part of a metric ruler) for scale are used. Color slide are fine for lecturing. Two floodlights (250 to 500 watts each) aimed at the subject from opposite sides at low angles provide effective lighting. A slow shutter speed combined with a small aperture opening and the use of slow film (low ASA number) help to get maximum detail. For publication, where possible, showing the specimen at natural size is desirable. Microscopic specimens, of course, need enlargement, and very large specimens must be reduced in size. You should use a tripod or camera stand to avoid blurring of the image due to vibration.

SHARING YOUR INFORMATION No matter what your collection holds, it will not advance the field of paleontology until its contents are known by other students of the past. Some collectors give talks to schools and civic groups. Many eventually donate significant finds or entire collections to museums. Another worth- while method of disseminating information on what you have found is through publication. Many serious collectors have published papers in scientific publications, and by doing so have made contact with specialists who have been able to use information from their collections and in turn have helped with identification.

WHAT WILL EVENTUALLY HAPPEN TO YOUR COLLECTION? If you do not dispose of your collection while you are alive, it will be done later by someone else. No one knows as well as you do where the specimens will be best used. Don't wait too long. I have been made uncomfortable at times by seeing good collections left to the care of heirs who allow them to languish, become scattered, and eventually be lost. Some heirs do not place a great deal of significance on the collections and allow them to be removed piecemeal as curiosities. Some have ended as playthings of children.

WHAT IS THE MONETARY VALUE OF YOUR COLLECTION? The main value of a collection is in the information it provides. Its actual value on the market is highly overrated by most laymen. Life- time collections of large size and significant finds have sold for less than the actual out-of-pocket expenses involved in collecting them. If the collector's time were added into the collecting cost, probably no sale of collections would show a break-even figure. Because of these facts and the public's general misconception of fossil dollar values, museum curators are often put in the uncomfortable position of being asked to appraise the value of a collection and then finding themselves maligned for supposedly trying to under-value the items so they can get the collection cheaply.

LAWFUL COLLECTING Collecting of fossils on public lands by be restricted by the local or regional administrator of the supervising agency. No collecting is permitted in national parks except by qualified institutional groups or their representatives. In USDA Forest Service (USFS) or U.S. Bureau of Land Management (BLM) areas, permission to collect is usually granted if the specimens collected are to be used for hobby or scientific purposes. How much collecting should be allowed on federally owned lands has long been an unsettled issue. The balancing of five different needs is a thorny problem. Those needs are (1) the need to protect scientifically important or rare specimens from perpetual loss; (2) the need to protect fossil deposits from massive overcollecting by commercial collectors; (3) the need of scientific researchers to have access to fossils; (4) the need of the tax-paying public for recreational or hobby collecting of limited numbers of fossils; and (5) the need to avoid destruction of fossils by weathering. Despite years of conference within and between federal agencies, the issue remains unsettled and is mostly dealt with by individual land managers. A spokesman for the Portland, Oregon, BLM office stated, "There is a prohibition against collecting vertebrate fossils except for scientific purposes. A permit is required from the surface management agency. On BLM lands, there is a limit of 25 pounds plus one piece per day for petrified wood collection, with an annual limit of 250 pounds per person. Collection of small, noncommercial quantities of hobby materials is allowed free of charge. Gathering or collecting for the purpose of sale or barter is prohibited unless especially authorized. Collection on recorded mining claims is not advised without the mining claimant's consent because of legal problems that might arise between the claimant and the collector." USFS regulations prohibit excavating, damaging, or removing any vertebrate fossil or removing any paleontological resource for commercial purposes without a special-use permit. If you have any questions about whether you may collect at a specific site, be sure you contact the local office of the appropriate federal agency if you are on federal land, the appropriate state agency if you are on state land, and the property owner if you are on private property.

GRAB YOUR ROCK HAMMER, AND GO! If you know of a spot where fossils are found and may be collected, you are ready to start. If not, hit the nearest library to get a clue, and then make a try. You are sure to enjoy your experience. As with other adventures, getting off and running may be a bit confusing, but remember, "The longest of journeys begins with but one step." Have fun. Before long, you will be looking for room to house your collection and will be proudly showing it to the public. Just be sure none of your finds ends up as a clock on a study wall for lack of identification marking.

******** By Melvin S. Ashwill, amateur paleontologist, 940 SW Dover Lane, Madras, Oregon 97741 Mel Ashwill maintains a private fossil museum behind his home, which is at the northwest corner of the intersection of Dover Lane and Highway 97 about 2 miles south of Madras. He is willing to show the museum to interested persons or groups by phone appointment only. His phone number is (503) 475-2907.**
Acknowledgments: The author thanks reviewers William N. Orr, Steven R. Manchester, David G. Taylor, and Theodore Fremd for their suggestions and contributions.
References cited: Moore, E. J., 1971. Fossil mollusks of coastal Oregon (Oregon State Monographs, Studies in Geology 10); Corvallis, Oregon, Oregon State University Press, 64 p. Orr, W. M., and Orr, E. L., 1981. Handbook of Oregon plant and animal fossils; Eugene, Oregon 285 p. 1984, Bibliography of Oregon paleontology, 1792-1983; Oregon Department of Geology and Mineral Industries Special Paper 17, 82 p. Steere. ML, 1977; Fossils in Oregon; A collection of reprints from the Ore Bin, Oregon Department of Geology and Mineral Industries Bulletin 92, 227 p. Tidwell, WD, 1975. Common fossil plants of western North America; Provo, Utah, Brigham Young University Press, 197 p.
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THE GEOLOGICAL NEWSLETTER

GSOC

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ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Meeting—February.

FIELD TRIPS: Usually one per month, by 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. 371, 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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GEOLOGICAL NEWSLETTER

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

VISITORS WELCOME AT ALL MEETINGS — VOL. 66, No. 4
INFORMATION: www.gsoc.org *or* gsoc@teleport.com — APRIL 2000
Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

APRIL ACTIVITIES

Mon. April 3, 12-1:30 PM: Northern Mojave Desert Don Barr, past president
Central Library, 801 SW 10th St.

Fri. April 14, 8:00 PM: Changes in the Glacier Cover of North Cascades Nat. Park – 1955-1998 Frank Granshaw, faculty, PCC Earth Science Dept.; candidate for MS in geology, PSU; *Artemis Science Curriculum & Software* owner
Rm. 371 Cramer Hall, PSU, 1721 SW Broadway

Wed. April 26, 8:00 PM: Seminar
(1) "Extremophiles" Rosemary Kenney
(2) TBA
Rm. S-17 Cramer Hall, PSU, 1721 SW Broadway

April Field Trip: Sat. April 29: **Mt. Adams area ice caves**
call Taylor Hunt 503-662-4790 for details.

****

PREVIEW OF COMING ATTRACTIONS:

Fri. May 5, 12-1:30 PM, Central Library: Geological Formations of Kauai and Other Hawaiian Islands Taylor Hunt

Fri. May 12, 8:00 PM, Rm. 371 Cramer Hall, PSU: Methods for Predicting Earthquake-triggered Landslides Yumei Wang, Dir. of Earthquake & Landslide Programs, DOGAMI; PSU Civil Engineering Dept.

****

Calendar items must be received by 15TH of preceding month. Evelyn at 503-223-2601; ralf70@aol.com

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Message from the President

Adapted from our new President Ray Crowe's talk at the 65th Annual Banquet –

Welcome GSOC'rs and Guests... to the 65th Annual Banquet of the Geological Society of the Oregon Country. It's perhaps appropriate that I become the first president for the new century as I'll soon demonstrate. Way back at the end of the last century, 1999, the GSOC, mostly under Cecilia Crater's able direction I believe...sold time machines! Yes - time machines ! **Here it is!** (GSOC baseball-style hat.)...and to move back in time, I simply reverse the bill, teen-age style.

It's now Sunday, July 30th, 1950...half a century ago this year, and thanks to Rosemary Kenney, I have the documentation...let me read from the newsletter, Vol.16, No. 7: "Klickitat, deep in a canyon cut in the CORIBA basalt's east of Mt. Adams will be the goal of the field trip for the GSOC, Sunday, July 30th. There will be a trip up the river canyon by speeder bus on the logging railroad of the J. Neils Lumber Company, Gray Butte, on the lower edge of the Yakima Indian Reservation, the Goldendale surface of Palouse-like soil over the lavas, and the details of the dissection of the Miocene lavas of the canyon will be seen at close range."

Back when I was 12, I used to hang out at the Dept. of Geology and Mineral Industries downtown in the old State Building. I'd peek out the windows and look down ten stories and slightly shiver...it was really high then, and move down the hall to the DOGAMI offices and their collection of fossils and library. Does anybody recall this building and room? It was there that I met somebody from GSOC, name now long forgotten, that invited me on the field trip...my earliest memory of the Society. It's pleasant taking trips down memory lane isn't it? Well, I still have very fond memories of the trip today; chugging along on the train, lava formations and strange basalts being pointed out over the "clack-clack" and chugging noises; and we even a stop at the dry-ice factory outside of Klickitat. So, why am I dredging all this up? Because of the lasting impact that was made on the mind of a teen-ager, and how it led me, after many intervening years, to become a member of GSOC.

What I look forward to in the coming year is to start an **Outreach Program**, one that will target young minds in our school systems for special treatment...maybe by taking a simple field trip, or donating a few stones at a school. Perhaps by reaching out and touching someone...GSOC will have another president in the year 2050 that started as a novice, with guiding hands from someone in our fine organization. I've even started myself already...by last Tuesday putting up a display in my granddaughter's school, Dundee Elementary, of fossils in the hall display cases. I had her do all the collecting, cleaning, mounting, and labeling. These will all be available for public viewing at the Tualatin Valley Gem Club's show at the Hillsboro Fairgrounds this weekend...March 17th, 18th, and 19th...please come and see what she's done, and maybe we can duplicate it for other children.

Also, I have been active in promoting the **Rice Mineral Museum**, exit 61 on Sunset Highway 26. There, Charlene Elliott, curator, has mentioned the museum plans to start it's own outreach program to take rocks, minerals, and fossils to local schools. In conclusion...I look forward to a productive year with a good staff of officers, board members, and volunteers for committee chairpersons...and let's attract lots of new members please. **Thank you for selecting me as your president for 2000**.

I remain your new GSOC president,

Ray Crowe

LIFE MEMBER

Dr. Ewart M. Baldwin, former geology professor at University of Oregon and co-author of <u>Geology of Oregon</u>, has been granted honorary life membership in GSOC for his contributions to the knowledge of geology in the Oregon Country.

BOOK REVIEW

New Views on An Old Planet: A History of Global Change, by Van Andel, Tjeerd H., (University of Cambridge, formerly professor at Stanford University), 1994, second edition: Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211, 439 pages, paperback. Available through www.amazon.com at $31.95 + $3.99 shipping and handling. (Editor's note: Currently not in the Powell's Books inventory on the web).

This book is highly recommended reading for GSOC'ers. Although long, it is simply written for the layperson, minimizes technical jargon, and avoids technicalities. It lacks photographs, but portrays many easily interpreted diagrams with explanative captions. This is one of the few books outside of a general earth science text, of which I am aware, to give a broad overview of the planet, its origin and ongoing processes, interaction between atmospheric and oceanic processes, plate tectonics, evolution and extinction of life, and rates of these processes. It's a book for this time in history.

It is divided into 8 parts, (each with 1 to 4 chapters). They are:

1. At the Start [Prologue]
2. Foundations: Rocks, Events and Time
3. Climate Past and Present: the Ice Age
4. Drifting Continents, Rising Mountains
5. Changing Oceans, Changing Climates
6. Four-Billion-Year Childhood: [The Precambrian]
7. Life, Time and Change
8. Epilogue

Each part concludes with a perspective and list of further readings. Text is not interrupted by frequent citations, enabling easy continuous reading. An un-"fractured" glossary of 12 pages and extensive index of 15 pages completes the book.

The two points that impressed me are:

1. The continuous changes in earth processes, the stages of which are not repeated over time
2. The great variabilities in earth processes, many of which are poorly understood and needing comprehensive interdisciplinary study.

One draw-back to the book is the author's interpretation that human influence on the environment will cause conditions adverse to our existence, instead of his following the theme that change is constant and inevitable. I believe it's possible that the demise of humans will bring forth a fresh diversity of life in the history of earth, and that the extinction of humans could be another milepost in the planet's progress.

Statements (and page) in the book that appealed to me are:

1. Most geological process are faster than we thought (25).
2. In the northern hemisphere over 30 glaciations occurred during 2 million years, the last only 10,000 years ago (45).
3. Ice cores taken in Greenland show that some major changes in temperature took only years, not decades (65).
4. **Epeirogeny**, the broad uplift of continents, is the behavior of the mantle beneath the plates where an uneven distribution of temperature and therefore density, combined with convective flow, is capable of changing the level of the surface over which the plates moves (170).
5. Environmental processes are so complexly related that, as they interact, more than one outcome is possible (249).
6. Hot springs at mid-oceanic spreading centers, greatly influenced the composition of sea water, introducing iron, manganese, silica, lime, and soda, thereby affecting its salinity (280).
7. Photosynthesis is an effective process in the generation of atmospheric oxygen (283).
8. Life has evolved steadily toward greater complexity, and after every extinction a greater diversity of life develops (313).
9. In spite of extinctions and biological blooms, the rate of biological divergence over geologic time is fairly uniform (329).
10. Many late Cretaceous extinctions were incomplete. A number, including the dinosaurs, had been preceded by a prolonged decline; and a few genera extended possibly into the early Paleocene. Most dramatic was the reduction of oceanic, not continental, forms (383-385).

11. Timing a meteor impact to within 100,000 years of an extinction is presently not possible with today's dating techniques (388).
12. The history of the earth cannot be compared to a gently flowing stream, but instead resembles an extended set of cataracts and waterfalls.
13. **Neo-catastrophism** is a better term for it than **uniformitarianism** (391).
14. To understand the world through the science of the earth demands a simultaneous profound understanding of many difficult subjects and great skill in cross-disciplinary synthesis (402).

Dr. Paul E. Hammond

Other books available from this author (from the Powell's Books inventory):
New Views on an Old Planet :Continental Drift and the History of Earth, Cambridge University Press, 1985.
Science at Sea :Tales of an Old Ocean, W.H. Freeman, 1981.
Tales Of An Old Ocean, NORTON*(WW Norton & Co).

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Kevin Finucane

Robert McGown

PRESIDENT'S FIELD TRIP PREVIEW

Our new president, Ray Crowe, has decided upon the time and place for this year's President's Field Trip. The tentative dates are September 2 through September 9, 2000. The subject of the trip is the **Ice Age Floods features** from the scablands of eastern Washington across to Missoula, Montana.

We are looking into the possibility of staying at brand name motels, Best Western maybe, and using a Raz bus, so the lectures can be heard by all. Ray is working on possible routes now.
Ray would like to get a count of interested members, so let him know!!!
Check next month's newsletter for an update!

GSOC ANNUAL BANQUET

Members of GSOC recently celebrated the 65th anniversary of the organization with the annual banquet, held at the Beaverton Elks Club on March 12, 2000. Seventy-five persons registered for the event, which was organized by treasurer **Phyllis Thorne** and past-president **Carol Hasenberg**.

Exhibitors at the event included members **Charlene Holswarth, Rosemary Kenney, Taylor Hunt, and Archie Strong**. The speaker was **Dr. Scott Burns**, GSOC member and professor at Portland State University. New GSOC president **Ray Crowe** gave the Message from the President. (see page 20)

Charter member **Mildred Phillips** also attended the affair, after recently returning with her family from Hawaii, where she celebrated her ninety-fifth birthday.

WEB TEASERS

Mammoth Molars, Bird Bones, and Human Hairs-

All these and more are being found in two of the most interesting paleontological and archaeological sites in Oregon. Mammoth Park site, located near Woodburn High School, contains soil layers that originated from peat bogs formed in lowlands as the Ice Age Floods receded. Another exposure about half a mile away at Mill Creek Park contains similar material. The sites have been dated at about 12,000 years old.

Some of the more interesting finds have been examples of **megafauna**, or huge animals which roamed Oregon during the Pleistocene. A molar from a giant ground sloth, and the remains of mammoth, mastodon, bear, giant bison, dire wolf, and horse have been found. A large bird bone discovered at the Mill Creek Park site was identified as the upper wing bone from a **teratorn**, a bird with a wingspan twice that of an eagle.

The Mammoth Park site yielded evidence of the human occupation of Oregon during this period. Evidence of tool making such as flake stones and bones believed to be cut by tools have been discovered. The most fascinating finds, however, were strands of human hair that are now undergoing DNA analysis.

Investigations into the Mammoth Park site include a consortium of scientists from:

- Center for the Study of the First Americans
- Institute for Archaeological Studies, Portland
- North Dakota State University
- The University of Oregon
- Oregon State University
- The Northwest Museum of Natural History Association
- Thomas Condon State Museum of Fossils

Oregon Public Broadcasting's Oregon Field Guide recently featured the sites on their February 24th show, and now have information about them on their web site. To order video tapes of past OFG episodes, please call OPB's Audience Services at (503) 293-1982.

To "dig into" these sites further, see the following Web Sites:

Mammoth Park Web Site:
http://www.ndsu.nodak.edu/instruct/schwert/qel/woodburn/woodbrn.htm
Oregon Field Guide Web Site:
http://www.opb.org/ofg/index.asp

Publication Teaser

Current Special Paper features in the Geological Society of America's (GSA) online bookstore (http://www.geosociety.org/pubs/bkstore/) :

SPE339: Large Meteorite Impacts and Planetary Evolution II, 2000, edited by B. O. Dressler and V. L. Sharpton
SPE341: Argentine Precordillera, 1999, Martin Keller
SPE340: Mesozoic Sedimentary and Tectonic History of North-Central Mexico, 1999, edited by: Claudio Bartolini, James Wilson, Timothy Lawton
SPE337: Glacial Processes Past and Present, 1999, edited by: David M. Mickelson, John W. Attig

April Speaker

Our April 2000 evening meeting speaker, **Mr. Frank D. Granshaw**, earth science instructor at Portland Community College and sole proprietor of Artemis Science Curriculum and Software, is currently working to complete an master's degree in geology at Portland State University. The subject of his research, determining changes in the area and volume of glaciers in the North Cascade Range, will be the topic of the April meeting. A description of his research project can be found on the web at: http://www.geol.pdx.edu/Glaciers/granshaw/default.html

Radiometric Dating

Adapted from the USGS publication, "Geologic Time"

A chemical element consists of atoms with a specific number of protons in their nuclei but different atomic weights owing to variations in the number of neutrons. Atoms of the same element with differing atomic weights are called isotopes. Radioactive decay is a spontaneous process in which an isotope (the parent) loses particles from its nucleus to form an isotope of a new element (the daughter). The rate of decay is conveniently expressed in terms of an isotope's half-life, or the time it takes for one-half of a particular radioactive isotope in a sample to decay. Most radioactive isotopes have rapid rates of decay (that is, short half-lives) and lose their radioactivity within a few days or years. Some isotopes, however, decay slowly, and several of these are used as geologic clocks. The parent isotopes and corresponding daughter products most commonly used in radiometric dating are listed below:

Parent Isotope	Stable Daughter Product	Currently Accepted Half-Life Values
Uranium-238	Lead-206	4.5 billion years
Uranium-235	Lead-207	704 million years
Thorium-232	Lead-208	14.0 billion years
Rubidium-87	Strontium-87	48.8 billion years
Potassium-40	Argon-40	1.25 billion years
Samarium-147	Neodymium-143	106 billion years
Carbon-14	Nitrogen-14	5730 years

The mathematical expression that relates radioactive decay to geologic time is called the age equation and is:

$$t = \frac{1}{\lambda}\ln\left(1+\frac{D}{P}\right)$$

Where t is the age of the rock or mineral specimen
D is the number of atoms of a daughter product today,
P is the number of atoms of the parent isotope today,
ln is the natural logarithm of the expression in parentheses,
and λ is the appropriate decay constant.

The decay constant for each parent isotope is related to its half-life, $t^{1/2}$, by the following expression:

$$t^{1/2} = \frac{\ln 2}{\lambda}.$$

Dating rocks by these radioactive timekeepers is simple in theory, but the laboratory procedures are complex. The numbers of parent and daughter isotopes in each specimen are determined by various kinds of analytical methods. The principal difficulty lies in measuring precisely very small amounts of isotopes.

The potassium-argon method can be used on rocks as young as a few thousand years as well as on the oldest rocks known. Potassium is found in most rock-forming minerals, the half-life of its radioactive isotope potassium-40 is such that measurable quantities of argon (daughter) have accumulated in potassium-bearing minerals of nearly all ages, and the amounts of potassium and argon isotopes can be measured accurately, even in very small quantities. Where feasible, two or more methods of analysis are used on the same specimen of rock to confirm the results.

Another important atomic clock used for dating purposes is based on the radioactive decay of the isotope carbon-14, which has a half-life of 5,730 years. Carbon-14 is produced continuously in the Earth's upper atmosphere as a result of the bombardment of nitrogen by neutrons from cosmic rays. This newly formed radiocarbon becomes uniformly mixed with the non-radioactive carbon in the carbon dioxide of the air, and it eventually finds its way into all living plants and animals. In effect, all carbon in living organisms contains a constant proportion of radiocarbon to non-radioactive carbon. After the death of the organism, the amount of radiocarbon gradually decreases as it reverts to nitrogen-14 by radioactive decay. By measuring the amount of radioactivity remaining in organic materials, the amount of carbon-14 in the materials can be calculated and the time of death can be determined. For example, if carbon from a sample of wood is found to contain only half as much carbon-14 as that from a living plant, the estimated age of the old wood would be 5,730 years.

The radiocarbon clock has become an extremely useful and efficient tool in dating the important episodes in the recent prehistory and history of man, but because of the relatively short half-life of carbon-14, the clock can be used for dating events that have taken place only within the past 50,000 years.

THE GEOLOGICAL NEWSLETTER

GSOC

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ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Meeting—February.

FIELD TRIPS: Usually one per month, by 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.

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INFORMATION: www.gsoc.org *or* gsoc@teleport.com
Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

VOL. 66, No. 4
APRIL 2000

APRIL ACTIVITIES

Mon. April 3, 12-1:30 PM: Northern Mojave Desert Don Barr, past president
Central Library, 801 SW 10th St.

Fri. April 14, 8:00 PM: Changes in the Glacier Cover of North Cascades Nat. Park – 1955-1998 Frank Granshaw, faculty, PCC Earth Science Dept.; candidate for MS in geology, PSU; *Artemis Science Curriculum & Software* owner
Rm. 371 Cramer Hall, PSU, 1721 SW Broadway

Wed. April 26, 8:00 PM: Seminar
(1) "Extremophiles" Rosemary Kenney
(2) TBA
Rm. S-17 Cramer Hall, PSU, 1721 SW Broadway

April Field Trip: Sat. April 29: **Mt. Adams area ice caves**
call Taylor Hunt 503-662-4790 for details.

****

PREVIEW OF COMING ATTRACTIONS:

Fri. May 5, 12-1:30 PM, Central Library: Geological Formations of Kauai and Other Hawaiian Islands Taylor Hunt

Fri. May 12, 8:00 PM, Rm. 371 Cramer Hall, PSU: Methods for Predicting Earthquake-triggered Landslides Yumei Wang, Dir. of Earthquake & Landslide Programs, DOGAMI; PSU Civil Engineering Dept.

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Calendar items must be received by 15TH of preceding month. Evelyn at 503-223-2601; ralf70@aol.com

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Message from the President

Adapted from our new President Ray Crowe's talk at the 65th Annual Banquet –

Welcome GSOC'rs and Guests... to the 65th Annual Banquet of the Geological Society of the Oregon Country. It's perhaps appropriate that I become the first president for the new century as I'll soon demonstrate. Way back at the end of the last century, 1999, the GSOC, mostly under Cecilia Crater's able direction I believe...sold time machines! Yes - time machines ! **Here it is!** (GSOC baseball-style hat.)...and to move back in time, I simply reverse the bill, teen-age style.

It's now Sunday, July 30th, 1950...half a century ago this year, and thanks to Rosemary Kenney, I have the documentation...let me read from the newsletter, Vol.16, No. 7: "Klickitat, deep in a canyon cut in the CORIBA basalt's east of Mt. Adams will be the goal of the field trip for the GSOC, Sunday, July 30th. There will be a trip up the river canyon by speeder bus on the logging railroad of the J. Neils Lumber Company, Gray Butte, on the lower edge of the Yakima Indian Reservation, the Goldendale surface of Palouse-like soil over the lavas, and the details of the dissection of the Miocene lavas of the canyon will be seen at close range."

Back when I was 12, I used to hang out at the Dept. of Geology and Mineral Industries downtown in the old State Building. I'd peek out the windows and look down ten stories and slightly shiver...it was really high then, and move down the hall to the DOGAMI offices and their collection of fossils and library. Does anybody recall this building and room? It was there that I met somebody from GSOC, name now long forgotten, that invited me on the field trip...my earliest memory of the Society. It's pleasant taking trips down memory lane isn't it? Well, I still have very fond memories of the trip today; chugging along on the train, lava formations and strange basalts being pointed out over the "clack-clack" and chugging noises; and we even a stop at the dry-ice factory outside of Klickitat. So, why am I dredging all this up? Because of the lasting impact that was made on the mind of a teen-ager, and how it led me, after many intervening years, to become a member of GSOC.

What I look forward to in the coming year is to start an **Outreach Program**, one that will target young minds in our school systems for special treatment...maybe by taking a simple field trip, or donating a few stones at a school. Perhaps by reaching out and touching someone...GSOC will have another president in the year 2050 that started as a novice, with guiding hands from someone in our fine organization. I've even started myself already...by last Tuesday putting up a display in my granddaughter's school, Dundee Elementary, of fossils in the hall display cases. I had her do all the collecting, cleaning, mounting, and labeling. These will all be available for public viewing at the Tualatin Valley Gem Club's show at the Hillsboro Fairgrounds this weekend...March 17th, 18th, and 19th...please come and see what she's done, and maybe we can duplicate it for other children.

Also, I have been active in promoting the **Rice Mineral Museum**, exit 61 on Sunset Highway 26. There, Charlene Elliott, curator, has mentioned the museum plans to start it's own outreach program to take rocks, minerals, and fossils to local schools. In conclusion...I look forward to a productive year with a good staff of officers, board members, and volunteers for committee chairpersons...and let's attract lots of new members please. **Thank you for selecting me as your president for 2000**.

I remain your new GSOC president,

Ray Crowe

LIFE MEMBER

Dr. Ewart M. Baldwin, former geology professor at University of Oregon and co-author of Geology of Oregon, has been granted honorary life membership in GSOC for his contributions to the knowledge of geology in the Oregon Country.

BOOK REVIEW

New Views on An Old Planet: A History of Global Change, by Van Andel, Tjeerd H., (University of Cambridge, formerly professor at Stanford University), 1994, second edition: Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211, 439 pages, paperback. Available through www.amazon.com at $31.95 + $3.99 shipping and handling. (Editor's note: Currently not in the Powell's Books inventory on the web).

This book is highly recommended reading for GSOC'ers. Although long, it is simply written for the layperson, minimizes technical jargon, and avoids technicalities. It lacks photographs, but portrays many easily interpreted diagrams with explanative captions. This is one of the few books outside of a general earth science text, of which I am aware, to give a broad overview of the planet, its origin and ongoing processes, interaction between atmospheric and oceanic processes, plate tectonics, evolution and extinction of life, and rates of these processes. It's a book for this time in history.

It is divided into 8 parts, (each with 1 to 4 chapters). They are:

1. At the Start [Prologue]
2. Foundations: Rocks, Events and Time
3. Climate Past and Present: the Ice Age
4. Drifting Continents, Rising Mountains
5. Changing Oceans, Changing Climates
6. Four-Billion-Year Childhood: [The Precambrian]
7. Life, Time and Change
8. Epilogue

Each part concludes with a perspective and list of further readings. Text is not interrupted by frequent citations, enabling easy continuous reading. An un-"fractured" glossary of 12 pages and extensive index of 15 pages completes the book.

The two points that impressed me are:

1. The continuous changes in earth processes, the stages of which are not repeated over time
2. The great variabilities in earth processes, many of which are poorly understood and needing comprehensive interdisciplinary study.

One draw-back to the book is the author's interpretation that human influence on the environment will cause conditions adverse to our existence, instead of his following the theme that change is constant and inevitable. I believe it's possible that the demise of humans will bring forth a fresh diversity of life in the history of earth, and that the extinction of humans could be another milepost in the planet's progress.

Statements (and page) in the book that appealed to me are:

1. Most geological process are faster than we thought (25).
2. In the northern hemisphere over 30 glaciations occurred during 2 million years, the last only 10,000 years ago (45).
3. Ice cores taken in Greenland show that some major changes in temperature took only years, not decades (65).
4. **Epeirogeny**, the broad uplift of continents, is the behavior of the mantle beneath the plates where an uneven distribution of temperature and therefore density, combined with convective flow, is capable of changing the level of the surface over which the plates moves (170).
5. Environmental processes are so complexly related that, as they interact, more than one outcome is possible (249).
6. Hot springs at mid-oceanic spreading centers, greatly influenced the composition of sea water, introducing iron, manganese, silica, lime, and soda, thereby affecting its salinity (280).
7. Photosynthesis is an effective process in the generation of atmospheric oxygen (283).
8. Life has evolved steadily toward greater complexity, and after every extinction a greater diversity of life develops (313).
9. In spite of extinctions and biological blooms, the rate of biological divergence over geologic time is fairly uniform (329).
10. Many late Cretaceous extinctions were incomplete. A number, including the dinosaurs, had been preceded by a prolonged decline; and a few genera extended possibly into the early Paleocene. Most dramatic was the reduction of oceanic, not continental, forms (383-385).

11. Timing a meteor impact to within 100,000 years of an extinction is presently not possible with today's dating techniques (388).
12. The history of the earth cannot be compared to a gently flowing stream, but instead resembles an extended set of cataracts and waterfalls.
13. **Neo-catastrophism** is a better term for it than **uniformitarianism** (391).
14. To understand the world through the science of the earth demands a simultaneous profound understanding of many difficult subjects and great skill in cross-disciplinary synthesis (402).

Dr. Paul E. Hammond

Other books available from this author (from the Powell's Books inventory):
New Views on an Old Planet :Continental Drift and the History of Earth, Cambridge University Press, 1985.
Science at Sea :Tales of an Old Ocean, W.H. Freeman, 1981.
Tales Of An Old Ocean, NORTON*(WW Norton & Co).

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Kevin Finucane

Robert McGown

PRESIDENT'S FIELD TRIP PREVIEW

Our new president, Ray Crowe, has decided upon the time and place for this year's President's Field Trip. The tentative dates are September 2 through September 9, 2000. The subject of the trip is the **Ice Age Floods features** from the scablands of eastern Washington across to Missoula, Montana.

We are looking into the possibility of staying at brand name motels, Best Western maybe, and using a Raz bus, so the lectures can be heard by all. Ray is working on possible routes now.
Ray would like to get a count of interested members, so let him know!!!
Check next month's newsletter for an update!

GSOC ANNUAL BANQUET

Members of GSOC recently celebrated the 65th anniversary of the organization with the annual banquet, held at the Beaverton Elks Club on March 12, 2000. Seventy-five persons registered for the event, which was organized by treasurer **Phyllis Thorne** and past-president **Carol Hasenberg**.

Exhibitors at the event included members **Charlene Holswarth, Rosemary Kenney, Taylor Hunt, and Archie Strong**. The speaker was **Dr. Scott Burns**, GSOC member and professor at Portland State University. New GSOC president **Ray Crowe** gave the Message from the President. (see page 20)

Charter member **Mildred Phillips** also attended the affair, after recently returning with her family from Hawaii, where she celebrated her ninety-fifth birthday.

WEB TEASERS

Mammoth Molars, Bird Bones, and Human Hairs-

All these and more are being found in two of the most interesting paleontological and archaeological sites in Oregon. Mammoth Park site, located near Woodburn High School, contains soil layers that originated from peat bogs formed in lowlands as the Ice Age Floods receded. Another exposure about half a mile away at Mill Creek Park contains similar material. The sites have been dated at about 12,000 years old.

Some of the more interesting finds have been examples of **megafauna**, or huge animals which roamed Oregon during the Pleistocene. A molar from a giant ground sloth, and the remains of mammoth, mastodon, bear, giant bison, dire wolf, and horse have been found. A large bird bone discovered at the Mill Creek Park site was identified as the upper wing bone from a **teratorn**, a bird with a wingspan twice that of an eagle.

The Mammoth Park site yielded evidence of the human occupation of Oregon during this period. Evidence of tool making such as flake stones and bones believed to be cut by tools have been discovered. The most fascinating finds, however, were strands of human hair that are now undergoing DNA analysis.

Investigations into the Mammoth Park site include a consortium of scientists from:

- Center for the Study of the First Americans
- Institute for Archaeological Studies, Portland
- North Dakota State University
- The University of Oregon
- Oregon State University
- The Northwest Museum of Natural History Association
- Thomas Condon State Museum of Fossils

Oregon Public Broadcasting's Oregon Field Guide recently featured the sites on their February 24th show, and now have information about them on their web site. To order video tapes of past OFG episodes, please call OPB's Audience Services at (503) 293-1982.

To "dig into" these sites further, see the following Web Sites:

Mammoth Park Web Site:
http://www.ndsu.nodak.edu/instruct/schwert/qel/woodburn/woodbrn.htm
Oregon Field Guide Web Site:
http://www.opb.org/ofg/index.asp

Publication Teaser

Current Special Paper features in the Geological Society of America's (GSA) online bookstore (http://www.geosociety.org/pubs/bkstore/) :

SPE339: Large Meteorite Impacts and Planetary Evolution II, 2000, edited by B. O. Dressler and V. L. Sharpton
SPE341: Argentine Precordillera, 1999, Martin Keller
SPE340: Mesozoic Sedimentary and Tectonic History of North-Central Mexico, 1999, edited by: Claudio Bartolini, James Wilson, Timothy Lawton
SPE337: Glacial Processes Past and Present, 1999, edited by: David M. Mickelson, John W. Attig

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Children under age 18__________________________________

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Phone (____)____-_______ **Email address**____________________

Geologic Interests and Hobbies__________________________________
____

Please indicate Membership type and include check for appropriate amount:
Individual $20.00 ________ **Family $30.00** ________ **Student $10.00** ________

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Yumei Wang, Dir. of Earthquake & Landslide Programs, DOGAMI; PSU Civil Engineering Dept.   Rm. 371 Cramer Hall, PSU

Wed. May 24, 8:00 PM: Seminar
"Snowball Earth, Oxygen Poisoning, and Early Life"
Rm. S-17 Cramer Hall, PSU, 1721 SW Broadway

May Field Trip: Sat. May 24: Mary's Peak, highest mountain in Coast Range; Eocene ocean floor capped with gabbro sill; glaciation evidence; great views, wildflowers. Call Taylor Hunt, 503-662-4790, for details.

****

PREVIEW OF COMING ATTRACTIONS:
Fri. June 9, 8:00 PM: Geology on the Big Island of Hawaii   Diana Baker
June Field Trip: Sat. June 24: What's been happening to our coast? See some recent geologic changes between The Capes & Cannon Beach. Call Evelyn Pratt, 503-223-2601

****

Calendar items must be received by 15TH of preceding month. Evelyn at 503-223-2601; ralf70@aol.com

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Message from the President

Re-cap of the March 25, 2000 field trip led by field trip director **Taylor Hunt**:

The group of 17 met at **Rocky Butte** in NE Portland, for an overview of areas where flood waters 400 feet deep, and moving at 75 miles an hour, swept out of the Columbia Gorge. In the distance, long bars could be seen, especially in Vancouver, WA, past Plum Hill, and towards city center, then again, approaching our vantage point. The summit where we stood had a saddle that had been broached, the waters excavating a plunge pool on the west side of the ancient volcanic vent. A large rounded boulder near the summit caused Taylor to wonder if even the summit had seen flood waters over the top.

Next stop was at the **Rose City Golf Course** along Sacramento Street. To the east was Rocky Butte, around which the flood waters surged, leaving a broad swale at the golf course that continued to Hwy. 84, and into the Willamette River six miles away.

At Oregon City, the group admired **Willamette Falls**, where the flood waters had backed up and exited by way of Lake Oswego into the Tualatin Valley. At the top of the Oregon City Canyon above the falls, Taylor led the group on a short excursion to an active landslide area. After the Troutdale Formation gravels were deposited on top of the Columbia River Basalts', the Boring lavas covered them, leaving the "ball-bearing like" gravels to create future landslides after the Willamette River washed away the toe of the landslide. It is active today, leaving large gaps in the ground and trees at strange angles.

A stop was made at the **Tualatin City Hall** to hear Lisa Thorpe tell of the bones of "Tu Tu Tuala," a mastodon skeleton on display that had been excavated from the nearby parking lot of the Fred Meyer Store (the store hadn't been built in 1962 when excavated). After an excellent talk, the group lunched in their cars or on the hood, while pouring over maps of the area.

The group then headed overland across flood scoured areas and kolk lakes, and stopped briefly at **Onion Flats**. The area near Tonquin and Sherwood had scablands and channels.

Between the Chehalem Hills and Parrott Mt., a stop was made on **Rex Hill**, where large landslide terraces had slumped. Taylor believed successive floods had cut off the toe of the slides, allowing them to continue with non-catastrophic sliding. Red soils, Taylor commented, were caused by the decomposition of basalt.

In the **Chehalem Hills**, Taylor led us up the west face of Bald Peak, allowing a different view of the terraces of giant landslide slumps. One slide apparently blocked and changed the course of the Tualatin River, a divide between the two drainages noted in the broad valley below us.

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I remain your GSOC President,
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The Life of a Hawaiian Volcano

In the early stages of the life of a Hawaiian volcano, basalts are erupted from the plume of magma arising from the hot spot to create a subterranean mountain. The common basalt in the early stage eruptions is called tholeiite, and contains crystals of the mineral olivine. The mountain gets larger and larger until it appears above the water, after many thousands of years. It continues to erupt, and forms a regular shape. Hawaiian volcanoes tend to erupt "quietly", or with non-explosive outpourings of molten rock which roll down the slopes and into the sea. The slope of the mountain is very shallow compared to mainland volcanoes, because the hot thin lava flows cannot maintain a steep slope. This type of volcano is called a **shield volcano.**

Shield volcanoes have a characteristic shape. With the accumulation of heavy, fractured rock, the massive mound begins to settle and crack. The upwelling magma then forces its way up through fractures that radiate from the central cauldera, which lies just above the magma chamber. These fractures are called **rift zones**. The spacing between rift zones tends to be about 120°, so that a shield volcano by itself will have three rift zones. If the volcano develops alongside an older one (such as Kilauea and Mauna Loa), the older volcano will act as a bolster and only two rift zones will develop.

As this mountain building process is unfolding, the weight of the volcano gets greater and greater, depressing the ocean floor in its vicinity. All around the Hawaiian islands is a depression in the ocean floor called **the Hawaiian deep**. The deep is greatest around the island of Hawaii, with the great masses of Mauna Kea and Mauna Loa, the two tallest peaks in the islands. It can be argued that if

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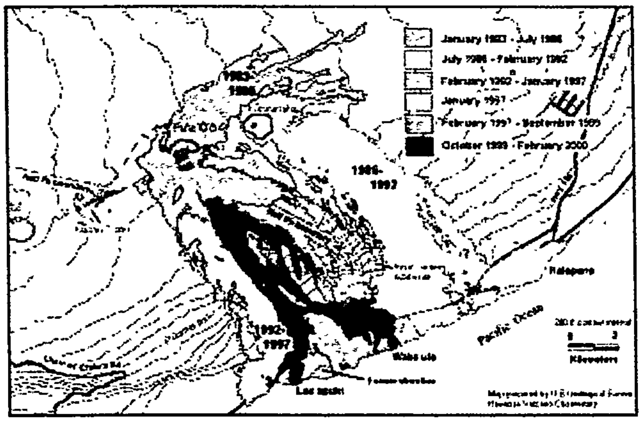

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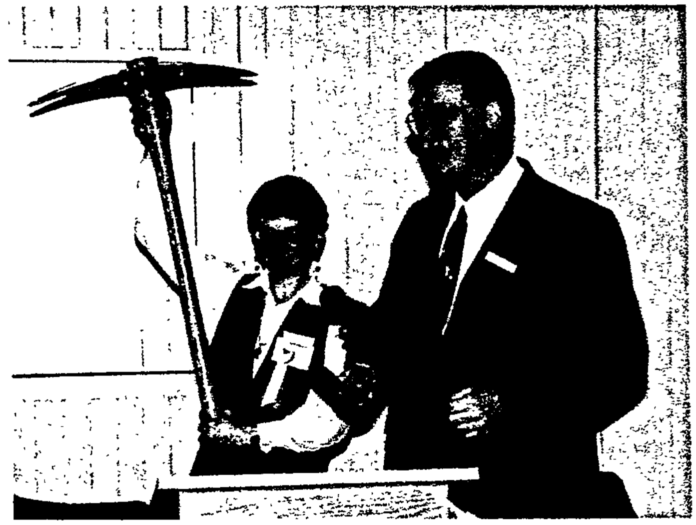

New GSOC president **Ray Crowe** and past President **Carol Hasenberg** pass the pick-axe.

Charter member **Mildred Phillips** also attended the affair, after recently returning with her family from Hawaii, where she celebrated her ninety-fifth birthday.

SOME MORE GEO-WEB TEASERS

If you liked last month's radiometric dating article, read one on the pitfalls of radio-carbon dating from the Scientific American Discovering Archaeology site:
http://www.discoveringarchaeology.com/0799toc/7special7-radiocarbon.shtml

Like dinosaurs? Here's a few dino-teasers:

The Royal Tyrell Museum of Paleontology
http://www.tyrrellmuseum.com/

One of my favorite childhood memories is visiting the Carnegie Museum of Natural History in Pittsburgh, PA:
http://www.clpgh.org/cmnh/

Here's a good hobbyist link page:
Dino Russ's Lair - Home Page
http://www.isgs.uiuc.edu/dinos/dinos_home.html

GEOLOGICAL TIME CHART

Rusty on your geological time chart? Here's the latest version from the USGS web site:

Phanerozoic Eon (544 ma to present)
- Cenozoic Era (65 ma to present)
  - Quaternary Period (1.8 ma to present)
    - Holocene Epoch (8,000 years ago to present)
    - Pleistocene Epoch (1.8 ma to 8,000 years ago)
  - Tertiary Period (65 to 1.8 ma)
    - Pliocene Epoch (5.3 to 1.8 ma)
    - Miocene Epoch (23.8 to 5.3 ma)
    - Oligocene Epoch (33.7 to 23.8 ma)
    - Eocene Epoch (55.5 to 33.7 ma)
    - Paleocene Epoch (65 to 55.5 ma)
- Mesozoic Era (248 to 65 ma)
  - Cretaceous Period (145 to 65 ma)
  - Jurassic Period (213 to 145 ma)
  - Triassic Period (248 to 213 ma)
- Paleozoic Era (544 to 248 ma)
  - Permian Period (286 to 248 ma)
  - Carboniferous Period (360 to 286 ma)
    - Pennsylvanian Period (325 to 286 ma)
    - Mississippian Period (360 to 325 ma)
  - Devonian Period (410 to 360 ma)
  - Silurian Period (440 to 410 ma)
  - Ordovician Period (505 to 440 ma)
  - Cambrian Period (544 to 505 ma)

Precambrian Time (4500 to 544 ma)
- Proterozoic Era (2500 to 544 ma)
  - Vendian Period (544 to 650 ma)
- Archaean Era (3800 to 2500 ma)
- Hadean Time (4500 to 3800 ma)

For more info on geological time, visit the USGS web site at:
http://geology.er.usgs.gov/paleo/geotime.shtml
http://pubs.usgs.gov/gip/geotime/
or, try the University of California (Berkeley) Museum of Paleontology's excellent Web Geological Time Machine:
http://www.ucmp.berkeley.edu/help/timeform.html
or this one:
Do you keep forgetting the geo time chart? Read some hilarious pneumonic sayings on Dr. Bob's Geologic Time Page:
http://oldsci.eiu.edu/geology/jorstad/geoltime.html
One of my favorite was "Quit Telling Crazy Jack That Perry Como Died Slowly Over Coals"!!!

PRESIDENT'S FIELD TRIP SEPTEMBER 2-9, 2000
THE BRETZ FLOOD--PORTLAND TO MISSOULA

President Ray Crowe and RAZ Transportation Company are planning an exciting trip. Details to date are as follows:

September 2 - Portland to Twin Cities
September 3,4 - Moses Lake
September 5 - Spokane
September 6 - Missoula
September 7 - Spokane
September 8 - Ellensberg
September 9 - Return Portland

The anticipated cost of the trip is $650.00 per person, twin room, based on 30 persons. Final cost will depend on how many persons go. If you plan to attend, please send in your reservation form with a deposit of $100.00 prior to June 30. The total cost will be determined prior to July 15, when final payment is due. Seating is limited and GSOC members will have priority. RAZ has made reservations at motels with dining rooms in the motel or immediately adjacent.

Ray is discussing a flyover from Moses Lake. This is an optional trip. The estimated cost is $89.00 per person, in a nine person plane. There may be tax added onto this amount. If the group wants to have a leader accompany the flight, the cost of his fare will be paid by those on the flight.

If you have any questions about the trip, call Ray Crowe, President. Telephone: (503) 640-6581

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FIELD TRIP RESERVATION FORM

____
Name/Names

____
Address and Telephone Number

I am interested in the flyover: ________________________

Deposit of $100.00 enclosed for each reservation: $__________

Check payable to: RAZ Transportation & Tours--Tour PG0902

Mail check to: Geological Society of the Oregon Country
P. O. Box 907, Portland OR 97207-0907

THE GEOLOGICAL NEWSLETTER

GSOC

MAY 2000

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

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

2000-2001 ADMINISTRATION
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Vice-President:
Sandra Adamson - 667-6287
Secretary
Beverly Vogt - 292-6939
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Phyllis Thorne - 292-6134

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Taylor Hunt (3 years) - 662-4790
Archie Strong (2 years) - 244-1488
Richard Donelson (1 year) - 654-1098

Immediate Past Presidents:
Carol Hasenberg 282-0547
Beverly Vogt 292-6939

THE GEOLOGICAL NEWSLETTER

Editor:
Carol Hasenberg - 282-0547
Calendar:
Evelyn Pratt - 223-2601

Business Manager:
Rosemary Kenney - 221-0757
Assistant Business Manager:
Cecelia Crater - 235-5158

ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Meeting—February.

FIELD TRIPS: Usually one per month, by 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. 371, 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:

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.

WEBSITE: www.gsoc.org. Email address: gsoc@teleport.com.

APPLICATION FOR MEMBERSHIP-
THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Name______________________________ **Spouse**____________________
Children under age 18______________________________________

Address ____________________________ **City** __________ **State** ___ **Zip**______-___
Phone (____)_____-_________ **Email address**____________________

Geologic Interests and Hobbies______________________________________
____

Please indicate Membership type and include check for appropriate amount:
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Make Check Payable to: **The Geological Society of the Oregon Country**
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VISITORS WELCOME AT ALL MEETINGS
INFORMATION: www.gsoc.org *or* gsoc@teleport.com
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Evelyn Pratt, 503-223-2601

VOL. 66, No. 5
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MAY ACTIVITIES

Fri. May 5, 12-1:30 PM: Geological Formations of Kauai and Other Hawaiian Islands
Taylor Hunt   Central Library, 801 SW 10th St.

Fri. May 12, 8:00 PM: Methods for Predicting Earthquake-Triggered Landslides
Yumei Wang, Dir. of Earthquake & Landslide Programs, DOGAMI; PSU Civil Engineering Dept.   Rm. 371 Cramer Hall, PSU

Wed. May 24, 8:00 PM: Seminar
"Snowball Earth, Oxygen Poisoning, and Early Life"
Rm. S-17 Cramer Hall, PSU, 1721 SW Broadway

May Field Trip: Sat. May 24: Mary's Peak, highest mountain in Coast Range; Eocene ocean floor capped with gabbro sill; glaciation evidence; great views, wildflowers. Call Taylor Hunt, 503-662-4790, for details.

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PREVIEW OF COMING ATTRACTIONS:
Fri. June 9, 8:00 PM: Geology on the Big Island of Hawaii   Diana Baker
June Field Trip: Sat. June 24: What's been happening to our coast? See some recent geologic changes between The Capes & Cannon Beach. Call Evelyn Pratt, 503-223-2601

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Calendar items must be received by 15TH of preceding month. Evelyn at 503-223-2601; ralf70@aol.com

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Message from the President

Re-cap of the March 25, 2000 field trip led by field trip director **Taylor Hunt**:

The group of 17 met at **Rocky Butte** in NE Portland, for an overview of areas where flood waters 400 feet deep, and moving at 75 miles an hour, swept out of the Columbia Gorge. In the distance, long bars could be seen, especially in Vancouver, WA, past Plum Hill, and towards city center, then again, approaching our vantage point. The summit where we stood had a saddle that had been broached, the waters excavating a plunge pool on the west side of the ancient volcanic vent. A large rounded boulder near the summit caused Taylor to wonder if even the summit had seen flood waters over the top.

Next stop was at the **Rose City Golf Course** along Sacramento Street. To the east was Rocky Butte, around which the flood waters surged, leaving a broad swale at the golf course that continued to Hwy. 84, and into the Willamette River six miles away.

At Oregon City, the group admired **Willamette Falls**, where the flood waters had backed up and exited by way of Lake Oswego into the Tualatin Valley. At the top of the Oregon City Canyon above the falls, Taylor led the group on a short excursion to an active landslide area. After the Troutdale Formation gravels were deposited on top of the Columbia River Basalts', the Boring lavas covered them, leaving the "ball-bearing like" gravels to create future landslides after the Willamette River washed away the toe of the landslide. It is active today, leaving large gaps in the ground and trees at strange angles.

A stop was made at the **Tualatin City Hall** to hear Lisa Thorpe tell of the bones of "Tu Tu Tuala," a mastodon skeleton on display that had been excavated from the nearby parking lot of the Fred Meyer Store (the store hadn't been built in 1962 when excavated). After an excellent talk, the group lunched in their cars or on the hood, while pouring over maps of the area.

The group then headed overland across flood scoured areas and kolk lakes, and stopped briefly at **Onion Flats**. The area near Tonquin and Sherwood had scablands and channels.

Between the Chehalem Hills and Parrott Mt., a stop was made on **Rex Hill**, where large landslide terraces had slumped. Taylor believed successive floods had cut off the toe of the slides, allowing them to continue with non-catastrophic sliding. Red soils, Taylor commented, were caused by the decomposition of basalt.

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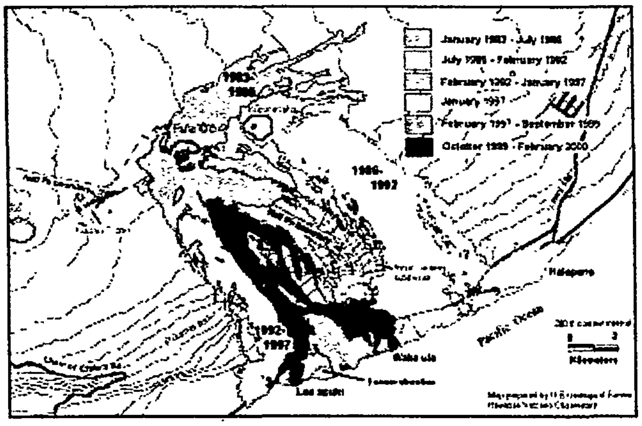

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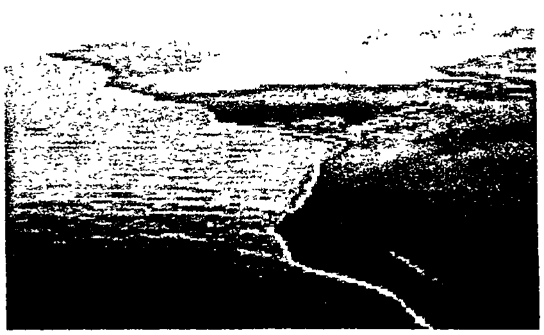

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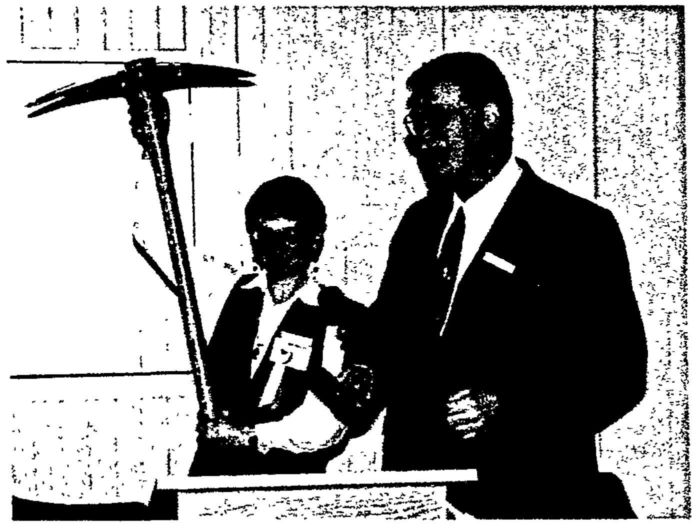
GSOC Annual Banquet Pics

These pictures are courtesy GSOC member Bob Richmond:



New GSOC president **Ray Crowe** and past President **Carol Hasenberg** pass the pick-axe.

Charter member **Mildred Phillips** also attended the affair, after recently returning with her family from Hawaii, where she celebrated her ninety-fifth birthday.

SOME MORE GEO-WEB TEASERS

If you liked last month's radiometric dating article, read one on the pitfalls of radio-carbon dating from the Scientific American Discovering Archaeology site:
http://www.discoveringarchaeology.com/0799toc/7special7-radiocarbon.shtml

Like dinosaurs? Here's a few dino-teasers:

The Royal Tyrell Museum of Paleontology
http://www.tyrrellmuseum.com/

One of my favorite childhood memories is visiting the Carnegie Museum of Natural History in Pittsburgh, PA:
http://www.clpgh.org/cmnh/

Here's a good hobbyist link page:
Dino Russ's Lair - Home Page
http://www.isgs.uiuc.edu/dinos/dinos_home.html

GEOLOGICAL TIME CHART

Rusty on your geological time chart? Here's the latest version from the USGS web site:

- Phanerozoic Eon (544 ma to present)
  - Cenozoic Era (65 ma to present)
    - Quaternary Period (1.8 ma to present)
      - Holocene Epoch (8,000 years ago to present)
      - Pleistocene Epoch (1.8 ma to 8,000 years ago)
    - Tertiary Period (65 to 1.8 ma)
      - Pliocene Epoch (5.3 to 1.8 ma)
      - Miocene Epoch (23.8 to 5.3 ma)
      - Oligocene Epoch (33.7 to 23.8 ma)
      - Eocene Epoch (55.5 to 33.7 ma)
      - Paleocene Epoch (65 to 55.5 ma)
  - Mesozoic Era (248 to 65 ma)
    - Cretaceous Period (145 to 65 ma)
    - Jurassic Period (213 to 145 ma)
    - Triassic Period (248 to 213 ma)
  - Paleozoic Era (544 to 248 ma)
    - Permian Period (286 to 248 ma)
    - Carboniferous Period (360 to 286 ma)
      - Pennsylvanian Period (325 to 286 ma)
      - Mississippian Period (360 to 325 ma)
    - Devonian Period (410 to 360 ma)
    - Silurian Period (440 to 410 ma)
    - Ordovician Period (505 to 440 ma)
    - Cambrian Period (544 to 505 ma)
- Precambrian Time (4500 to 544 ma)
  - Proterozoic Era (2500 to 544 ma)
    - Vendian Period (544 to 650 ma)
  - Archaean Era (3800 to 2500 ma)
  - Hadean Time (4500 to 3800 ma)

For more info on geological time, visit the USGS web site at:
http://geology.er.usgs.gov/paleo/geotime.shtml
http://pubs.usgs.gov/gip/geotime/
or, try the University of California (Berkeley) Museum of Paleontology's excellent Web Geological Time Machine:
http://www.ucmp.berkeley.edu/help/timeform.html
or this one:
Do you keep forgetting the geo time chart? Read some hilarious pneumonic sayings on Dr. Bob's Geologic Time Page:
http://oldsci.eiu.edu/geology/jorstad/geoltime.html
One of my favorite was "Quit Telling Crazy Jack That Perry Como Died Slowly Over Coals"!!!

PRESIDENT'S FIELD TRIP SEPTEMBER 2-9, 2000
THE BRETZ FLOOD--PORTLAND TO MISSOULA

President Ray Crowe and RAZ Transportation Company are planning an exciting trip. Details to date are as follows:

September 2 - Portland to Twin Cities

September 3,4 - Moses Lake	September 7 - Spokane
September 5 - Spokane	September 8 - Ellensberg
September 6 - Missoula	September 9 - Return Portland

The anticipated cost of the trip is $650.00 per person, twin room, based on 30 persons. Final cost will depend on how many persons go. If you plan to attend, please send in your reservation form with a deposit of $100.00 prior to June 30. The total cost will be determined prior to July 15, when final payment is due. Seating is limited and GSOC members will have priority. RAZ has made reservations at motels with dining rooms in the motel or immediately adjacent.

Ray is discussing a flyover from Moses Lake. This is an optional trip. The estimated cost is $89.00 per person, in a nine person plane. There may be tax added onto this amount. If the group wants to have a leader accompany the flight, the cost of his fare will be paid by those on the flight.

If you have any questions about the trip, call Ray Crowe, President. Telephone: (503) 640-6581

****

FIELD TRIP RESERVATION FORM

____
Name/Names

____
Address and Telephone Number

I am interested in the flyover: ______________________________

Deposit of $100.00 enclosed for each reservation: $___________

Check payable to: RAZ Transportation & Tours--Tour PG0902

Mail check to: Geological Society of the Oregon Country
P. O. Box 907, Portland OR 97207-0907

THE GEOLOGICAL NEWSLETTER

GSOC

JUNE 2000

Geological Society of the Oregon Country
P. O. Box 907
Portland, OR 97207

Since 1935

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

2000-2001 ADMINISTRATION
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Vice-President:
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Beverly Vogt - 292-6939
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Archie Strong (2 years) - 244-1488
Richard Donelson (1 year) - 654-1098

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Carol Hasenberg 282-0547
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THE GEOLOGICAL NEWSLETTER

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Carol Hasenberg - 282-0547
Calendar:
Evelyn Pratt - 223-2601

Business Manager:
Rosemary Kenney - 221-0757
Assistant Business Manager:
Cecelia Crater - 235-5158

ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Meeting—February.
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MEMBERSHIP: Per year from January 1: Individual--$20.00, Family--$30.00, Junior (under 18)/Student--$10.00.
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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.
WEBSITE: www.gsoc.org. Email address: gsoc@teleport.com.

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THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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Children under age 18________________________________

Address ________________________ **City** ____________ **State** ___ **Zip**______-___
Phone (____)_____-__________ **Email address**____________________

Geologic Interests and Hobbies________________________________
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Please indicate Membership type and include check for appropriate amount:
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P.O. BOX 907, PORTLAND, OR 97207

VISITORS WELCOME AT ALL MEETINGS — VOL. 66, No. 6
INFORMATION: www.gsoc.org *or* gsoc@teleport.com — JUNE 2000
Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

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Message from the President

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In Moses Lake, Gene Kiver will take us on a tour covering the area of **Dry Falls State Park**, a once ancient cataract, scour pot-holes, giant bars of gravel, and to view the giant coulees, carved by the ancient torrents. Air flights touring over the spectacular area are planned also, while those on the ground collect souvenir rocks.

As we travel eastward, the group will visit the area of the ancient North American continent docking with terranes, and there will be a stop-over at Farragut State Park where we will get to see where the floods gouged out basins after failure of the glacier tongue on the Clark Fork River near Sandpoint, ID. We'll view giant watermarks on the hills near **Missoula, Montana**, and then even possibly a bison-burger cook-out before heading back towards Ellensburg, WA.

A stop at the Vantage, WA, outwash of the Columbia River channel of the Missoula floods will be combined with Native American rock pictographs and a state park museum dedicated to petrified ginkgo wood. While in Ellensburg, time permitting, the **Central Washington University** has the sign-language speaking bonobo apes that will be visited. The final day, Sept. 9th, the bus will return to Portland, stopping at the Discovery Center in The Dalles to visit their many important exhibits, including those of the Missoula Floods. For more information, please contact me at 503-640-6581 or raycrowe@aol.com.

I remain your GSOC President,
Ray Crowe

GO FOR THE GOLD!!!

The Rice Northwest Museum of Rocks and Minerals is holding the grand opening of its new display of 92 crystallized **gold specimens** from the world-famous John Barlow Collection from 9 a.m. to 5 p.m., Saturday and Sunday, June 10 and 11, 2000. For this event, the Museum is having extended hours and waiving its normal admission fees. The Museum is located west of Portland, just off Highway 26 at 26385 N. W. Groveland Drive, in Hillsboro. Take exit 61 off Highway 26 west, and take the first turn west onto Groveland Drive. Normal hours are 1 to 5 p.m., Wednesday through Saturday; usual admission fees except for this event are $2 for adults and $1 for students. For additional information, call 503-647-2418; website is www.ricenwmuseum.org.

DR. BALDWIN THANKS GSOC

The Geological Society of the Oregon Country honored Dr. Ewart Baldwin by making him an Honorary Life Member at the GSOC Annual Banquet in March of this year. The honor was in recognition of Dr. Baldwin's many contributions to the study of geology in Oregon during his long career as professor of geology at the University of Oregon and his authorship of early editions of the book Geology of Oregon. Following is a letter of response from Dr. Baldwin:

"*April 24, 2000*

Beverly F. Vogt
Secretary GSOC
PO Box 907
Portland, OR 97207

Dear Beverly,

I wish to thank the Geological Society of the Oregon Country for their awarding me Honorary Membership in the Society. I first joined in 1944 and have pretty well been a member ever since. I had come to work with DOGAMI and John Allen on the Coos Bay coal project. John knew everybody, and with his introductions, I soon felt right at home. I am sorry that distance and now age have kept me from taking part more.

Do extend my thanks and best wishes to the Society, and thank you.

Sincerely,

Ewart M. Baldwin"

WISH LIST: NEW SLIDE PROJECTOR

The Geological Society of the Oregon Country has monthly noon talks at the downtown Multnomah County Library. We urgently need a **Kodak carousel-type slide projector** to be used at the luncheons, because speakers or members have had to provide their own for the talks. If anyone is will to donate a projector or money to buy one, please contact President Ray Crowe, 503-640-6581.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Michael Marshall
Curt and Rebecca Ralston
Dr. Kay F. Reinartz

MAY FIELD TRIP PRE/reVIEW - MARY'S PEAK

Mary's Peak (4097 ft.) is the highest elevation in the Oregon Coast Range. The peak is topped by an erosion-resistant sill which intrudes bedded sandstones of the middle Eocene. The body of the peak consists of the northwest dipping Siletz River

Volcanics formation, from the early Eocene. The Corvallis fault lies at the eastern base of the peak.

FIELD TRIP RECAP – ICE CAVE AT TROUT LAKE, WASHINGTON

The destination for the April field trip was the Ice Cave near Trout Lake, Washington. This well-known cave develops ice formations in the winter, and it served as the ice supply for the towns of Hood River and The Dalles in pioneer years. Twenty-eight GSOC members and guests met in Hood River to caravan up to explore the cave, led by field trip director Taylor Hunt.

Traveling up the White Salmon River from the Columbia gave the group views of CRB (Columbia River Basalt) and conglomerates below Underwood mountain, followed by CRB and Troutdale Formation conglomerates. The latter were easily identified as flood deposits, as much metamorphic rock was mixed with basalt cobbles. Then conglomerates and lahar and debris flow were all Mt. Adams basalt. The caravan ascended up into Trout Lake Valley, which is less than 10,000 years old and is a landslide/mudflow valley fill, roughly 3 miles by 27 miles. Trout Lake itself is a shallow sink behind the landslide toe.

The group then headed west up to the cave entrance near the National Forest boundary. The last ¾ mile of the road was covered with patches of snow, but the beautiful weather made the short hike to the cave worthwhile. The altimeter indicated 2800 feet of elevation at the parking area.

The Ice Cave is a lava tube formation with four sections separated by three collapse sinks. The main entrance of the cave is another collapse sink about 15 feet in diameter and 14 feet deep. This entrance is within Ice Cave Forest Campground of the Gifford Pinchot National Forest. The Forest Service has constructed a wooden ladder leading into the "neve cone" beneath the main entrance. This domed room collects ice formations in the winter due to its depth and stagnant air pocket. The formations were both above the group in the form of stalactites and columns, and unfortunately were also underfoot, making the entry into the cave very treacherous.

The group observed hundreds of ice stalactites, stalagmites, columns, draperies and curtains, some 10 inches thick or more. Some openings were so clogged with ice that further travel would have damaged the formations. The group also explored other sections of the cave, which were all easier to enter than the main cave. However, most passages were blocked by ice at some point.

Taylor is hoping to repeat the tour of the cave on July 8, when the cave will be easier to explore. He also hopes to stop along the White Salmon River area of the Columbia River Gorge to explore that particular geology. More in next month's newsletter...

Taylor Hunt and Carol Hasenberg

Glacial Research in the North Cascades

Mr. Frank Granshaw, master's candidate at Portland State University, spoke to GSOC at the April 14, 2000 Friday night meeting. The subject of his research has been glaciers in the North Cascades National Park, which contains over one-third of the glaciers in the continental United States.

The study of glaciers is significant because glaciers are highly sensitive indicators of climate change. They also function as water storage devices for the regions in which they are found. However, Frank has discovered that studying glaciers can be difficult. Study is limited primarily to the month of August, when one can distinguish snow accumulation from the actual glacier. When assessing glaciers on site by foot, access to the glacier often is extremely difficult and weather can be a problem. Remote sensing can be very expensive and is also limited by the weather.

The major tasks associated with Frank's study are:

- calculating glacier area and volume change from the 1973 inventory to 1998
- determining stream flows for three watersheds in the park
- comparing regional climate change to changes in glacier geometry and stream flow

So far, Frank has determined that the park lost at least six glaciers since the 1973 inventory. Also, glacier area and volume has decreased by at least 10%. This has occurred during climate trends where precipitation has generally decreased and average annual temperature has generally increased. Frank is currently analyzing the stream flow data to determine the correlation with the glacier changes.

We'd like to thank Frank once again for this interesting presentation.

Carol Hasenberg

Gotta Hava Loupe!!!

A loupe, (otherwise known as pocket magnifier or hand lens), is used by geologists to closely inspect small but visible objects. Loupes are handy for GSOC'ers to observe rock crystals and other small details when on a GSOC field trip. But before you rush out to get one for this month's exciting field trip on the Oregon coast, do a little research so that you get the right lens for you.

First, you should know that there are three basic lens configurations for the lenses in a loupe. They are:

- A coddington, or **single** lens, which is more rugged (especially in watery environments), needs to be larger in diameter due to the fact that the edges are visually distorted.
- A **doublet**, with two lenses separated by an air space, provides less visual distortion (slight distortion at the edges) than the single lens and is usually very reasonable in price.
- The **triplet** is the highest quality of lens, and thus is the highest in price. A Hastings triplet has three lenses cemented together in an achromatic configuration (all lenses focus on the same point). Triplets also have the least distortion of the image, and are the standard lens used to grade diamonds.

In addition to the lens configuration, each loupe will have a **power specification** (10X, meaning 10 times larger than "real life", etc.) and a lens size in diameter. In general, the higher the power, the smaller in diameter the lens will be. Also, the higher the power the lens, the less **depth of field** you will have. For rock crystal viewing, power in the range of 10X to 15X is generally sufficient. Make sure you bring along a sample to inspect if buying your loupe locally.

Last but not least, make sure you purchase or make a **lanyard** for your lens. My old hand lens is now rusting at the top of Steens Mountain!!! It is so easy to put the lens down and walk away from it – you won't if it's hanging around your neck.

So, where are you going to get that loupe? Some local places that carry a selection are:

- Ed's House of Gems on NE Sandy Blvd.
- Handley Rock and Jewelry Supply on Hwy 99 in Vancouver, WA

Also check out the following web sites:

http://www.kooters.com/handlens.html
http://www.ascsci.com/geotools/lens.html
http://www.indigo.com/magnify/mgfyfold.html
http://www.allensinc.com/coins/supplies/magloupe.htm
http://www.kassoy.com/loupes01.htm
http://www.frostproof.com/catalog/m37.html
http://www.frostproof.com/catalog/meas02.html

Friends of the Pleistocene

The Pacific Cell of the Friends of the Pleistocene visited the late Quaternary faulting and pluvial lake history of the northern Quinn River and Alvord valleys in north-central Nevada and southeastern Oregon on their annual field trip during September 24-26, 1999. Guidebooks are available for $26 a copy from: Bud Burke, Geology Department, Humboldt State University, Arcata CA, 95521.

The FOP Pacific Northwest Cell visited the geo-archaeology of the Columbia River Gorge on their annual field trip, September 18 and 19, 1999. Guidebooks are available for $10 from Alex_Bourdeau@r1.fws.gov.

This year the PNW Cell plans to visit the Newberry Volcano in central Oregon on September 15-17, 2000 Trip leaders will be Larry Chitwood (USFS) and Bob Jensen (USFS) with co-leaders Bob Reynolds (COCC), Steve Kuehn (WSU), Tom Connolly (U of O), and Julie Donnelly-Nolan (USGS). A web site has been set up at http://www.geocities.com/ pnw2000fop/ or e-mail pnw2000fop@ yahoo.com to communicate details of the trip.

You can visit the FOP web site at: http://pc53.chm.nau.edu/amqua/v29n2/2000_friends_of_the_pleistocene_.htm

JUNE FIELD TRIP – OREGON COAST DISASTERS!!!

This month Evelyn Pratt will lead the GSOC field trip on the Oregon Coast from the Netarts area to Cannon Beach. Completing the highway 6 – 101 – 26 loop the group will visit the following landslide/erosional features:

- The 1991 slide scarp at the crest of highway 6 along the Wilson River (see photo)

- The landslide at the Capes development near Netarts
- The landslide just north of Cape Meares State Park
- Cape Falcon/Oswald West area
- Cove Beach erosional features
- Hug Point
- Landslides on both highway 6 and 26

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Children under age 18____________________

Address __________________ **City** ________ **State** ___ **Zip**_____-___
Phone (____)____-______ **Email address**______________

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The Geological Society of the Oregon Country in Portland is planning its **annual President's Field Trip** over this route Sept. 2nd through the 9th. This historic bus tour will be the first organized trip by a group over the newly designated route of our next national trailway, assuming Congress approves it. The eight-day trip will leave Portland and pass through the Columbia Gorge. Dr. Richard Waitt of the U.S. Geological Survey will be our guide as far as Kennewick, and into Moses Lake, WA. Staying at a popular hotel chain for the duration of the trip, the next day we hope to take our tour bus to the popular Palouse Falls, a trickle now compared to the raging Ice Age floods. While in the area we expect an anthropologist to point out the sites of ancient Kennewick Man and Marmes Man, so the group will be able to walk in the footsteps of ancient man. Hopefully, evening lectures will fill in our knowledge of the area, plus add information about the fossil mammoth and Native American presence in the Columbia Basin.

In Moses Lake, Gene Kiver will take us on a tour covering the area of **Dry Falls State Park**, a once ancient cataract, scour pot-holes, giant bars of gravel, and to view the giant coulees, carved by the ancient torrents. Air flights touring over the spectacular area are planned also, while those on the ground collect souvenir rocks.

As we travel eastward, the group will visit the area of the ancient North American continent docking with terranes, and there will be a stop-over at Farragut State Park where we will get to see where the floods gouged out basins after failure of the glacier tongue on the Clark Fork River near Sandpoint, ID. We'll view giant watermarks on the hills near **Missoula, Montana**, and then even possibly a bison-burger cook-out before heading back towards Ellensburg, WA.

A stop at the Vantage, WA, outwash of the Columbia River channel of the Missoula floods will be combined with Native American rock pictographs and a state park museum dedicated to petrified ginkgo wood. While in Ellensburg, time permitting, the **Central Washington University** has the sign-language speaking bonobo apes that will be visited. The final day, Sept. 9th, the bus will return to Portland, stopping at the Discovery Center in The Dalles to visit their many important exhibits, including those of the Missoula Floods. For more information, please contact me at 503-640-6581 or raycrowe@aol.com.

I remain your GSOC President,
Ray Crowe

GO FOR THE GOLD!!!

The Rice Northwest Museum of Rocks and Minerals is holding the grand opening of its new display of 92 crystallized **gold specimens** from the world-famous John Barlow Collection from 9 a.m. to 5 p.m., Saturday and Sunday, June 10 and 11, 2000. For this event, the Museum is having extended hours and waiving its normal admission fees. The Museum is located west of Portland, just off Highway 26 at 26385 N. W. Groveland Drive, in Hillsboro. Take exit 61 off Highway 26 west, and take the first turn west onto Groveland Drive. Normal hours are 1 to 5 p.m., Wednesday through Saturday; usual admission fees except for this event are $2 for adults and $1 for students. For additional information, call 503-647-2418; website is www.ricenwmuseum.org.

DR. BALDWIN THANKS GSOC

The Geological Society of the Oregon Country honored Dr. Ewart Baldwin by making him an Honorary Life Member at the GSOC Annual Banquet in March of this year. The honor was in recognition of Dr. Baldwin's many contributions to the study of geology in Oregon during his long career as professor of geology at the University of Oregon and his authorship of early editions of the book Geology of Oregon. Following is a letter of response from Dr. Baldwin:

"April 24, 2000

Beverly F. Vogt
Secretary GSOC
PO Box 907
Portland, OR 97207

Dear Beverly,

I wish to thank the Geological Society of the Oregon Country for their awarding me Honorary Membership in the Society. I first joined in 1944 and have pretty well been a member ever since. I had come to work with DOGAMI and John Allen on the Coos Bay coal project. John knew everybody, and with his introductions, I soon felt right at home. I am sorry that distance and now age have kept me from taking part more.

Do extend my thanks and best wishes to the Society, and thank you.

Sincerely,

Ewart M. Baldwin"

WISH LIST: NEW SLIDE PROJECTOR

The Geological Society of the Oregon Country has monthly noon talks at the downtown Multnomah County Library. We urgently need a **Kodak carousel-type slide projector** to be used at the luncheons, because speakers or members have had to provide their own for the talks. If anyone is will to donate a projector or money to buy one, please contact President Ray Crowe, 503-640-6581.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Michael Marshall
Curt and Rebecca Ralston
Dr. Kay F. Reinartz

MAY FIELD TRIP PRE/reVIEW - MARY'S PEAK

Mary's Peak (4097 ft.) is the highest elevation in the Oregon Coast Range. The peak is topped by an erosion-resistant sill which intrudes bedded sandstones of the middle Eocene. The body of the peak consists of the northwest dipping Siletz River

Volcanics formation, from the early Eocene. The Corvallis fault lies at the eastern base of the peak.

FIELD TRIP RECAP – ICE CAVE AT TROUT LAKE, WASHINGTON

The destination for the April field trip was the Ice Cave near Trout Lake, Washington. This well-known cave develops ice formations in the winter, and it served as the ice supply for the towns of Hood River and The Dalles in pioneer years. Twenty-eight GSOC members and guests met in Hood River to caravan up to explore the cave, led by field trip director Taylor Hunt.

Traveling up the White Salmon River from the Columbia gave the group views of CRB (Columbia River Basalt) and conglomerates below Underwood mountain, followed by CRB and Troutdale Formation conglomerates. The latter were easily identified as flood deposits, as much metamorphic rock was mixed with basalt cobbles. Then conglomerates and lahar and debris flow were all Mt. Adams basalt. The caravan ascended up into Trout Lake Valley, which is less than 10,000 years old and is a landslide/mudflow valley fill, roughly 3 miles by 27 miles. Trout Lake itself is a shallow sink behind the landslide toe.

The group then headed west up to the cave entrance near the National Forest boundary. The last ¾ mile of the road was covered with patches of snow, but the beautiful weather made the short hike to the cave worthwhile. The altimeter indicated 2800 feet of elevation at the parking area.

The Ice Cave is a lava tube formation with four sections separated by three collapse sinks. The main entrance of the cave is another collapse sink about 15 feet in diameter and 14 feet deep. This entrance is within Ice Cave Forest Campground of the Gifford Pinchot National Forest. The Forest Service has constructed a wooden ladder leading into the "neve cone" beneath the main entrance. This domed room collects ice formations in the winter due to its depth and stagnant air pocket. The formations were both above the group in the form of stalactites and columns, and unfortunately were also underfoot, making the entry into the cave very treacherous.

The group observed hundreds of ice stalactites, stalagmites, columns, draperies and curtains, some 10 inches thick or more. Some openings were so clogged with ice that further travel would have damaged the formations. The group also explored other sections of the cave, which were all easier to enter than the main cave. However, most passages were blocked by ice at some point.

Taylor is hoping to repeat the tour of the cave on July 8, when the cave will be easier to explore. He also hopes to stop along the White Salmon River area of the Columbia River Gorge to explore that particular geology. More in next month's newsletter...

Taylor Hunt and Carol Hasenberg

Glacial Research in the North Cascades

Mr. Frank Granshaw, master's candidate at Portland State University, spoke to GSOC at the April 14, 2000 Friday night meeting. The subject of his research has been glaciers in the North Cascades National Park, which contains over one-third of the glaciers in the continental United States.

The study of glaciers is significant because glaciers are highly sensitive indicators of climate change. They also function as water storage devices for the regions in which they are found. However, Frank has discovered that studying glaciers can be difficult. Study is limited primarily to the month of August, when one can distinguish snow accumulation from the actual glacier. When assessing glaciers on site by foot, access to the glacier often is extremely difficult and weather can be a problem. Remote sensing can be very expensive and is also limited by the weather.

The major tasks associated with Frank's study are:

- calculating glacier area and volume change from the 1973 inventory to 1998
- determining stream flows for three watersheds in the park
- comparing regional climate change to changes in glacier geometry and stream flow

So far, Frank has determined that the park lost at least six glaciers since the 1973 inventory. Also, glacier area and volume has decreased by at least 10%. This has occurred during climate trends where precipitation has generally decreased and average annual temperature has generally increased. Frank is currently analyzing the stream flow data to determine the correlation with the glacier changes.

We'd like to thank Frank once again for this interesting presentation.

Carol Hasenberg

Gotta Hava Loupe!!!

A loupe, (otherwise known as pocket magnifier or hand lens), is used by geologists to closely inspect small but visible objects. Loupes are handy for GSOC'ers to observe rock crystals and other small details when on a GSOC field trip. But before you rush out to get one for this month's exciting field trip on the Oregon coast, do a little research so that you get the right lens for you.

First, you should know that there are three basic lens configurations for the lenses in a loupe. They are:

- A coddington, or **single** lens, which is more rugged (especially in watery environments), needs to be larger in diameter due to the fact that the edges are visually distorted.
- A **doublet**, with two lenses separated by an air space, provides less visual distortion (slight distortion at the edges) than the single lens and is usually very reasonable in price.
- The **triplet** is the highest quality of lens, and thus is the highest in price. A Hastings triplet has three lenses cemented together in an achromatic configuration (all lenses focus on the same point). Triplets also have the least distortion of the image, and are the standard lens used to grade diamonds.

In addition to the lens configuration, each loupe will have a **power specification** (10X, meaning 10 times larger than "real life", etc.) and a lens size in diameter. In general, the higher the power, the smaller in diameter the lens will be. Also, the higher the power the lens, the less **depth of field** you will have. For rock crystal viewing, power in the range of 10X to 15X is generally sufficient. Make sure you bring along a sample to inspect if buying your loupe locally.

Last but not least, make sure you purchase or make a **lanyard** for your lens. My old hand lens is now rusting at the top of Steens Mountain!!! It is so easy to put the lens down and walk away from it – you won't if it's hanging around your neck.

So, where are you going to get that loupe? Some local places that carry a selection are:

- Ed's House of Gems on NE Sandy Blvd.
- Handley Rock and Jewelry Supply on Hwy 99 in Vancouver, WA

Also check out the following web sites:

http://www.kooters.com/handlens.html
http://www.ascsci.com/geotools/lens.html
http://www.indigo.com/magnify/mgfyfold.html
http://www.allensinc.com/coins/supplies/magloupe.htm
http://www.kassoy.com/loupes01.htm
http://www.frostproof.com/catalog/m37.html
http://www.frostproof.com/catalog/meas02.html

Friends of the Pleistocene

The Pacific Cell of the Friends of the Pleistocene visited the late Quaternary faulting and pluvial lake history of the northern Quinn River and Alvord valleys in north-central Nevada and southeastern Oregon on their annual field trip during September 24-26, 1999. Guidebooks are available for $26 a copy from: Bud Burke, Geology Department, Humboldt State University, Arcata CA, 95521.

The FOP Pacific Northwest Cell visited the geo-archaeology of the Columbia River Gorge on their annual field trip, September 18 and 19, 1999. Guidebooks are available for $10 from Alex_Bourdeau@r1.fws.gov.

This year the PNW Cell plans to visit the Newberry Volcano in central Oregon on September 15-17, 2000 Trip leaders will be Larry Chitwood (USFS) and Bob Jensen (USFS) with co-leaders Bob Reynolds (COCC), Steve Kuehn (WSU), Tom Connolly (U of O), and Julie Donnelly-Nolan (USGS). A web site has been set up at http://www.geocities.com/ pnw2000fop/ or e-mail pnw2000fop@ yahoo.com to communicate details of the trip.

You can visit the FOP web site at: http://pc53.chm.nau.edu/amqua/v29n2/2000_friends_of_the_pleistocene_.htm

JUNE FIELD TRIP – OREGON COAST DISASTERS!!!

This month Evelyn Pratt will lead the GSOC field trip on the Oregon Coast from the Netarts area to Cannon Beach. Completing the highway 6 – 101 – 26 loop the group will visit the following landslide/erosional features:

- The 1991 slide scarp at the crest of highway 6 along the Wilson River (see photo)

- The landslide at the Capes development near Netarts
- The landslide just north of Cape Meares State Park
- Cape Falcon/Oswald West area
- Cove Beach erosional features
- Hug Point
- Landslides on both highway 6 and 26

THE GEOLOGICAL NEWSLETTER

GSOC

JULY 2000

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

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

SINCE 1935

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Meeting—February.
FIELD TRIPS: Usually one per month, by 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. 371, 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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Please indicate Membership type and include check for appropriate amount:
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THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY
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VISITORS WELCOME AT ALL MEETINGS — VOL. 66, No. 7
INFORMATION: www.gsoc.org *or* gsoc@teleport.com — JULY 2000
Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

JULY ACTIVITIES

Fri. July 14, 8:00 PM: Changing Faces of Io Greg Cermak, Solar System Ambassador, NASA Jet Propulsion Laboratory; Senior Software Engineer, Instructor with STEP technology; Director of Clark County Historical Museum
Rm. 371 Cramer Hall, PSU, 1721 SW Broadway

July Field Trip: **Mt. St. Helens** 20 years after the blast, see exciting and easy-to-reach eruption and pre-eruption features on Mt. St. Helens' lesser-known SOUTH side. Call Taylor Hunt, 503-662-4790, for details.

PREVIEW OF COMING ATTRACTIONS

Sun. Aug. 13, 11:00 AM: Potluck picnic at Rice Northwest Museum of Rocks and Minerals off Hwy 26 West, Exit 61 North; drive west to Groveland Dr. After the picnic, view the Museum's excellent exhibits.

Sat. Sept. 2-9: President's Field Trip: **TRAVELLERS THROUGH TIME: MISSOULA FLOOD TOUR**. Experience soon-to-be designated Ice Age Floods National Geological Region accompanied by knowledgeable Pacific NW geologists. See June Newsletter or call Ray Crowe, 640-6581, for further details. Make $100 prepayment check to Raz Transportation & Tours and send to Phyllis Thorne, 9035 SW Monterey Pl., Portland 97225-6511, **ASAP**!

****

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601; or e-mail ralf70@aol.com.

Message from the President

TRAVELLERS THROUGH TIME - MISSOULA FLOOD TOUR

The President's annual field trip will be coming up in September, and one of our stops the first day, Sept 2nd, will be at the Kennewick Man site. Why the interest in archeology? Because it is believed by some that ancient man was witness to these catastrophic floods - the Missoula Floods of the late Ice Age.

In July, 1996, two young men found a skull at Columbia Park in Kennewick, WA. Dr James Chatters was notified, and was the initial investigator, the first to study the bones, those of a possible 1800's pioneer with a partially healed wound from a projectile point in his pelvis, the right ilium. His left arm was withered from some other problems. The 40 year old probably drowned, as the bones hadn't been chewed by carnivores, but infection from his wound could have been the cause also. His body was rapidly buried in the area where he might have been hunting among lush stands of grass and scrub brush. There were probably pines topping the higher slopes of the Horse Heaven Hills. Other bones were found up to ten feet offshore, and in 18 inches of water, and are now in the Burke Museum in Seattle.

Dr James Chatters has agreed to show us the original site, so we can "walk where ancient man walked" (the original site has been covered with burlap and dirt to prevent erosion and is now overgrown). Dr Chatters owns Applied Paleoscience in Richland, where he lives, and teaches at Central Washington University. He is in the news frequently concerning Kennewick Man - but also for other things. In the May 27, 2000 Herald, it was noted that Dr Chatters was called on to identify the bones of an ancient Harlan's sloth, an ox sized creature found near Quincy, WA, that was 12-14,000 years old. He was also in the news with Tom McClelland of Richland who made a cast of the skull that was used to recreate the European facial features of Kennewick Man.

Later radiocarbon dated to 8340-9200 B.P. by three labs, it was noted that the 5.6 cm projectile point was of the ancient Cascade type, but there were problems with the skull - it looked like a European, rather than a paleo-Indian. Current thinking was that paleo-Indians came from Siberia, rather than some who cited a possible Iberian source for early men in North America. They could have followed the ice with boats, taking walrus, seals, birds and fish.

The bones of Kennewick Man are about to be DNA tested, according to the Tri-City Herald (Apr 26, 2000). The results will be available in August, hopefully in time to be announced on our field trip by Dr. Chatters. Native American tribes are trying to recover the bones for burial before these tests can be conducted.

There are other sites of ancient man in the area. Near East Wenatchee in 1987, Clovis Culture spear points were found that were dated at 10,000 years. And as we travel towards Palouse Falls on the Sept. 3rd, we'll probably stop for lunch at the junction of the Palouse and Snake Rivers, at Lyons Ferry State Park, the site (nearby) of the Marmes Rock Shelter, now 40 feet deep under the waters of the Lower Monumental Dam.

In 1963 Dr Richard Daugherty, a WSU archeologist, excavated a 25 foot deep cave, where he found hundreds of artifacts, weapons, animal bones, and even a tiny sewing needle. Animal bones like that of the Arctic fox and the pine martin, were found in addition to human bones. Marmes Man made his home here. His bones (believed to have been split for marrow in an old Oregonian newspaper clip) were found in midden, or trash heaps. They had been carbon dated at 10,130 years B.P.

There was a rush in 1969 to recover artifacts, as the water from the dam was flooding the site. President Lyndon Johnson ordered a levee, but engineers had miscalculated, and it leaked badly. Eventually the site was covered with plastic and sand to preserve it for future generations. Dr. James Chatters plans to accompany us to this site also.

Now this is all very nice, but the last Missoula Flood episode was perhaps 14,500 years ago - well beyond the age limits of the Kennewick and Marmes sites...but there is another, older archeological site closer to home.

Dr. Allison Stenger has been kind enough to forward a report on findings at the Woodburn, OR, site (Editor's note – refer to the April newsletter "Web Teasers"). It seems like blonde human hairs 14-18 " in length with bulbs were found in Ice Age Willamette silts that has had cultural material carbon dated at 12,200-12,310 years B.P.. This, geologically speaking, is in the back yard of the floods, and there were probably, at the time, cultural tales of the floods among the natives. Also, a whole assemblage of artifacts and fossil bones has been recovered. This will probably turn out to be one of the more important New World archeological and paleontological sites.

I have made a request to Jones and Jones, the group working for an Ice Age Floods program to bring signs and interpretive centers to the route of the Missoula floods, that they consider this site as an area for the development of a major Willamette Valley Interpretive Center.

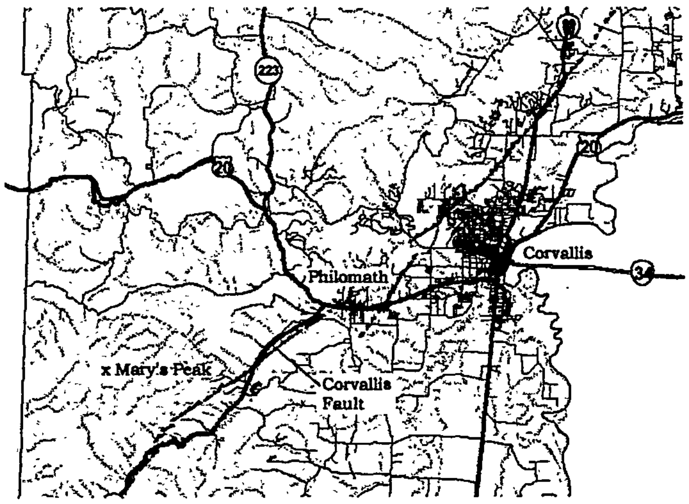
I remain your GSOC President,
Ray Crowe

MARY'S PEAK FIELD TRIP RECAP

Eleven GSOC members met at Polk County Fairgrounds in Rickreall on May 27, 2000 for the trip to Mary's Peak. The trip was led by Taylor Hunt.

Introduction

Mary's Peak (4097 ft) is topped by an erosion resistant sill, which intrudes bedded sandstones of the middle Eocene Flournoy Formation, which in turn overlie the early Eocene Siletz River Volcanics. The Corvallis fault lies at the eastern base of the peak, and just west of the city of Corvallis (see map). The smaller Kings Valley fault is crossed several times. The bulk of the peak is composed of Siletz River Volcanics. This field trip traverses the structural grain of the area.



The rock units are of the Eocene and younger intrusions, which make up the bulk of the exposed coast range. The oldest exposed unit at the base of the peak is Siletz River Volcanics, composed of submarine pillow and massive basalt flows, basalt breccias and tuffs, and associated thin basaltic-sedimentary rocks. Geophysical data suggest sediments beneath the unexposed base. The lower part is thought to be oceanic crust which accreted to the continental margin. Rocks of more varied composition occurring in the upper part are seamounts. The unit is estimated at over 10,000 feet in thickness.

The upper part, the Kings Valley Siltstone Member, is 500 ft thick on Mary's Peak. It is mainly tuffaceous siltstones and minor tuffaceous sandstones of basaltic derivation. Locally white ash beds are present, some with fossils.

The Flournoy overlies the Kings Valley with no unconformity. It is a thick sequence of rhythmically bedded marine sandstones and siltstones of middle Eocene derived from the Klamath Mountains. Sedimentary structures indicative of turbidite deposition are common. The unit is 6000 feet thick west of Mary's Peak and thins rapidly to the east. The Flournoy is overlain unconformably by the late Eocene Spencer Formation, a series of thick-bedded basaltic, arkosic, and micaceous marine sandstones, deposited off the block west of the Corvallis fault during and after the early motion on the fault.

The Mary's Peak sill intruded between beds of the Flournoy Formation. It formed from a basaltic magma and developed a typical basalt differentiation sequence. The entire sill is about 1000 feet thick. A radiometric date of 29.9 m.y. gives an Oligocene age for the sill.

Trip Log

Drive west from Philomath, following Hwy 34 to Mary's Peak Park.

As we turned right on Mary's Peak Road, altered Siletz River volcanics in this area show ghostly outline of pillows in red soil.

Our first stop showed a relatively fresh outcrop of Siletz River Volcanics showing the contact between pyroclastics on the east and a columnar jointed flow on the west. The contact had a relatively steep northwest dip. A small low angle fault cuts the outcrop. Zeolite and calcite secondary mineralization are filling spaces in the rock.

At stop two, weather permitted at this overlook to view southwest along the Corvallis fault and east across the Willamette Valley. Southeast, across the Corvallis fault, Flat Mountain and Green Peak are capped by sills similar to that on Mary's Peak. Massive, jointed flows of Siletz River basalt occur in the outcrop across road.

Stop three, a road cut, had an excellent outcrop of Siletz River pillow basalts passing upward into massive basalt. This was topped by a thin bed of basaltic glass tuff over which there is another pillow basalt unit. Several small faults were present. The pillows were well preserved. Most were surrounded by a glassy rind and show a well-developed radial joint. Calcite and zeolites occur between pillows. The basalt is composed of labradorite, augite, titaniferous magnetite, and glass is commonly intensely layered.

Stop four was a short distance to Parker Creek, after turning left onto Harlan Road. Here was an outcrop of Flournoy sandstone about 150 feet below the base of the Mary's Peak sill. Here we were west of the Kings Valley fault in the down dropped block. We ate lunch by this beautiful tumbling creek and collected naturolite sprays in jugs. We returned to Mary's Peak Road, crossing Kings Valley fault again.

Stop five was a roadside stop, after turning left to continue on Mary's Peak Road, to Parker Creek Waterfall. The middle of Mary's Peak sill is seen here. It is a dark gray ultramafic rock.

Stop six at the end of the road, overlooks to the west across the Coast Range. The parking lot and the walk up from the saddle to the top was fogged in, but on a clear day the bridge across the Yaquina estuary can be seen, even from the parking lot. Many of the huge rocks lining the parking lot are highly altered by zeolites. (Trip from park entrance to top is 9 ½ miles.) The group disbanded here for the return home.

Taylor Hunt

Reference:

Lawrence, Robert D., Rosenfeld, Charles L., and Ruddiman, William III, "Mary's Peak Field Trip: Structure of the Eastern Flank of the Central Coast Range", Oregon State University, Corvallis, Oregon.

FIELD TRIP PREVIEW – ICE CAVE AT TROUT LAKE, WASHINGTON

The destination for one the July field trips is the Ice Cave near Trout Lake, Washington. This well-known cave develops ice formations in the winter, and it served as the ice supply for the towns of Hood River and The Dalles in pioneer years. This field trip is a follow-up trip from the April field trip, led by field trip director Taylor Hunt. As you may recall from last month's newsletter, the ice in the cave prevented GSOC members from going very far into the interior.

The cave has 3 main sections with several sinks and constrictions. The westernmost section is a broad low passage about 150 feet long, with a smooth lava floor.

The middle section contains two sinks, or pits, and divides into two passages towards the eastern end.

The "main" section contains a side-shoot called the Crack Room and another spur with a natural bridge. The eastern end of the main section traps cold, heavy air in the winter which is responsible for the ice formations in the cave. The air is stagnant in this part of the cave.

Although most of the ice melts in the summer, an ice floor, a few stalagmites and other formations persist throughout the year. This may create some hazardous footing in the cave even in July.

If you're thinking of going on the trip, here are some tips on the appropriate type of gear to bring:

- Warm clothing
- Boots with treads or crampons
- Head protection
- Dependable sources of light – bring a back-up!

Also, the Mt. Adams Ranger district asks that you respect the rights of others to see the cave, so leave it like you found it - that is, no rock collecting and no littering!

EXTREMOPHILES – life as we know it – NOT!

Bacteria known as **extremophiles** are microbes that live under extreme temperatures, pressures, alkalinity or acidity.

Extreme environment describes habitats that are not extreme to the organisms that grow and multiply in these niches but are extreme in the minds of humans and the general run of microorganisms. Normal habitats are at 35 degrees Celsius, neutral pH, aerobic atmosphere, and 1-1/2 % salinity.

During the evolution of the earth, many different extreme environments evolved with the accompanying microorganisms. Earth underwent tremendous changes, starting from an extremely hot, gaseous environment; hence environmental extremes were probably the norm for much of earth's existence. Microflora that adapted to these environments are termed extremophiles. Many extremophiles freely adapt to a variety of environments: hence halo-alkaliphiles, barophiles, psychrophiles, thermophilic-acidophiles.

A **psychrophile** or cryophile is an organism that can live in cold environments. **Barophiles** live in high pressure environments. **Hyperthermophiles** grow fastest between 80-110 degrees Celsius and are found water-containing volcanic areas. Hyperthermophiles can be extremely acidophilic, moderately acidophilic, or neutrophilic. They can be chemolithoautotrophic or heterotrophic. **Alkaliphiles** are bacteria that grow optimally or well above pH 9 but cannot grow or grow only slowly at pH 6.5.

Metal-contaminated environments are man-made in which certain microorganisms survive and reproduce by genetic or physiological adaptation. Detoxification occurs mainly by reduction of metals and metalloid elements. Another **man-made extreme environment** is created by pollution with petroleum or synthetic solvents such as toluene. Petroleum is a natural product, and microorganisms have been in contact with it ever since petroleum deposits were laid down. Mutations of E. coli can make the organism more tolerant to organic solvents. Bacteria was used in the clean-up of the Exxon-Valdez oil spill in Alaska. Deep, subterranean hyperthermophiles depend mainly on organic crude oil compounds as an energy source. They do not need sunlight. Artificial biotopes include smoldering coal refuse piles and hot outflows from geothermal and atomic power plants.

Deep subterranean non-volcanic **geothermally heated biotopes** were discovered about 3500 meters below the bottom of the North Sea and below the Alaskan North Slope permafrost soil, where temperatures were approximately 100 degrees Celsius. Similar organisms exist in a reservoir in France. Marine biotopes may be shallow, like the beach of Volcano Island, Italy; or deep ocean, such as black smokers where temperatures may reach 400 degrees Celsius and active seamounts such as Macdonald seamount near Tahiti.

The best sources of thermophilic bacteria are deep-**sea vents and geothermal pools**. Deep-sea vents occur along mid-ocean ridges, although not every ridge has a deep-sea hydrothermal vent site. The reasons for this have yet to be discovered. Large amounts of heat and chemical mass are transferred from deep within the earth to the surface at these vents. The chemistry of ocean water is controlled by this process.

The centers of the vents are sterile, but around these vent sites live communities of highly specialized animals. Tube worms, bivalves, gastropods and crustaceans live in complete darkness, extreme pressure, and vent water temperatures that range from 20 to 400 degrees Celsius. All these creatures are dependent on the bacteria which use **hydrogen sulphide** from vent water as a primary source of energy.

There have been few in-depth studies of life on hydrothermal vent habitats. Such communities were only discovered 20 years ago, and the environment they inhabit is extremely difficult to work in, so many unknowns remain. Scientists are studying these life forms living in and around black smokers in search of clues as to how life began on earth.

Fossil evidence of organic carbon dates back 3.8 billion years to a time when the earth was only 0.5 billion years old. Growth demands of hyperthermophiles fit the scenario of a hot volcanic-dominated primitive earth. Similar anaerobic organisms, completely independent of a sun, could even exist on other planets provided that active volcanism and liquid water were present. Because of their ability to survive for long periods in the cold, recent hyperthermophiles can even spread in cold conditions in a kind of dormant state. Hyperthermophiles could have successfully inoculated other planets such as Mars, when growth conditions were favorable in the Archaean past. It is possible that some may still exist deep below the surface if water and heat are still present there.

Cryophiles are also life forms that could exist on other worlds. Dormant, ancient microbes, and even higher plants such as moss, can remain viable be **cryopreservation**, resuming metabolic activity upon thawing after being frozen glacial ice or permafrost for thousands to millions of years. There is a possibility that conditions under the ice may approximate those on Europa, a frozen moon of Jupiter, or the ice caps of Mars, and so may indicate whether life may be able to exist in harsh condition elsewhere in the solar system.

Other extremophiles need salt to maintain their cell membranes. Some of these salt-dependent archaea, called **halobacteria**, reside in such places as the Dead Sea and the Great Salt Lake. Remnants of such an ancient lake has been discovered about 0.5 mile below the earth's surface in New Mexico. Microbiologists have revived bacteria believed to be last active 250 million years ago. These bacteria form spores, which explain their survival for so long. If the claims are true, this may shed light onto issues as how life on earth evolved, and how long life-forms can survive.

From past President **Rosemary Kenney**, in her GSOC seminar discussion this past season

Research into extremophiles has now taken many branches. Besides helping to explain the origin and development of life, and posing questions about life on other worlds, industry has found extremophiles to be extreme-ly useful! For more information on extremophiles, check out the following websites/links:

Scientific American: Article: Extremophiles: April 1997 -
http://www.sciam.com/0497issue/0497marrs.html

Theory suggests primordial soup cooked in scalding ocean depths (6/08/2000) -
http://www.pioneerplanet.com:80/seven-days/4/news/docs/014575.htm

THE GEOLOGICAL NEWSLETTER

GSOC

AUGUST 2000

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ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Meeting—February.

FIELD TRIPS: Usually one per month, by 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. 371, 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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Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

VOL. 66, No. 8
AUGUST 2000

AUGUST ACTIVITIES

Field Trip Sat. Aug. 12: Geomorphology of the Columbia Gorge: How the Gorge was built, from Troutdale to Bonneville Dam. Call Taylor Hunt, 503-662-4790 for details.

Potluck picnic Sun. Aug. 13, 11:00 AM at Rice Northwest Museum of Rocks and Minerals. Take Hwy 26 west to Exit 61 (Helvetia); go west, paralleling highway, to Groveland Dr. Private showing of the Museum's outstanding exhibits. Call Taylor Hunt, 503-662-4790 for details.

****

PREVIEW OF COMING ATTRACTIONS

Sat. Sept. 2-9: President's Field Trip: **TRAVELLERS THROUGH TIME: MISSOULA FLOOD TOUR**. You can see soon-to-be designated Ice Age Floods National Geological Region accompanied by knowledgeable Pacific NW geologists. Call Ray Crowe, 503-640-6581 or Phyllis Thorne, 503-292-6134 for further details. If you haven't paid yet, make $100 prepayment check to Raz Transportation & Tours and send to Phyllis Thorne, 9035 SW Monterey Pl., Portland 97225-6511, **ASAP**!

Fri. Sept. 8, 8 PM: TBA
Rm. 371 Cramer Hall, PSU, 1721 SW Broadway

****

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601; or e-mail Folkdans@aol.com.

Message from the President

TRAVELLERS THROUGH TIME - MISSOURI TOUR

This month our intrepid President is on tour in the state of Missouri. We'll be looking forward to his message next month!

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Liane Brown
Barbara Rogers
Kris Karlson
Barbara Halverson
Catherine Ellis
Jim Riggle
Bill Price

SNOWBALL EARTH, OXYGEN POISONING, and Early Life

Bev Vogt, 5/24/00; recorded by Evelyn Pratt, edited by Bev Vogt

Although the latest 570 million years of Earth's history have been studied and written about for the last century and a half, very little was known about the preceding 4 billion years. This can be compared to recording the biography of an 80-year-old knowing only what happened during the last ten years of his or her life. Thanks to new tools, dedicated **paleogeologists**, and burgeoning interest in the Precambrian during the last decade, much more information is currently available.

(GSOC seminar speakers this year reported on readings that dealt with this first 80% of Earth's history. In the May seminar, Past President Beverly Vogt included much of what we'd learned as she presented an amazing amount of information in just one hour. This is an outline of her presentation.)

An article in the New Scientist journal, 8/7/99, titled "Nine days that shook the world", lists the following cataclysmic events:

1. **4.5 Ba:** Earth hit by very big object; moon broken loose - moon's orbit was 1/20 distance from Earth that it is today.
2. **3.5-2.2 Ba:** Gas warfare among organisms; cyanobacteria emitted oxygen, killing or driving away anaerobic bacteria. Oxygen increased in Earth's atmosphere from <1% to 15%.
3. **590 Ma:** Giant meteorite crater in Australia; impact was probably responsible for major die off.
4. **250 Ma:** Immense lava flows, Siberian Traps - possible reason that up to 95% of all organisms died at end of Permian.
5. **5.8 Ma:** Mediterranean dried up. Then, as plate tectonics opened Straits of Gibraltar, waterfall 100x size of Victoria Falls filled Mediterranean.
6. **1 Ma:** Huge landslide took away northeast portion of Oahu. Another slide is poised on southeast side of island of Hawaii.
7. **15,000 ya:** Bretz-Missoula floods
8. **300 ya:** 1/26/1700 AD, 9 PM, huge Cascadia Subduction Zone earthquake
9. **4/1810:** Tambora, near Bali, erupted, producing 150x more tephra than Mt. St. Helens.

We'll concentrate on Number 2, and another event not included on this list. Earth originated about 4.6 Ba. By 4.2 Ba a metallic core, a mantle, and an outer crust with a rocky rind were in place. Earth was bombarded by meteorites from its beginning, but by 3.9 Ba the impacts had slowed down considerably.

The early atmosphere probably was composed of N, CO_2, water vapor, methane, ammonia, and H_2. No ozone layer existed, so nothing stopped ultraviolet from zapping Earth with lethal rays. Lightning storms were frequent. The geologic time which includes organisms is divided into three main sections. Oldest is Archaean, 3.8-2.5 Ba. After that is the Proterozoic, 2.5 Ba-570 Ma. From 570 Ma to today is the Phanerozoic. The five most common elements on Earth are carbon (C), hydrogen (H), oxygen (O), nitrogen (N), and helium. Four of these five - C, H, O, and N - make up more than 99.9% of all living systems on earth.

The earliest probable evidence of life has been found in southwest Greenland. It consists of 3.8 Ba graphite, possibly from organically-produced carbon. A good date of 3.465 Ba has been established in Australia for tiny rounded Apex chert grains, which are bracketed by two lava beds containing uranium-to-lead dated zircons. The rounded grains consist of 11 species of bacteria and 6 oxygen-producing **cyanobacteria**, which were transported by moving water to the Apex bed. They include **autotrophs** (organisms that make their own food) and **heterotrophs** (organisms that eat other organisms) as well as aerobes (oxygen producers/users) and anaerobes (poisoned by oxygen). Recently it was announced that scientists have found a protein in anaerobes that may be responsible for their "knowing" when oxygen is present.

From the time meteorite bombardment of Earth slowed down drastically (~3.9Ba) until these organisms appeared was over 400 million years - about the same amount of time as that from when life first emerged from the sea in the Devonian until today. It's possible to be so involved in one's own specialty that vital information from other fields is missed. 40 or 50 years ago geologists were puzzled by what they called **Cryptozoans** - layered objects with life-form carbon in them. At the same time biologists were studying big biscuit-shaped "microbial mats" that grew in extra-salty bays along the southern Australian coast. In the '60's geologists and biologists compared notes and discovered they'd been looking at fossil and living forms of the same thing - what are now called stromatolites.

Stromatolites have been around from 3.45 Ba to today. They range from fingernail-size to several feet in diameter. They are made of a top layer of cyanobacteria, which photosynthesize and give off oxygen; a lower layer of photosynthetic bacteria that do not produce oxygen; and a still lower layer of anaerobic bacteria. Each layer uses different wavelengths of light. Mucilage protects them from ultraviolet rays, and a lot of mud is intermixed with them, which together give stromatolites their consistencies - rubbery, leathery, or cottage-cheesy. These colonies of organisms have stayed virtually the same throughout geologic time. Their worst predators are gastropods (snails and their allies), which are found in shallow seas everywhere except where water is very saline.

Geochemists study isotopes used by organisms. Carbon has two isotopes: carbon-12 (12C) and carbon-13 (13C). Organisms use 12C preferentially in life processes. Limestones which are formed when there is a lot of biogenic activity have less 12C and more 13C than those laid down when few living things are present. Also, since living things preferentially take up 32S, the ratio of 32S/34S is another good indicator of whether certain minerals such as pyrite were produced by organic processes.

Fe++ is soluble in water. When enough oxygen is produced, Fe+++ is formed and combines with the oxygen to form rust. Although there couldn't have been a great deal of oxygen in Earth's early atmosphere, from 3.5 to 2.2 Ba enough was produced by cyanobacteria in the oceans to make banded iron oxide (rust) layers which were deposited on ocean floors around the world. Ferruginous chert formations starting around 3.5 BA also indicate the presence of oxygen. From 2.2 to 1.9 Ba the oxygen content of the air rose from 1% to 15% of the present-day level. Eukaryotes, the complex cell type of which we are made, appeared around 2.5 Ba. Once organisms were able to combine gametes with differing genes in the process of sexual reproduction, around 1.1 Ba, the rate of change in living things swiftly accelerated. Then from 900-600 Ma many organisms disappeared. The ratio of 12C to 13C in limestones laid down just before that time shows an upward change from abundant biogenic activity to practically none. No impact evidence has been found, but on top of these limestones all over the world are rocks that look like glacial till. Above that layer are limestones teeming with biogenic activity.

This is what has led to the hot topic of 1999-2000 - the **"Snowball Earth" theory**. It proposes that the Earth was completely covered by glaciers at least two, and possibly four, times. Theories on how these may have happened range from a change in the earth's tilt, to a reduction of CO_2 producing the opposite of global warming, to having broken-up pieces of a formerly large continent, Rodinia, positioned along the equator. In the latter theory, four or five steps would have been needed:

1. The supercontinent breaks up. Because the resulting land masses have many more shorelines, chemical weathering increases dramatically. More CO_2 is locked up in the oceans, reducing CO_2 in the atmosphere. More heat can escape into outer space.
2. Albedo from ice caps means the sun's heat is reflected into space.
3. As the oceans freeze over, water vapor is no longer released into the atmosphere, so precipitation slows. This produces deserts on the continents.
4. Plate tectonics continues under the ice. Volcanoes erupt, spewing CO_2 into the atmosphere. This has a greenhouse effect, meaning that heat is retained and ice starts to thaw.
5. As the thaw accelerates, oceans and atmosphere, formerly separated by ice, go into equilibrium. Soluble iron in seawater combines with oxygen and is precipitated onto the seafloor as banded iron formations.

How would life return after this? Perhaps single-celled organisms "hid out" in rocks or on the sea floor*. As the ice started to thaw, many nutrients were added to the ocean. So the seas again teemed with life. From 700-550 Ma, softbodied multicellular organisms named the Ediacara fossil assemblage are found in several places around the world. Then they disappeared. They seem to have been an evolutionary dead end. The beginning of the Cambrian is marked by the worldwide appearance of the first group of organisms with hard parts, the Tommotian. So little is known about these that they go by the less-than-dignified appellation "small shelly fauna".

Finally, in the Cambrian Burgess shale in Canada, a submarine landslide fortuitously buried ancestors of many modern organisms in anaerobic conditions which preserved them. Some paleontologists, including Stephen Jay Gould and Simon Morris, disagree on fine points of relationships of these fossils to each other and to succeeding ones. But so great is the variety of organisms preserved in the Burgess Shale and similar-aged deposits in other parts of the world that it has given rise to the term "Cambrian explosion of life."

Beverly Vogt gave a fascinating account of the Precambrian. With the tremendous amount of studying of life's first 3.5 billion years going on right now, the next few years should produce much more information on the initial 80% of Earth's history.

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*Since this talk was given, computer modelers suggest that even during Snowball Earth certain portions of the ocean were not frozen. Isolated colonies of organisms would have had a chance to survive. B.V.

Suggested Readings:

Fortey, Richard, 1997, Life: A Natural History of the First Four Billion Years of Life on Earth, New York, Vintage Books, 346 p.

Gould, Stephen Jay, 1989, Wonderful life: The Burgess Shale and the Nature of History, New York, W.W. Norton and Company, 347 p.

Morris, Simon Conway, 1998, The Crucible of Creation: The Burgess Shale and the Rise of Animals New York, Oxford University Press, 242 p.

Schopf, J. William, 1999, Cradle of Life: The Discovery of Earth's Earliest Fossils: Princeton, N.J., Princeton University Press, 367 p.

--- 1998, "Tracing the roots of the Universal Tree of Life", in Breck, Andre, ed., The Molecular Origins of Life, New York, Cambridge University Press, p. 337-362.

--- 1993, Major Events in the History of Life, Boston, Jones and Bartlett Publishers, 190 p.

Ward, Peter D., and Brownlee, Donald, 2000, Rare Earth: Why Complex Life is Uncommon in the Universe, New York, Copernicus, Springer-Verlag, 333 p.

The Geological Newsletter

Call for Submittals

Thinking of submitting an article to the Geological Newsletter? We'd love to get one, and here are the requirements for a submittal:

1. It is preferable to submit your article by email (to gsoc@teleport.com) or on a computer disk. The preferred file format is either MS Word (.doc) or simple text (.txt). (Articles typed in your email are more difficult to prepare for publishing.) Small news items can be sent via mail or by phone to the editor.
2. If you are quoting someone else's article, enclose the quotation in quotation marks and provide a reference to the article. We cannot reproduce someone else's article without permission.
3. Please do reference the sources for your information, even if the information is public property. This is out of courtesy to the authors, and also gives the readers sources to check for more information.
4. Do include pictures with your article; however we cannot reproduce copyrighted pictures. The preferred file formats are .gif or .jpg. We can also scan photographs.

We would also like to start a new feature called "Geological Snapshots" where we feature a snapshot from one of our members. Please include a caption. Here's an example:

GEOLOGICAL SNAPSHOTS

Bands of volcanic ash and cobbled sediments alternate in this shot of Isla Espiritu Santo near LaPaz, Baja Sur, Mexico.

Submitted by Carol Hasenberg

The Library Corner

Fossil Shells from Western Oregon – A Guide to Identification

By Ellen J. Moore, May 2000, Chintimini Press, Corvallis, Oregon, 131 p.

Publisher's Abstract

Starting about 57 Ma., a major tectonic plate reorganization wiped the fossil record clean in western Oregon. Since then, new layers of sediment, seen in beach cliffs and road cuts, have preserved one of the world's richest and most continuous sequences of fossil clams and snails. In this book for general readers, Ellen Moore shows how these fossils wrote a detailed geologic history of western Oregon. The book consists of three main parts:

1. Oregon's plate-tectonic architecture, with maps showing the geologic age of the fossiliferous rocks near each western Oregon town
2. Descriptions and annotated photographs of each of the most abundant and useful fossils organized by geologic age and by major fossil groups
3. A set of 8 detailed geologic excursions where readers can see western Oregon's rocks and fossils at first hand.

This book expands on the author's previous technical and popular books to include the full geologic range of marine fossiliferous rocks in western Oregon, from the late Paleocene to the Pleistocene, and the full geographic range, from border to border.

This book is now available for check-out in the GSOC library.

WEB TEASERS

What's new at the Cascade Volcanoes Observatory website this month? (http://vulcan.wr.usgs.gov/)

Volcano-Groundwater Interaction

Project Chief

Larry G. Mastin
USGS Cascades Volcano Observatory
5400 MacArthur Blvd.
Vancouver, Washington 98661
Phone: (360) 993-8925
e-mail: lgmastin@usgs.gov

Project Description

In active volcanic areas, groundwater can affect intrusive and eruptive activity by influencing cooling rates, modifying the strength of rocks in the volcanic edifice, and converting thermal energy of magma to explosive mechanical energy. One of the greatest hazards posed by groundwater exists when it is heated by magma and violently released, as eruptions of either pure steam or steam mixed with fragmented magma or country rock. The objective of this project is to identify the conditions under which groundwater in volcanoes poses a potential hazard. To accomplish this, the following methods are employed:

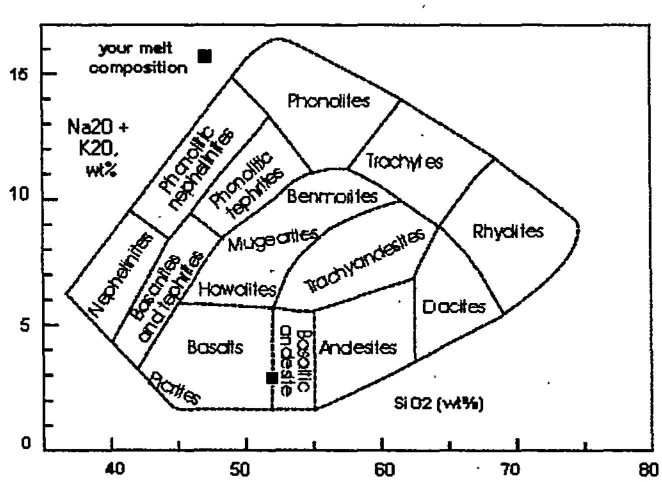
- Theoretical investigations:
    - Thermodynamic studies of the conditions under which groundwater, or water-magma mixtures, can be most explosive.
    - Numerical modelling of pressure and other flow properties of magma in eruptive conduits, to identify the conditions under which water can enter and mix with magma.

Site-specific investigations:

- Interdisciplinary studies in Alaska, Hawaii, and the Cascades, to identify the degree of involvement of water in specific eruptions, and the hydrologic or magmatic conditions that could have affected their explosivity.

Here is the Silica-Alkalai chart from the numerican modeling program Conflow: A numerical program for conduit flow and thermodynamics, by Larry G. Mastin (U.S. Geological Survey) and Mark S. Ghiorso (University of Washington)

Location of your melt on a Silica-Alkali plot



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Evelyn Pratt, 503-223-2601

VOL. 66, No. 7
JULY 2000

JULY ACTIVITIES

Fri. July 14, 8:00 PM: Changing Faces of Io Greg Cermak, Solar System Ambassador, NASA Jet Propulsion Laboratory; Senior Software Engineer, Instructor with STEP technology; Director of Clark County Historical Museum
Rm. 371 Cramer Hall, PSU, 1721 SW Broadway

July Field Trip: **Mt. St. Helens** 20 years after the blast, see exciting and easy-to-reach eruption and pre-eruption features on Mt. St. Helens' lesser-known SOUTH side. Call Taylor Hunt, 503-662-4790, for details.

PREVIEW OF COMING ATTRACTIONS

Sun. Aug. 13, 11:00 AM: Potluck picnic at Rice Northwest Museum of Rocks and Minerals off Hwy 26 West, Exit 61 North; drive west to Groveland Dr. After the picnic, view the Museum's excellent exhibits.

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Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601; or e-mail ralf70@aol.com.

Message from the President

TRAVELLERS THROUGH TIME - MISSOULA FLOOD TOUR

The President's annual field trip will be coming up in September, and one of our stops the first day, Sept 2nd, will be at the Kennewick Man site. Why the interest in archeology? Because it is believed by some that ancient man was witness to these catastrophic floods - the Missoula Floods of the late Ice Age.

In July, 1996, two young men found a skull at Columbia Park in Kennewick, WA. Dr James Chatters was notified, and was the initial investigator, the first to study the bones, those of a possible 1800's pioneer with a partially healed wound from a projectile point in his pelvis, the right ilium. His left arm was withered from some other problems. The 40 year old probably drowned, as the bones hadn't been chewed by carnivores, but infection from his wound could have been the cause also. His body was rapidly buried in the area where he might have been hunting among lush stands of grass and scrub brush. There were probably pines topping the higher slopes of the Horse Heaven Hills. Other bones were found up to ten feet offshore, and in 18 inches of water, and are now in the Burke Museum in Seattle.

Dr James Chatters has agreed to show us the original site, so we can "walk where ancient man walked" (the original site has been covered with burlap and dirt to prevent erosion and is now overgrown). Dr Chatters owns Applied Paleoscience in Richland, where he lives, and teaches at Central Washington University. He is in the news frequently concerning Kennewick Man - but also for other things. In the May 27, 2000 Herald, it was noted that Dr Chatters was called on to identify the bones of an ancient Harlan's sloth, an ox sized creature found near Quincy, WA, that was 12-14,000 years old. He was also in the news with Tom McClelland of Richland who made a cast of the skull that was used to recreate the European facial features of Kennewick Man.

Later radiocarbon dated to 8340-9200 B.P. by three labs, it was noted that the 5.6 cm projectile point was of the ancient Cascade type, but there were problems with the skull - it looked like a European, rather than a paleo-Indian. Current thinking was that paleo-Indians came from Siberia, rather than some who cited a possible Iberian source for early men in North America. They could have followed the ice with boats, taking walrus, seals, birds and fish.

The bones of Kennewick Man are about to be DNA tested, according to the Tri-City Herald (Apr 26, 2000). The results will be available in August, hopefully in time to be announced on our field trip by Dr. Chatters. Native American tribes are trying to recover the bones for burial before these tests can be conducted.

There are other sites of ancient man in the area. Near East Wenatchee in 1987, Clovis Culture spear points were found that were dated at 10,000 years. And as we travel towards Palouse Falls on the Sept. 3rd, we'll probably stop for lunch at the junction of the Palouse and Snake Rivers, at Lyons Ferry State Park, the site (nearby) of the Marmes Rock Shelter, now 40 feet deep under the waters of the Lower Monumental Dam.

In 1963 Dr Richard Daugherty, a WSU archeologist, excavated a 25 foot deep cave, where he found hundreds of artifacts, weapons, animal bones, and even a tiny sewing needle. Animal bones like that of the Arctic fox and the pine martin, were found in addition to human bones. Marmes Man made his home here. His bones (believed to have been split for marrow in an old Oregonian newspaper clip) were found in midden, or trash heaps. They had been carbon dated at 10,130 years B.P.

There was a rush in 1969 to recover artifacts, as the water from the dam was flooding the site. President Lyndon Johnson ordered a levee, but engineers had miscalculated, and it leaked badly. Eventually the site was covered with plastic and sand to preserve it for future generations. Dr. James Chatters plans to accompany us to this site also.

Now this is all very nice, but the last Missoula Flood episode was perhaps 14,500 years ago - well beyond the age limits of the Kennewick and Marmes sites...but there is another, older archeological site closer to home.

Dr. Allison Stenger has been kind enough to forward a report on findings at the Woodburn, OR, site (Editor's note – refer to the April newsletter "Web Teasers"). It seems like blonde human hairs 14-18 " in length with bulbs were found in Ice Age Willamette silts that has had cultural material carbon dated at 12,200-12,310 years B.P.. This, geologically speaking, is in the back yard of the floods, and there were probably, at the time, cultural tales of the floods among the natives. Also, a whole assemblage of artifacts and fossil bones has been recovered. This will probably turn out to be one of the more important New World archeological and paleontological sites.

I have made a request to Jones and Jones, the group working for an Ice Age Floods program to bring signs and interpretive centers to the route of the Missoula floods, that they consider this site as an area for the development of a major Willamette Valley Interpretive Center.

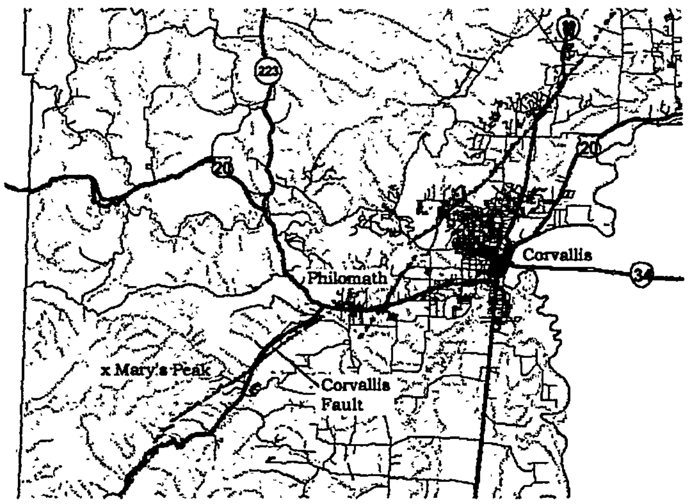
I remain your GSOC President,
Ray Crowe

MARY'S PEAK FIELD TRIP RECAP

Eleven GSOC members met at Polk County Fairgrounds in Rickreall on May 27, 2000 for the trip to Mary's Peak. The trip was led by Taylor Hunt.

Introduction

Mary's Peak (4097 ft) is topped by an erosion resistant sill, which intrudes bedded sandstones of the middle Eocene Flournoy Formation, which in turn overlie the early Eocene Siletz River Volcanics. The Corvallis fault lies at the eastern base of the peak, and just west of the city of Corvallis (see map). The smaller Kings Valley fault is crossed several times. The bulk of the peak is composed of Siletz River Volcanics. This field trip traverses the structural grain of the area.



The rock units are of the Eocene and younger intrusions, which make up the bulk of the exposed coast range. The oldest exposed unit at the base of the peak is Siletz River Volcanics, composed of submarine pillow and massive basalt flows, basalt breccias and tuffs, and associated thin basaltic-sedimentary rocks. Geophysical data suggest sediments beneath the unexposed base. The lower part is thought to be oceanic crust which accreted to the continental margin. Rocks of more varied composition occurring in the upper part are seamounts. The unit is estimated at over 10,000 feet in thickness.

The upper part, the Kings Valley Siltstone Member, is 500 ft thick on Mary's Peak. It is mainly tuffaceous siltstones and minor tuffaceous sandstones of basaltic derivation. Locally white ash beds are present, some with fossils.

The Flournoy overlies the Kings Valley with no unconformity. It is a thick sequence of rhythmically bedded marine sandstones and siltstones of middle Eocene derived from the Klamath Mountains. Sedimentary structures indicative of turbidite deposition are common. The unit is 6000 feet thick west of Mary's Peak and thins rapidly to the east. The Flournoy is overlain unconformably by the late Eocene Spencer Formation, a series of thick-bedded basaltic, arkosic, and micaceous marine sandstones, deposited off the block west of the Corvallis fault during and after the early motion on the fault.

The Mary's Peak sill intruded between beds of the Flournoy Formation. It formed from a basaltic magma and developed a typical basalt differentiation sequence. The entire sill is about 1000 feet thick. A radiometric date of 29.9 m.y. gives an Oligocene age for the sill.

Trip Log

Drive west from Philomath, following Hwy 34 to Mary's Peak Park.

As we turned right on Mary's Peak Road, altered Siletz River volcanics in this area show ghostly outline of pillows in red soil.

Our first stop showed a relatively fresh outcrop of Siletz River Volcanics showing the contact between pyroclastics on the east and a columnar jointed flow on the west. The contact had a relatively steep northwest dip. A small low angle fault cuts the outcrop. Zeolite and calcite secondary mineralization are filling spaces in the rock.

At stop two, weather permitted at this overlook to view southwest along the Corvallis fault and east across the Willamette Valley. Southeast, across the Corvallis fault, Flat Mountain and Green Peak are capped by sills similar to that on Mary's Peak. Massive, jointed flows of Siletz River basalt occur in the outcrop across road.

Stop three, a road cut, had an excellent outcrop of Siletz River pillow basalts passing upward into massive basalt. This was topped by a thin bed of basaltic glass tuff over which there is another pillow basalt unit. Several small faults were present. The pillows were well preserved. Most were surrounded by a glassy rind and show a well-developed radial joint. Calcite and zeolites occur between pillows. The basalt is composed of labradorite, augite, titaniferous magnetite, and glass is commonly intensely layered.

Stop four was a short distance to Parker Creek, after turning left onto Harlan Road. Here was an outcrop of Flournoy sandstone about 150 feet below the base of the Mary's Peak sill. Here we were west of the Kings Valley fault in the down dropped block. We ate lunch by this beautiful tumbling creek and collected naturolite sprays in jugs. We returned to Mary's Peak Road, crossing Kings Valley fault again.

Stop five was a roadside stop, after turning left to continue on Mary's Peak Road, to Parker Creek Waterfall. The middle of Mary's Peak sill is seen here. It is a dark gray ultramafic rock.

Stop six at the end of the road, overlooks to the west across the Coast Range. The parking lot and the walk up from the saddle to the top was fogged in, but on a clear day the bridge across the Yaquina estuary can be seen, even from the parking lot. Many of the huge rocks lining the parking lot are highly altered by zeolites. (Trip from park entrance to top is 9 ½ miles.) The group disbanded here for the return home.

Taylor Hunt

Reference:

Lawrence, Robert D., Rosenfeld, Charles L., and Ruddiman, William III, "Mary's Peak Field Trip: Structure of the Eastern Flank of the Central Coast Range", Oregon State University, Corvallis, Oregon.

FIELD TRIP PREVIEW - ICE CAVE AT TROUT LAKE, WASHINGTON

The destination for one the July field trips is the Ice Cave near Trout Lake, Washington. This well-known cave develops ice formations in the winter, and it served as the ice supply for the towns of Hood River and The Dalles in pioneer years. This field trip is a follow-up trip from the April field trip, led by field trip director Taylor Hunt. As you may recall from last month's newsletter, the ice in the cave prevented GSOC members from going very far into the interior.

The cave has 3 main sections with several sinks and constrictions. The westernmost section is a broad low passage about 150 feet long, with a smooth lava floor.

The middle section contains two sinks, or pits, and divides into two passages towards the eastern end.

The "main" section contains a side-shoot called the Crack Room and another spur with a natural bridge. The eastern end of the main section traps cold, heavy air in the winter which is responsible for the ice formations in the cave. The air is stagnant in this part of the cave.

Although most of the ice melts in the summer, an ice floor, a few stalagmites and other formations persist throughout the year. This may create some hazardous footing in the cave even in July.

If you're thinking of going on the trip, here are some tips on the appropriate type of gear to bring:

- Warm clothing
- Boots with treads or crampons
- Head protection
- Dependable sources of light – bring a back-up!

Also, the Mt. Adams Ranger district asks that you respect the rights of others to see the cave, so leave it like you found it - that is, no rock collecting and no littering!

EXTREMOPHILES – life as we know it – NOT!

Bacteria known as **extremophiles** are microbes that live under extreme temperatures, pressures, alkalinity or acidity.

Extreme environment describes habitats that are not extreme to the organisms that grow and multiply in these niches but are extreme in the minds of humans and the general run of microorganisms. Normal habitats are at 35 degrees Celsius, neutral pH, aerobic atmosphere, and 1-1/2 % salinity.

During the evolution of the earth, many different extreme environments evolved with the accompanying microorganisms. Earth underwent tremendous changes, starting from an extremely hot, gaseous environment; hence environmental extremes were probably the norm for much of earth's existence. Microflora that adapted to these environments are termed extremophiles. Many extremophiles freely adapt to a variety of environments: hence halo-alkaliphiles, barophiles, psychrophiles, thermophilic-acidophiles.

A **psychrophile** or cryophile is an organism that can live in cold environments. **Barophiles** live in high pressure environments. **Hyperthermophiles** grow fastest between 80-110 degrees Celsius and are found water-containing volcanic areas. Hyperthermophiles can be extremely acidophilic, moderately acidophilic, or neutrophilic. They can be chemolithoautotrophic or heterotrophic. **Alkaliphiles** are bacteria that grow optimally or well above pH 9 but cannot grow or grow only slowly at pH 6.5.

Metal-contaminated environments are man-made in which certain microorganisms survive and reproduce by genetic or physiological adaptation. Detoxification occurs mainly by reduction of metals and metalloid elements. Another **man-made extreme environment** is created by pollution with petroleum or synthetic solvents such as toluene. Petroleum is a natural product, and microorganisms have been in contact with it ever since petroleum deposits were laid down. Mutations of E. coli can make the organism more tolerant to organic solvents. Bacteria was used in the clean-up of the Exxon-Valdez oil spill in Alaska. Deep, subterranean hyperthermophiles depend mainly on organic crude oil compounds as an energy source. They do not need sunlight. Artificial biotopes include smoldering coal refuse piles and hot outflows from geothermal and atomic power plants.

Deep subterranean non-volcanic **geothermally heated biotopes** were discovered about 3500 meters below the bottom of the North Sea and below the Alaskan North Slope permafrost soil, where temperatures were approximately 100 degrees Celsius. Similar organisms exist in a reservoir in France. Marine biotopes may be shallow, like the beach of Volcano Island, Italy; or deep ocean, such as black smokers where temperatures may reach 400 degrees Celsius and active seamounts such as Macdonald seamount near Tahiti.

The best sources of thermophilic bacteria are deep-**sea vents and geothermal pools**. Deep-sea vents occur along mid-ocean ridges, although not every ridge has a deep-sea hydrothermal vent site. The reasons for this have yet to be discovered. Large amounts of heat and chemical mass are transferred from deep within the earth to the surface at these vents. The chemistry of ocean water is controlled by this process.

The centers of the vents are sterile, but around these vent sites live communities of highly specialized animals. Tube worms, bivalves, gastropods and crustaceans live in complete darkness, extreme pressure, and vent water temperatures that range from 20 to 400 degrees Celsius. All these creatures are dependent on the bacteria which use **hydrogen sulphide** from vent water as a primary source of energy.

There have been few in-depth studies of life on hydrothermal vent habitats. Such communities were only discovered 20 years ago, and the environment they inhabit is extremely difficult to work in, so many unknowns remain. Scientists are studying these life forms living in and around black smokers in search of clues as to how life began on earth.

Fossil evidence of organic carbon dates back 3.8 billion years to a time when the earth was only 0.5 billion years old. Growth demands of hyperthermophiles fit the scenario of a hot volcanic-dominated primitive earth. Similar anaerobic organisms, completely independent of a sun, could even exist on other planets provided that active volcanism and liquid water were present. Because of their ability to survive for long periods in the cold, recent hyperthermophiles can even spread in cold conditions in a kind of dormant state. Hyperthermophiles could have successfully inoculated other planets such as Mars, when growth conditions were favorable in the Archaean past. It is possible that some may still exist deep below the surface if water and heat are still present there.

Cryophiles are also life forms that could exist on other worlds. Dormant, ancient microbes, and even higher plants such as moss, can remain viable be **cryopreservation**, resuming metabolic activity upon thawing after being frozen glacial ice or permafrost for thousands to millions of years. There is a possibility that conditions under the ice may approximate those on Europa, a frozen moon of Jupiter, or the ice caps of Mars, and so may indicate whether life may be able to exist in harsh condition elsewhere in the solar system.

Other extremophiles need salt to maintain their cell membranes. Some of these salt-dependent archaea, called **halobacteria**, reside in such places as the Dead Sea and the Great Salt Lake. Remnants of such an ancient lake has been discovered about 0.5 mile below the earth's surface in New Mexico. Microbiologists have revived bacteria believed to be last active 250 million years ago. These bacteria form spores, which explain their survival for so long. If the claims are true, this may shed light onto issues as how life on earth evolved, and how long life-forms can survive.

From past President **Rosemary Kenney**, in her GSOC seminar discussion this past season

Research into extremophiles has now taken many branches. Besides helping to explain the origin and development of life, and posing questions about life on other worlds, industry has found extremophiles to be extreme-ly useful! For more information on extremophiles, check out the following websites/links:

Scientific American: Article: Extremophiles: April 1997 - http://www.sciam.com/0497issue/0497marrs.html

Theory suggests primordial soup cooked in scalding ocean depths (6/08/2000) - http://www.pioneerplanet.com:80/seven-days/4/news/docs/014575.htm

THE GEOLOGICAL NEWSLETTER

GSOC

SEPTEMBER 2000

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PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm. 371, 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.
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Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

VOL. 66, No. 9
SEPTEMBER 2000

SEPTEMBER ACTIVITIES

President's Field Trip: Glacial Lake Missoula Floods Sept. 2-9, Portland to Missoula, MT and return with Dr. John Whitmer, Dr. Richard Waitt, et al. Meet at PSU ~8:00 AM to allow time to pack bus. If you have not yet received your information sheet, call Phyllis Thorne, 503-292-6134, or Taylor Hunt, 503-662-4790.

No noon or evening meetings in September.

Projects to consider:

1. *Hazel Standeven*: "Ch. 2-TV news anchors need a quick course in rocks and minerals. Cathy Marshall defined a thunder egg as 'a chunk of lava with a rock inside.'" Ideas?

2. *Don Gedney*, a newer member, met with the Board at the Annual Picnic. He started 10 years ago videotaping for Oregon Field Guide. He wants to do some 6-7 min. segments for OFG, and would like suggestions from us on where to go and who to contact. He's also interested in developing educational videos, and is looking for people who can write script, be interviewed, develop teacher guides, etc. EP

****

PREVIEW OF COMING ATTRACTIONS

Fri. Oct. 6, 12:00-1:30 PM: Glacial Lake Missoula Floods Don Barr, Past President.
Central Library, 801 SW 10th St.

Fri. Oct. 13, 8:00 PM: TBA
Rm. 371 Cramer Hall, PSU, 1721 SW Broadway

****

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601; or e-mail folkdans@aol.com.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Dan Mendenhall

Constance Wong

THE CHANGING FACES OF IO

Friday evening presentation by Mr. Greg Cermak, Solar System Ambassador, NASA Jet Propulsion Laboratory, July 14, 2000

Greg Cermak's expertise with computers and his interest in planetary robotics gave viewers a picture of what future solar system exploration may look like. Voyager, after flying 20 years in space, revealed that volcanism has altered the surfaces of Mercury billions of years ago, Venus recently, and Mars from time to time. The newer Galileo spacecraft ended its mission in February after ten "frybys" of Jupiter's moon Io, the most geologically active body in the solar system. At one point Galileo was only 180 miles above the moon's surface.

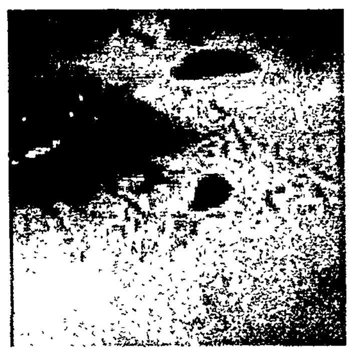
Io, about the size of our moon, is the closest of Jupiter's satellites. It is hard to compare phenomena in our world with those of Io. Earth's moon causes tides in the solid surface as well as in our planet's oceans, but they are less than eight inches high. Io's crust, activated by the gravity of its giant neighbor, moves up and down an amount equal to the rise and fall of an elevator in a thirty-story building. Also, a huge torus of charged particles with two trillion watts of direct current connects Io and Jupiter. The effects of this are almost unknown. The gravity of this moon is much less than Earth's, its atmospheric pressure is one billionth of ours, and there is almost no sign of plate tectonics.

The pizza pie appearance of Io's crust is due in large part to red, white, and green sulfur compounds which degrade to yellow sulfur. Hot basaltic lavas flowing over these make plumes of sulfur dioxide which snow back down onto the moon. One photo of a lava fountain was too hot to be recorded on a spectrometer that measures up to 3000°F, roughly ½ the temperature of the surface of the sun. Most volcanoes on Io are shield volcanoes. 350 of them are active, some continuously, some sporadically.

After the intense radiation it has been subjected to, Galileo shouldn't have anything living on it. Nevertheless, NASA's taking no chances of it crashing into Europa and contaminating it. The satellite will eventually be driven into a fiery grave on Jupiter.

Evelyn Pratt

Images of Io from the Galileo Orbiter in NASA's Planetary Photojournal:
http://photojournal.jpl.nasa.gov



Ongoing Volcanic Eruption at Tvashtar Catena, Io

Stereo Image of Zal Patera and Neighboring Mountain, Io

Bright Lava Flows at Emakong Patera, Io

Ionian Mountains and Calderas

HOSPITALITY – Help Needed!!!

Tom Gordon has graciously accepted the Refreshments Chairperson role for our Friday evening meetings. **Thank you, Tom!**

This is a really important job if you like cookies and a beverage along with stimulating conversation. If **YOU COULD HELP** by opening up the room and setting up coffee pot, creamer, etc, about 7:15 pm, and/or bringing some sort of cookies or munchies, please contact Tom Gordon at (360) 835-7748. **Thanks!**

PS - There **help** are no subliminal **out** messages here.

-WANTED-
-FIELD TRIP ASSISTANTS-

Taylor Hunt, acting Field Trip Chairperson, is developing about 24 local fieldtrips which can be changed and/or updated as needed. He could use help in developing itinerary and trip logs for these and ideas for other day trips. He would also like for someone to help organize and review this information and possibly lead some of these trips in the future. Please contact Taylor Hunt at (503) 662-4790 if you have time to assist or a desire to learn more about the Northwest. **THANKS**!

TROUT LAKE ICE CAVES – FIELD TRIP #2

Taylor Hunt, Leader
Saturday July 8, 2000

On Saturday July 8, five members and 2 guests revisited the Trout Lake Ice Caves. With most of the ice melted, access was much easier. However, there was still snow at the base of the main entrance ladder and the ice pool was still in existence, blocking our way to the Crystal Grotto at the lower east end.

We were able, however, to find the Natural Bridge across a side tunnel. It represents the top of a flow into a side tube that appears to have been more of a sink. The lava frothed up and surge-lines can be seen to the top of the tube as more lava flowed into the tube than could blow through it. A very small sinuous opening through a breakdown area led to the Crack Room ('spider web'), a large circular room of a previous tube formation. Near the back, a vent, appearing like an artesian spring, gently covered the floor (no surge lines along the cave wall) as it flowed toward the main tube. This flow may be the downward vent for the Natural Bridge flow. At least three chambers are plugged tubes entering the main channel by secondary flows. The balance of tubes we explored are now free of the fragile ice structures that blocked our way in April.

Field Trip Attendees:

Taylor Hunt	Jean Hunt
Marilyn Lum	Jett Karlson
Diane Stafford	Mr. & Mrs. Patrick S Finney

Editor's note: For the first TLIC field trip, see the June 2000 issue of the Geological Newsletter.

GEOLOGICAL SNAPSHOTS

Fossils in the making – breadfruit casts in recent lava at Hawaii Volcanoes National Park.

Submitted by Carol Hasenberg

Mt. Saint Helens Field Trip – Revisited

Taylor Hunt, Trip Leader
Saturday July 22, 2000

On Saturday, July 22, twenty-two persons toured the lahar fields of the upper reaches of the South side of Mt Saint Helens.

The group met at 9:00 am at Brock's Oak Tree Restaurant at the Woodland, Washington, exit of I-5 and carpooled from there with seven cars out Hwy 503 along the Lewis River and through Cougar.

Our first stop was at Speelya Bay, along Merwin Lake. In the cut-away of the road down into the area can be seen pebbly laharic deposit overlaying runout-flow deposits, all of Swift Creek eruptive period. Younger boulder-rich river-transported deposits lie above.

Second stop was at Swift Dam/Reservoir overlook. The overlook provides a visible marker of the lahar flow level that filled this canyon and then was carved out by the river. Deposits of Cougar Eruption Period (E.P.) underlie this point. Near their base, deposits contain reddened oxidized dacite blocks which were probably derived from a dome emplaced in the earlier Ape Canyon E.P. Deposits likely filled Lewis River Valley. Eventually water overflowed and breached the fill, causing catastrophic laharic flow downstream.

Stop Three was to observe pyroclastic-flow deposits of Pine Creek E.P. exposed in walls of Pine Creek Canyon.

Stop Four was at site of Muddy River lahar of May 18, 1980, lahars generated by melting snow and ice and consolidating moisture in a debris avalanche. Here, in the early minutes of the eruption, passage of pyroclastic flows across snow and ice, especially down the slot of the Shoestring Glacier, caused the lahar. It was a broad sheet 1.3 km wide and up to 5 m thick. It forms a fan-like plain in the upper Muddy River. Its eastern side was the narrow ridgeline separating the Muddy River from the Smith Creek Valley. To the west the thinned flow spread laterally through forest into Pine Creek and a short distance beyond. Trees marginal to the Muddy River plain were sheared off or uprooted. Momentum carried the flow over ridges as high as 47 m. In this location its force stripped bark from the upstream side of trees and filled cracks in bark on the other tree sides with gray mud.

Stop Five was to observe tephra sequence exposed in the east bank of the Muddy River, at a stratigraphic section of the stream cut.

Stop Six was to see Lava Canyon within the Muddy River Valley. The early morning lahar of May 18, 1980, swept the Muddy River canyon of older flowage deposits and forest to expose excellent geologic features. Overlying deposits, chiefly of the Kalama E.P., consist of tephra over pyroclastic-flow deposits, which in turn rest upon bleached, reddish to orangish hydrothermally altered lava flows of the pre-Mt. St. Helens bedrock. A stream valley was cut into the bedrock prior to the Castle Creek E.P. During this E.P. a dark-colored hypersthene-augite-olivine-plagioclase andesitic lava flow issued from the flank of the volcano and descended the Muddy River, down this canyon, and into Smith Creek valley to the east. The lava flow is now buried by laharic deposits in the upper Muddy River fan and emerges at the head of the canyon, at Moss Springs. Moss Springs is also the source of the major water discharge in the stream during the dry months of the year. The well-laid-out trail crosses the margin of the lava flow, exposing its sharp-crested levee, the inner abraded wall of the levee, lava breccia or rubble, and a compact, gas-poor central part of the lava flow. Where deeply incised, old stream gravels can be seen underlying the lava. In deeper channels of the old canyon the lava ponded and cooled slowly, contracting to form joint-faced columns. Here the columns are perpendicular to the old canyon walls. Also observable is the trim line of May 18, 1980, laharic flow and the contact between the altered bedrock and Mt. St. Helens deposits.

Though the weather was better for this third trip to the mountain, the clouds still hid what would have been a full-mountain view from Lava Canyon.

Reference
Mt. St. Helens Field Guide 1992, Paul Hammond (Swanson, Crandall, others).

Field Trip Attendees

John Newhouse	Donald Barr
Diane Stafford	Rosemary Tolle
Tim Tolle	A Kenneth Yost
Gretchen A Yost	Pat Ruzicka
Richard Romaine	Helen Hiczun
Duane Diller	Dana Diller
Don Blanchard	Gladys Blanchard
Clay Kelleher	H S Bennett
Mildred A Bennett	Ted Walling
Nancy McDonald	Rosemary Kenney
Jean Hunt	Taylor Hunt

Due to the President's field trip and many other activities in September, there will be no planned field trip on the third Saturday of September. Watch for further news about an October field trip.

WEB TEASERS

Check out this web site for Earth Science Week:
http://www.earthscienceworld.org/week
from our V.P. Sandra Adamson.

This site promotes Earth Science Week, October 8-14, 2000. It also has loads of information and links to many other earth science sites, book recommendations, etc. Here's my favorite thing:

Mount Rainier Birthday Cake

Mount Rainier National Park turned 100 years old in 1999. If you were to make a birthday cake for Mount Rainier, this one might be appropriate:

1 1/2 cups sifted flour
1 1/2 teaspoon vanilla extract
1/2 cup sugar
1 teaspoon baking soda
1/2 cup brown sugar
1 tablespoon white vinegar
1 teaspoon salt
1 cup milk
4 tablespoons cocoa powder
3/4 cup small marshmallows
5 tablespoons butter, melted

1. Preheat oven to 350 degrees.
2. Melt butter.
3. Mix flour, sugars, salt, and cocoa in a 10-inch baking pan until the mixture looks like brownish sand.
4. With a spoon, create a hole in the center of the mixture so that the bottom of the pan is visible. Make a smaller hole in another part of the pan, and an even smaller hole on the other side of the pan.
5. Pour baking soda into the second hole. Pour melted butter into the big, first hole. Pour the vanilla into the last and smallest hole.
6. Pour vinegar into the second hole and watch it bubble! When it stops foaming, pour in the milk and mix it all together until it resembles...mud!
7. Scatter marshmallows over the mixture.
8. Bake for 35 minutes. Let cool and serve.
9. Serves 6

Provided by the Washington State Department of Natural Resources, Division of Geology and Earth Resources in celebration of EARTH SCIENCE WEEK 1999!

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http://www.agiweb.org/
The AGI book of the month:

Metal Mining and the Environment

By Travis Hudson
Paperback, 8.50"x11.00" 64 pp.

The booklet, Metal Mining and the Environment, and the colorful companion poster offer new tools for raising awareness and understanding of the impact and issues surrounding metal mining and the environment. The 64-page full-color booklet contains a copy of the poster which includes a student activity on the back. This booklet and poster can help you:

1. Illustrate the importance of our natural and environmental resources
2. Provide a geoscience perspective on metal mining and the environment
3. Improve Earth science literacy
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- Web Extra: Rejecting Kansas conservatives
- Grand Canyon quandary
- Mars may hide shades of blue
- Briny beginning
- Evasive nuclear testing a misstated threat
- Loophole in the carbon cycle
- Field Notes

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http://www.scn.org/tech/nwgs/
Our sister organization based in Seattle, Washington

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General Meetings are held on the last Tuesday of each month, September through June.

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September 19, Tuesday, 7 PM, Aracelia's Mexican Food Restaurant, 528 E. Trent, Spokane, WA
Presentation by "Andy Buddington":
"North Cascades Geology" - pre-lecture to field trip of 9/22-24

Picnic Recap

Thank you to those GSOC'ers attending the picnic on August 13, 2000. We had a great time chatting, eating, and visiting the wonderful Rice Northwest Museum of Rocks and Minerals. My favorite exhibit was the collection of petrified wood slabs.

THE GEOLOGICAL NEWSLETTER

GSOC

SEPTEMBER 2000

GEOLOGICAL SOCIETY
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2000-2001 ADMINISTRATION
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THE GEOLOGICAL NEWSLETTER

ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Meeting—February.

FIELD TRIPS: Usually one per month, by 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. 371, 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.

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Geologic Interests and Hobbies____________________
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Please indicate Membership type and include check for appropriate amount:
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VISITORS WELCOME AT ALL MEETINGS
INFORMATION: www.gsoc.org *or* gsoc@teleport.com
Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

VOL. 66, No. 9
SEPTEMBER 2000

SEPTEMBER ACTIVITIES

President's Field Trip: Glacial Lake Missoula Floods Sept. 2-9, Portland to Missoula, MT and return with Dr. John Whitmer, Dr. Richard Waitt, et al. Meet at PSU ~8:00 AM to allow time to pack bus. If you have not yet received your information sheet, call Phyllis Thorne, 503-292-6134, or Taylor Hunt, 503-662-4790.

No noon or evening meetings in September.

Projects to consider:

1. *Hazel Standeven*: "Ch. 2-TV news anchors need a quick course in rocks and minerals. Cathy Marshall defined a thunder egg as 'a chunk of lava with a rock inside.'" Ideas?

2. *Don Gedney*, a newer member, met with the Board at the Annual Picnic. He started 10 years ago videotaping for Oregon Field Guide. He wants to do some 6-7 min. segments for OFG, and would like suggestions from us on where to go and who to contact. He's also interested in developing educational videos, and is looking for people who can write script, be interviewed, develop teacher guides, etc. EP

****

PREVIEW OF COMING ATTRACTIONS

Fri. Oct. 6, 12:00-1:30 PM: Glacial Lake Missoula Floods Don Barr, Past President.
Central Library, 801 SW 10th St.

Fri. Oct. 13, 8:00 PM: TBA
Rm. 371 Cramer Hall, PSU, 1721 SW Broadway

****

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601; or e-mail folkdans@aol.com.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Dan Mendenhall
Constance Wong

THE CHANGING FACES OF IO

Friday evening presentation by Mr. Greg Cermak, Solar System Ambassador, NASA Jet Propulsion Laboratory, July 14, 2000

Greg Cermak's expertise with computers and his interest in planetary robotics gave viewers a picture of what future solar system exploration may look like. Voyager, after flying 20 years in space, revealed that volcanism has altered the surfaces of Mercury billions of years ago, Venus recently, and Mars from time to time. The newer Galileo spacecraft ended its mission in February after ten "frybys" of Jupiter's moon Io, the most geologically active body in the solar system. At one point Galileo was only 180 miles above the moon's surface.

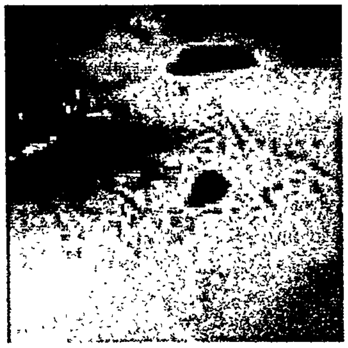
Io, about the size of our moon, is the closest of Jupiter's satellites. It is hard to compare phenomena in our world with those of Io. Earth's moon causes tides in the solid surface as well as in our planet's oceans, but they are less than eight inches high. Io's crust, activated by the gravity of its giant neighbor, moves up and down an amount equal to the rise and fall of an elevator in a thirty-story building. Also, a huge torus of charged particles with two trillion watts of direct current connects Io and Jupiter. The effects of this are almost unknown. The gravity of this moon is much less than Earth's, its atmospheric pressure is one billionth of ours, and there is almost no sign of plate tectonics.

The pizza pie appearance of Io's crust is due in large part to red, white, and green sulfur compounds which degrade to yellow sulfur. Hot basaltic lavas flowing over these make plumes of sulfur dioxide which snow back down onto the moon. One photo of a lava fountain was too hot to be recorded on a spectrometer that measures up to 3000°F, roughly ½ the temperature of the surface of the sun. Most volcanoes on Io are shield volcanoes. 350 of them are active, some continuously, some sporadically.

After the intense radiation it has been subjected to, Galileo shouldn't have anything living on it. Nevertheless, NASA's taking no chances of it crashing into Europa and contaminating it. The satellite will eventually be driven into a fiery grave on Jupiter.

Evelyn Pratt

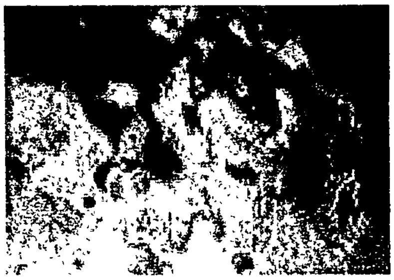
Images of Io from the Galileo Orbiter in NASA's Planetary Photojournal:
http://photojournal.jpl.nasa.gov



Stereo Image of Zal Patera and Neighboring Mountain, Io .

Ongoing Volcanic Eruption at Tvashtar Catena, Io

Bright Lava Flows at Emakong Patera, Io



Ionian Mountains and Calderas

HOSPITALITY – Help Needed!!!

Tom Gordon has graciously accepted the Refreshments Chairperson role for our Friday evening meetings. **Thank you, Tom!**

This is a really important job if you like cookies and a beverage along with stimulating conversation. If **YOU COULD HELP** by opening up the room and setting up coffee pot, creamer, etc, about 7:15 pm, and/or bringing some sort of cookies or munchies, please contact Tom Gordon at (360) 835-7748. **Thanks!**

PS - There **help** are no subliminal **out** messages here.

-WANTED-
-FIELD TRIP ASSISTANTS-

Taylor Hunt, acting Field Trip Chairperson, is developing about 24 local fieldtrips which can be changed and/or updated as needed. He could use help in developing itinerary and trip logs for these and ideas for other day trips. He would also like for someone to help organize and review this information and possibly lead some of these trips in the future. Please contact Taylor Hunt at (503) 662-4790 if you have time to assist or a desire to learn more about the Northwest. **THANKS**!

TROUT LAKE ICE CAVES – FIELD TRIP #2

Taylor Hunt, Leader
Saturday July 8, 2000

On Saturday July 8, five members and 2 guests revisited the Trout Lake Ice Caves. With most of the ice melted, access was much easier. However, there was still snow at the base of the main entrance ladder and the ice pool was still in existence, blocking our way to the Crystal Grotto at the lower east end.

We were able, however, to find the Natural Bridge across a side tunnel. It represents the top of a flow into a side tube that appears to have been more of a sink. The lava frothed up and surge-lines can be seen to the top of the tube as more lava flowed into the tube than could blow through it. A very small sinuous opening through a breakdown area led to the Crack Room ('spider web'), a large circular room of a previous tube formation. Near the back, a vent, appearing like an artesian spring, gently covered the floor (no surge lines along the cave wall) as it flowed toward the main tube. This flow may be the downward vent for the Natural Bridge flow. At least three chambers are plugged tubes entering the main channel by secondary flows. The balance of tubes we explored are now free of the fragile ice structures that blocked our way in April.

Field Trip Attendees:

Taylor Hunt	Jean Hunt
Marilyn Lum	Jett Karlson
Diane Stafford	Mr. & Mrs. Patrick S Finney

Editor's note: For the first TLIC field trip, see the June 2000 issue of the Geological Newsletter.

GEOLOGICAL SNAPSHOTS

Fossils in the making – breadfruit casts in recent lava at Hawaii Volcanoes National Park.

Submitted by Carol Hasenberg

Mt. Saint Helens Field Trip – Revisited

Taylor Hunt, Trip Leader
Saturday July 22, 2000

On Saturday, July 22, twenty-two persons toured the lahar fields of the upper reaches of the South side of Mt Saint Helens.

The group met at 9:00 am at Brock's Oak Tree Restaurant at the Woodland, Washington, exit of I-5 and carpooled from there with seven cars out Hwy 503 along the Lewis River and through Cougar.

Our first stop was at Speelya Bay, along Merwin Lake. In the cut-away of the road down into the area can be seen pebbly laharic deposit overlaying runout-flow deposits, all of Swift Creek eruptive period. Younger boulder-rich river-transported deposits lie above.

Second stop was at Swift Dam/Reservoir overlook. The overlook provides a visible marker of the lahar flow level that filled this canyon and then was carved out by the river. Deposits of Cougar Eruption Period (E.P.) underlie this point. Near their base, deposits contain reddened oxidized dacite blocks which were probably derived from a dome emplaced in the earlier Ape Canyon E.P. Deposits likely filled Lewis River Valley. Eventually water overflowed and breached the fill, causing catastrophic laharic flow downstream.

Stop Three was to observe pyroclastic-flow deposits of Pine Creek E.P. exposed in walls of Pine Creek Canyon.

Stop Four was at site of Muddy River lahar of May 18, 1980, lahars generated by melting snow and ice and consolidating moisture in a debris avalanche. Here, in the early minutes of the eruption, passage of pyroclastic flows across snow and ice, especially down the slot of the Shoestring Glacier, caused the lahar. It was a broad sheet 1.3 km wide and up to 5 m thick. It forms a fan-like plain in the upper Muddy River. Its eastern side was the narrow ridgeline separating the Muddy River from the Smith Creek Valley. To the west the thinned flow spread laterally through forest into Pine Creek and a short distance beyond. Trees marginal to the Muddy River plain were sheared off or uprooted. Momentum carried the flow over ridges as high as 47 m. In this location its force stripped bark from the upstream side of trees and filled cracks in bark on the other tree sides with gray mud.

Stop Five was to observe tephra sequence exposed in the east bank of the Muddy River, at a stratigraphic section of the stream cut.

Stop Six was to see Lava Canyon within the Muddy River Valley. The early morning lahar of May 18, 1980, swept the Muddy River canyon of older flowage deposits and forest to expose excellent geologic features. Overlying deposits, chiefly of the Kalama E.P., consist of tephra over pyroclastic-flow deposits, which in turn rest upon bleached, reddish to orangish hydrothermally altered lava flows of the pre-Mt. St. Helens bedrock. A stream valley was cut into the bedrock prior to the Castle Creek E.P. During this E.P. a dark-colored hypersthene-augite-olivine-plagioclase andesitic lava flow issued from the flank of the volcano and descended the Muddy River, down this canyon, and into Smith Creek valley to the east. The lava flow is now buried by laharic deposits in the upper Muddy River fan and emerges at the head of the canyon, at Moss Springs. Moss Springs is also the source of the major water discharge in the stream during the dry months of the year. The well-laid-out trail crosses the margin of the lava flow, exposing its sharp-crested levee, the inner abraded wall of the levee, lava breccia or rubble, and a compact, gas-poor central part of the lava flow. Where deeply incised, old stream gravels can be seen underlying the lava. In deeper channels of the old canyon the lava ponded and cooled slowly, contracting to form joint-faced columns. Here the columns are perpendicular to the old canyon walls. Also observable is the trim line of May 18, 1980, laharic flow and the contact between the altered bedrock and Mt. St. Helens deposits.

Though the weather was better for this third trip to the mountain, the clouds still hid what would have been a full-mountain view from Lava Canyon.

Reference
Mt. St. Helens Field Guide 1992, Paul Hammond (Swanson, Crandall, others).

Field Trip Attendees

John Newhouse	Donald Barr
Diane Stafford	Rosemary Tolle
Tim Tolle	A Kenneth Yost
Gretchen A Yost	Pat Ruzicka
Richard Romaine	Helen Hiczun
Duane Diller	Dana Diller
Don Blanchard	Gladys Blanchard
Clay Kelleher	H S Bennett
Mildred A Bennett	Ted Walling
Nancy McDonald	Rosemary Kenney
Jean Hunt	Taylor Hunt

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Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

VOL. 66, No. 8
AUGUST 2000

AUGUST ACTIVITIES

Field Trip Sat. Aug. 12: Geomorphology of the Columbia Gorge: How the Gorge was built, from Troutdale to Bonneville Dam. Call Taylor Hunt, 503-662-4790 for details.

Potluck picnic Sun. Aug. 13, 11:00 AM at Rice Northwest Museum of Rocks and Minerals. Take Hwy 26 west to Exit 61 (Helvetia); go west, paralleling highway, to Groveland Dr. Private showing of the Museum's outstanding exhibits. Call Taylor Hunt, 503-662-4790 for details.

****

PREVIEW OF COMING ATTRACTIONS

Sat. Sept. 2-9: President's Field Trip: **TRAVELLERS THROUGH TIME: MISSOULA FLOOD TOUR**. You can see soon-to-be designated Ice Age Floods National Geological Region accompanied by knowledgeable Pacific NW geologists. Call Ray Crowe, 503-640-6581 or Phyllis Thorne, 503-292-6134 for further details. If you haven't paid yet, make $100 prepayment check to Raz Transportation & Tours and send to Phyllis Thorne, 9035 SW Monterey Pl., Portland 97225-6511, **ASAP**!

Fri. Sept. 8, 8 PM: TBA
Rm. 371 Cramer Hall, PSU, 1721 SW Broadway

****

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601; or e-mail Folkdans@aol.com.

Message from the President

TRAVELLERS THROUGH TIME - MISSOURI TOUR

This month our intrepid President is on tour in the state of Missouri. We'll be looking forward to his message next month!

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Liane Brown
Barbara Rogers
Kris Karlson
Barbara Halverson
Catherine Ellis
Jim Riggle
Bill Price

SNOWBALL EARTH, OXYGEN POISONING, and Early Life

Bev Vogt, 5/24/00; recorded by Evelyn Pratt, edited by Bev Vogt

Although the latest 570 million years of Earth's history have been studied and written about for the last century and a half, very little was known about the preceding 4 billion years. This can be compared to recording the biography of an 80-year-old knowing only what happened during the last ten years of his or her life. Thanks to new tools, dedicated **paleogeologists**, and burgeoning interest in the Precambrian during the last decade, much more information is currently available.

(GSOC seminar speakers this year reported on readings that dealt with this first 80% of Earth's history. In the May seminar, Past President Beverly Vogt included much of what we'd learned as she presented an amazing amount of information in just one hour. This is an outline of her presentation.)

An article in the New Scientist journal, 8/7/99, titled "Nine days that shook the world", lists the following cataclysmic events:

1. **4.5 Ba:** Earth hit by very big object; moon broken loose - moon's orbit was 1/20 distance from Earth that it is today.
2. **3.5-2.2 Ba:** Gas warfare among organisms; cyanobacteria emitted oxygen, killing or driving away anaerobic bacteria. Oxygen increased in Earth's atmosphere from <1% to 15%.
3. **590 Ma:** Giant meteorite crater in Australia; impact was probably responsible for major die off.
4. **250 Ma:** Immense lava flows, Siberian Traps - possible reason that up to 95% of all organisms died at end of Permian.
5. **5.8 Ma:** Mediterranean dried up. Then, as plate tectonics opened Straits of Gibraltar, waterfall 100x size of Victoria Falls filled Mediterranean.
6. **1 Ma:** Huge landslide took away northeast portion of Oahu. Another slide is poised on southeast side of island of Hawaii.
7. **15,000 ya:** Bretz-Missoula floods
8. **300 ya:** 1/26/1700 AD, 9 PM, huge Cascadia Subduction Zone earthquake
9. **4/1810:** Tambora, near Bali, erupted, producing 150x more tephra than Mt. St. Helens.

We'll concentrate on Number 2, and another event not included on this list. Earth originated about 4.6 Ba. By 4.2 Ba a metallic core, a mantle, and an outer crust with a rocky rind were in place. Earth was bombarded by meteorites from its beginning, but by 3.9 Ba the impacts had slowed down considerably.

The early atmosphere probably was composed of N, CO_2, water vapor, methane, ammonia, and H_2. No ozone layer existed, so nothing stopped ultraviolet from zapping Earth with lethal rays. Lightning storms were frequent. The geologic time which includes organisms is divided into three main sections. Oldest is Archaean, 3.8-2.5 Ba. After that is the Proterozoic, 2.5 Ba-570 Ma. From 570 Ma to today is the Phanerozoic. The five most common elements on Earth are carbon (C), hydrogen (H), oxygen (O), nitrogen (N), and helium. Four of these five - C, H, O, and N - make up more than 99.9% of all living systems on earth.

The earliest probable evidence of life has been found in southwest Greenland. It consists of 3.8 Ba graphite, possibly from organically-produced carbon. A good date of 3.465 Ba has been established in Australia for tiny rounded Apex chert grains, which are bracketed by two lava beds containing uranium-to-lead dated zircons. The rounded grains consist of 11 species of bacteria and 6 oxygen-producing **cyanobacteria**, which were transported by moving water to the Apex bed. They include **autotrophs** (organisms that make their own food) and **heterotrophs** (organisms that eat other organisms) as well as aerobes (oxygen producers/users) and anaerobes (poisoned by oxygen). Recently it was announced that scientists have found a protein in anaerobes that may be responsible for their "knowing" when oxygen is present.

From the time meteorite bombardment of Earth slowed down drastically (~3.9Ba) until these organisms appeared was over 400 million years - about the same amount of time as that from when life first emerged from the sea in the Devonian until today. It's possible to be so involved in one's own specialty that vital information from other fields is missed. 40 or 50 years ago geologists were puzzled by what they called **Cryptozoans** - layered objects with life-form carbon in them. At the same time biologists were studying big biscuit-shaped "microbial mats" that grew in extra-salty bays along the southern Australian coast. In the '60's geologists and biologists compared notes and discovered they'd been looking at fossil and living forms of the same thing - what are now called stromatolites.

Stromatolites have been around from 3.45 Ba to today. They range from fingernail-size to several feet in diameter. They are made of a top layer of cyanobacteria, which photosynthesize and give off oxygen; a lower layer of photosynthetic bacteria that do not produce oxygen; and a still lower layer of anaerobic bacteria. Each layer uses different wavelengths of light. Mucilage protects them from ultraviolet rays, and a lot of mud is intermixed with them, which together give stromatolites their consistencies - rubbery, leathery, or cottage-cheesy. These colonies of organisms have stayed virtually the same throughout geologic time. Their worst predators are gastropods (snails and their allies), which are found in shallow seas everywhere except where water is very saline.

Geochemists study isotopes used by organisms. Carbon has two isotopes: carbon-12 (12C) and carbon-13 (13C). Organisms use 12C preferentially in life processes. Limestones which are formed when there is a lot of biogenic activity have less 12C and more 13C than those laid down when few living things are present. Also, since living things preferentially take up 32S, the ratio of 32S/34S is another good indicator of whether certain minerals such as pyrite were produced by organic processes.

Fe++ is soluble in water. When enough oxygen is produced, Fe+++ is formed and combines with the oxygen to form rust. Although there couldn't have been a great deal of oxygen in Earth's early atmosphere, from 3.5 to 2.2 Ba enough was produced by cyanobacteria in the oceans to make banded iron oxide (rust) layers which were deposited on ocean floors around the world. Ferruginous chert formations starting around 3.5 BA also indicate the presence of oxygen. From 2.2 to 1.9 Ba the oxygen content of the air rose from 1% to 15% of the present-day level. Eukaryotes, the complex cell type of which we are made, appeared around 2.5 Ba. Once organisms were able to combine gametes with differing genes in the process of sexual reproduction, around 1.1 Ba, the rate of change in living things swiftly accelerated. Then from 900-600 Ma many organisms disappeared. The ratio of 12C to 13C in limestones laid down just before that time shows an upward change from abundant biogenic activity to practically none. No impact evidence has been found, but on top of these limestones all over the world are rocks that look like glacial till. Above that layer are limestones teeming with biogenic activity.

This is what has led to the hot topic of 1999-2000 - the **"Snowball Earth" theory**. It proposes that the Earth was completely covered by glaciers at least two, and possibly four, times. Theories on how these may have happened range from a change in the earth's tilt, to a reduction of CO_2 producing the opposite of global warming, to having broken-up pieces of a formerly large continent, Rodinia, positioned along the equator. In the latter theory, four or five steps would have been needed:

1. The supercontinent breaks up. Because the resulting land masses have many more shorelines, chemical weathering increases dramatically. More CO_2 is locked up in the oceans, reducing CO_2 in the atmosphere. More heat can escape into outer space.
2. Albedo from ice caps means the sun's heat is reflected into space.
3. As the oceans freeze over, water vapor is no longer released into the atmosphere, so precipitation slows. This produces deserts on the continents.
4. Plate tectonics continues under the ice. Volcanoes erupt, spewing CO_2 into the atmosphere. This has a greenhouse effect, meaning that heat is retained and ice starts to thaw.
5. As the thaw accelerates, oceans and atmosphere, formerly separated by ice, go into equilibrium. Soluble iron in seawater combines with oxygen and is precipitated onto the seafloor as banded iron formations.

How would life return after this? Perhaps single-celled organisms "hid out" in rocks or on the sea floor*. As the ice started to thaw, many nutrients were added to the ocean. So the seas again teemed with life. From 700-550 Ma, softbodied multicellular organisms named the Ediacara fossil assemblage are found in several places around the world. Then they disappeared. They seem to have been an evolutionary dead end. The beginning of the Cambrian is marked by the worldwide appearance of the first group of organisms with hard parts, the Tommotian. So little is known about these that they go by the less-than-dignified appellation "small shelly fauna".

Finally, in the Cambrian Burgess shale in Canada, a submarine landslide fortuitously buried ancestors of many modern organisms in anaerobic conditions which preserved them. Some paleontologists, including Stephen Jay Gould and Simon Morris, disagree on fine points of relationships of these fossils to each other and to succeeding ones. But so great is the variety of organisms preserved in the Burgess Shale and similar-aged deposits in other parts of the world that it has given rise to the term "Cambrian explosion of life."

Beverly Vogt gave a fascinating account of the Precambrian. With the tremendous amount of studying of life's first 3.5 billion years going on right now, the next few years should produce much more information on the initial 80% of Earth's history.

---

*Since this talk was given, computer modelers suggest that even during Snowball Earth certain portions of the ocean were not frozen. Isolated colonies of organisms would have had a chance to survive. B.V.

Suggested Readings:

Fortey, Richard, 1997, Life: A Natural History of the First Four Billion Years of Life on Earth, New York, Vintage Books, 346 p.

Gould, Stephen Jay, 1989, Wonderful life: The Burgess Shale and the Nature of History, New York, W.W. Norton and Company, 347 p.

Morris, Simon Conway, 1998, The Crucible of Creation: The Burgess Shale and the Rise of Animals New York, Oxford University Press, 242 p.

Schopf, J. William, 1999, Cradle of Life: The Discovery of Earth's Earliest Fossils: Princeton, N.J., Princeton University Press, 367 p.

--- 1998, "Tracing the roots of the Universal Tree of Life", in Breck, Andre, ed., The Molecular Origins of Life, New York, Cambridge University Press, p. 337-362.

--- 1993, Major Events in the History of Life, Boston, Jones and Bartlett Publishers, 190 p.

Ward, Peter D., and Brownlee, Donald, 2000, Rare Earth: Why Complex Life is Uncommon in the Universe, New York, Copernicus, Springer-Verlag, 333 p.

THE GEOLOGICAL NEWSLETTER

Call for Submittals

Thinking of submitting an article to the Geological Newsletter? We'd love to get one, and here are the requirements for a submittal:

1. It is preferable to submit your article by email (to gsoc@teleport.com) or on a computer disk. The preferred file format is either MS Word (.doc) or simple text (.txt). (Articles typed in your email are more difficult to prepare for publishing.) Small news items can be sent via mail or by phone to the editor.
2. If you are quoting someone else's article, enclose the quotation in quotation marks and provide a reference to the article. We cannot reproduce someone else's article without permission.
3. Please do reference the sources for your information, even if the information is public property. This is out of courtesy to the authors, and also gives the readers sources to check for more information.
4. Do include pictures with your article; however we cannot reproduce copyrighted pictures. The preferred file formats are .gif or .jpg. We can also scan photographs.

We would also like to start a new feature called "Geological Snapshots" where we feature a snapshot from one of our members. Please include a caption. Here's an example:

GEOLOGICAL SNAPSHOTS

Bands of volcanic ash and cobbled sediments alternate in this shot of Isla Espiritu Santo near LaPaz, Baja Sur, Mexico.

Submitted by Carol Hasenberg

The Library Corner

Fossil Shells from Western Oregon – A Guide to Identification

By Ellen J. Moore, May 2000, Chintimini Press, Corvallis, Oregon, 131 p.

Publisher's Abstract

Starting about 57 Ma., a major tectonic plate reorganization wiped the fossil record clean in western Oregon. Since then, new layers of sediment, seen in beach cliffs and road cuts, have preserved one of the world's richest and most continuous sequences of fossil clams and snails. In this book for general readers, Ellen Moore shows how these fossils wrote a detailed geologic history of western Oregon. The book consists of three main parts:

1. Oregon's plate-tectonic architecture, with maps showing the geologic age of the fossiliferous rocks near each western Oregon town
2. Descriptions and annotated photographs of each of the most abundant and useful fossils organized by geologic age and by major fossil groups
3. A set of 8 detailed geologic excursions where readers can see western Oregon's rocks and fossils at first hand.

This book expands on the author's previous technical and popular books to include the full geologic range of marine fossiliferous rocks in western Oregon, from the late Paleocene to the Pleistocene, and the full geographic range, from border to border.

This book is now available for check-out in the GSOC library.

WEB TEASERS

What's new at the Cascade Volcanoes Observatory website this month? (http://vulcan.wr.usgs.gov/)

Volcano-Groundwater Interaction

Project Chief

Larry G. Mastin
USGS Cascades Volcano Observatory
5400 MacArthur Blvd.
Vancouver, Washington 98661
Phone: (360) 993-8925
e-mail: lgmastin@usgs.gov

Project Description

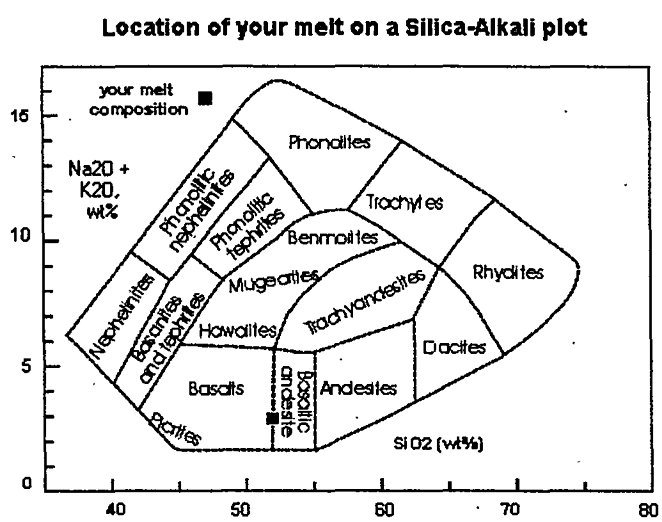
In active volcanic areas, groundwater can affect intrusive and eruptive activity by influencing cooling rates, modifying the strength of rocks in the volcanic edifice, and converting thermal energy of magma to explosive mechanical energy. One of the greatest hazards posed by groundwater exists when it is heated by magma and violently released, as eruptions of either pure steam or steam mixed with fragmented magma or country rock. The objective of this project is to identify the conditions under which groundwater in volcanoes poses a potential hazard. To accomplish this, the following methods are employed:

- Theoretical investigations:
  - Thermodynamic studies of the conditions under which groundwater, or water-magma mixtures, can be most explosive.
  - Numerical modelling of pressure and other flow properties of magma in eruptive conduits, to identify the conditions under which water can enter and mix with magma.

Site-specific investigations:

- Interdisciplinary studies in Alaska, Hawaii, and the Cascades, to identify the degree of involvement of water in specific eruptions, and the hydrologic or magmatic conditions that could have affected their explosivity.

Here is the Silica-Alkalai chart from the numerican modeling program Conflow: A numerical program for conduit flow and thermodynamics, by Larry G. Mastin (U.S. Geological Survey) and Mark S. Ghiorso (University of Washington)



THE GEOLOGICAL NEWSLETTER

GSOC

OCTOBER 2000

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THE GEOLOGICAL NEWSLETTER

ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Meeting—February.
FIELD TRIPS: Usually one per month, by 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. 371, 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: www.gsoc.org *or* gsoc@teleport.com
Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

VOL. 66, No. 10
OCTOBER 2000

OCTOBER ACTIVITIES

Fri. Oct. 6, 12:00-1:30 PM: Glacial Lake Missoula Floods Don Barr, Past President. Central Library, 801 SW 10th St.

Fri. Oct. 13, 8:00 PM: Guided Tour: PSU's Geology Dept. Laboratories and Equipment. Introduction by Michael L. Cummings, PSU Professor of Geology Rm. 371 Cramer Hall, PSU, 1721 SW Broadway.

Seminars: Your special interest? Ideas wanted! Time: January through May or June. Evelyn Pratt, 503-223-2601, and Richard Bartels, 503-292-6939.

****

Field Trip: Nov. 4 The Non-boring Boring Volcanoes. Find out what Mt. Sylvania, Mt. Tabor, and Larch Mt. have in common, and what their curious association is with much-older Troutdale Formation. Meet at PCC Sylvania, 12000 SW 49th Ave. parking lot, 8:30 AM for signup, handout, orientation & carpooling. Depart before 9:30 AM; no-host lunch at budget restaurant; end near Troutdale 4:00 PM. Leader Clay Kelleher, 503-775-6263, or e-mail ClayKelleher@cs.com.

Preview of Coming Attractions:

Mon. Nov. 6, 12-1:30 PM: The Ever-changing Coastline of the Pacific Northwest Evelyn Pratt, past president Central Library, 801 SW 10th St.

Fri. Nov. 10, 8:00 PM: The Case of the Disappearing Bridge: Some observations on the Eliot Branch Debris Flow of Nov. 25, 1999, in the Northern Oregon Cascade Range. Chris Hedeen, M.S. in Geology and Instructor of Earth Science, Lakeridge H.S., Lake

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601; or e-mail folkdans@aol.com.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Carl Fullman
Jerome Fulton
Al and Trudi Kempin
Pamela Parks
Teresa Coleman

VOLCANIC VOCABULARY

From the USGS Cascades Volcano Observatory website:
http://vulcan.wr.usgs.gov
Definitions from Tilling, 1985, Volcanoes: USGS General Interest Publication except as noted.

Calderas

The largest and most explosive volcanic eruptions eject tens to hundreds of cubic kilometers of magma onto the Earth's surface. When such a large volume of magma is removed from beneath a volcano, the ground subsides or collapses into the emptied space, to form a huge depression called a caldera. Some calderas are more than 25 kilometers in diameter and several kilometers deep.
From: Brantley, 1994, Volcanoes of the United States: USGS General Interest Publication

Cinder Cones and Scoria Cones

Cinder cones are the simplest type of volcano. They are built from particles and blobs of congealed lava ejected from a single vent. As the gas-charged lava is blown violently into the air, it breaks into small fragments that solidify and fall as cinders around the vent to form a circular or oval cone. Most cinder cones have a bowl-shaped crater at the summit and rarely rise more than a thousand feet or so above their surroundings. Cinder cones are numerous in western North America as well as throughout other volcanic terrains of the world.

Composite Volcanoes and Stratovolcanoes

Some of the Earth's grandest mountains are composite volcanoes -- sometimes called stratovolcanoes. They are typically steep-sided, symmetrical cones of large dimension built of alternating layers of lava flows, volcanic ash, cinders, blocks, and bombs and may rise as much as 8,000 feet above their bases. Some of the most conspicuous and beautiful mountains in the world are composite volcanoes, including Mount Fuji in Japan, Mount Cotopaxi in Ecuador, Mount Shasta in California, Mount Hood in Oregon, Mount St. Helens and Mount Rainier in Washington. Most composite volcanoes have a crater at the summit, which contains a central vent or a clustered group of vents. Lavas either flow through breaks in the crater wall or issue from fissures on the flanks of the cone. Lava, solidified within the fissures, forms dikes that act as ribs which greatly strengthen the cone. The essential feature of a composite volcano is a conduit system through which magma from a reservoir deep in the Earth's crust rises to the surface. The volcano is built up by the accumulation of material erupted through the conduit and increases in size as lava, cinders, ash, etc., are added to its slopes. Composite volcanoes tend to erupt explosively and pose considerable danger to nearby life and property.
From: Tilling, Topinka, and Swanson, 1990, Eruptions of Mount St. Helens: Past, Present, and Future: USGS General Interest Publication

Shield Volcanoes

Shield volcanoes are built almost entirely of fluid lava flows. Flow after flow pours out in all directions from a central summit vent, or group of vents, building a broad, gently sloping cone of flat, domical shape, with a profile much like that of a warrior's shield. They are built up slowly by the accretion of thousands of flows of highly fluid basaltic (from basalt, a hard, dense dark volcanic rock) lava that spread widely over great distances, and then cool as thin, gently dipping sheets. Lavas also commonly erupt from vents along fractures (rift zones) that develop on the flanks of the cone. Some of the largest volcanoes in the world are shield volcanoes. In northern California and Oregon, many shield volcanoes have diameters of 3 or 4 miles and heights of 1,500 to 2,000 feet. The Hawaiian Islands are composed of linear chains of these volcanoes including Kilauea and Mauna Loa on the island of Hawaii -- two of the world's most active volcanoes. The floor of the ocean is more than 15,000 feet deep at the bases of the islands. As Mauna Loa, the largest of the shield volcanoes (and also the world's largest active volcano), projects 13,677 feet above sea level, its top is over 28,000 feet above the deep ocean floor.

Lava Plateaus

In some shield-volcano eruptions, basaltic lava pours out quietly from long fissures instead of central vents and floods the surrounding countryside with lava flow upon lava flow, forming broad plateaus. Lava plateaus of this type can be seen in Iceland, southeastern Washington, eastern Oregon, and southern Idaho.

Submarine Volcanoes, Ridges, and Vents

Submarine volcanoes and volcanic vents are common features on certain zones of the ocean floor. Some are active at the present time and, in shallow water, disclose their presence by blasting steam and rock-debris high above the surface of the sea. Many others lie at such great depths that the tremendous weight of the water above them results in high, confining pressure and prevents the formation and explosive release of steam and gases. Even very large, deepwater eruptions may not disturb the ocean surface.

Lava Domes

Lava (usually dacite or rhyolite) that is too sticky to flow far from its vent forms steep-sided mounds called lava domes.
Wright and Pierson, 1992, USGS Circular 1973

Maars and Tuff Cones

Also called "tuff cones", maars are shallow, flat-floored craters that scientists interpret have formed above diatremes as a result of a violent expansion of magmatic gas or steam; deep erosion of a maar presumably would expose a diatreme. Maars range in size from 200 to 6,500 feet across and from 30 to 650 feet deep, and most are commonly filled with water to form natural lakes. Most maars have low rims composed of a mixture of loose fragments of volcanic rocks and rocks torn from the walls of the diatreme.

Monogenetic Volcanic Fields

Composite volcanoes erupt episodically over tens to hundreds of thousand of years and can display a wide range of eruption styles. Monogenetic volcanoes typically erupt for only brief time intervals weeks to perhaps centuries and generally display a narrower range in eruptive behavior. Most monogenetic volcanoes are basaltic in composition but a few are of andesite and dacite composition; that is, with a relatively higher silica content.
From: Walder, et.al. 1999, Volcano Hazards in the Mount Jefferson Region, Oregon: USGS Open-File Report 99-24.

Monogenetic volcanic fields are collections of cinder cones, and/or Maar vents and associated lava flows and pyroclastic deposits. Sometimes a stratovolcano is at the center of the field.
From: Wood and Kienle, 1990, Volcanoes of North America: United States and Canada: Cambridge University Press, 354p.

Tuyas

A volcano formed under a glacier.

"Island-Arc" Volcanoes

In a typical "island-arc" environment, volcanoes lie along the crest of an arcuate, crustal ridge bounded on its convex side by a deep oceanic trench. The granite or granite-like layer of the continental crust extends beneath the ridge to the vicinity of the trench. Basaltic magmas, generated in the mantle beneath the ridge, rise along fractures through the granitic layer. These magmas commonly will be modified or changed in composition during passage through the granitic layer and erupt on the surface to form volcanoes built largely of non-basaltic rocks.

"Oceanic" Volcanoes

In a typical "oceanic" environment, volcanoes are aligned along the crest of a broad ridge that marks an active fracture system in the oceanic crust. Basaltic magmas, generated in the upper mantle beneath the ridge, rise along fractures through the basaltic layer. Because the granitic crustal layer is absent, the magmas are not appreciably modified or changed in composition and they erupt on the surface to form basaltic volcanoes.

"Continental" Volcanoes

In the typical "continental" environment, volcanoes are located in unstable, mountainous belts that have thick roots of granite or granite-like rock. Magmas, generated near the base of the mountain root, rise slowly or intermittently along fractures in the crust. During passage through the granite layer, magmas are commonly modified or changed in composition and erupt on the surface to form volcanoes constructed of non-basaltic rocks.

SNEAK PREVIEW

Pictures from the Ice Age Floods field trip submitted by Duane Diller:

Photo of the group: "**GSOC Missoula Floods Tour 2000 - arm-wavers and detailers.**"

Photo of pillow rock: "**Sleep hard tonight with a basalt pillow!**"

Photo of Taylor Hunt and Don inspecting sediment near Ellensburg: **"Note the layering, this is water-borne deposit, not aeolian, right?"**

The girls are crying, **"Fresh salmon, two dollars a pound!"**

After the Flood

Geologist James Gilluly was extremely critical of Harlan Bretz' interpretations until he saw the region for himself. Then he was heard to mutter, "How could anyone have been so wrong?"

A glacier once 'neath its collar got hot
And out o'er the scablands a mighty flood shot.
Now truly, Gilluly, t'will fool ye,
For Bretz has been there and he says there is not
A shadow of doubt what occurred on that spot.
'Tis true, it has Jim Gilluly's goat got.
But speaks he not truly, Gilluly?

Source: Michael Parfit, "The Floods That Carved the West" in 4/95 Smithsonian magazine; author of the poem is anonymous.

Evelyn Pratt

Editor's Note:
We'll have lots more about the trip in subsequent newsletters – keep tuned!

Also, for more info, attend Past President Don Barr's presentation at the Central Library (see schedule).

-WANTED-
-FIELD TRIP ASSISTANTS-

Taylor Hunt, acting Field Trip Chairperson, is developing about 24 local fieldtrips which can be changed and/or updated as needed. He could use help in developing itinerary and trip logs for these and ideas for other day trips. He would also like for someone to help organize and review this information and possibly lead some of these trips in the future. Please contact Taylor Hunt at (503) 662-4790 if you have time to assist or a desire to learn more about the Northwest. **THANKS!**

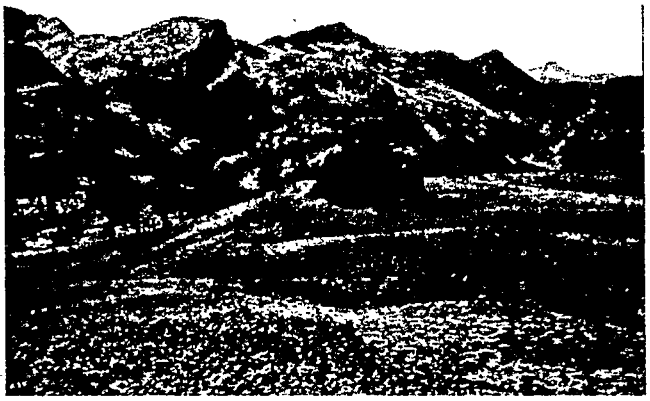
HOSPITALITY – Help Needed!!!

Tom Gordon has graciously accepted the Refreshments Chairperson role for our Friday evening meetings. **Thank you, Tom!**

This is a really important job if you like cookies and a beverage along with stimulating conversation. If **YOU COULD HELP** by opening up the room and setting up coffee pot, creamer, etc, about 7:15 pm, and/or bringing some sort of cookies or munchies, please contact Tom Gordon at (360) 835-7748. **Thanks!**

PS – I may **help** have to keep posting **out** these (not subliminal) messages until we get **RATS!** some response!!!!

GEOLOGICAL SNAPSHOTS



This field of what appears to be volcanic ash is perched at the crest of the Wallowa Mountains. This photo was taken near Hummingbird Mountain.

"The Wallowa Mountains…began as a mass of continental-shelf and ocean floor sediments scraped off onto the edge of the continent about 200 million years ago, quite early in the sequence of geologic events that make Oregon. A large mass of granite intruded those rocks about 150 million years ago and now makes the resistant core of the higher parts of the range." – from Alt, David, and Hyndman, Donald, Roadside Geology of Oregon, Montana Press Publishing Co., 1989.

Submitted by John Hasenberg

WEB TEASERS

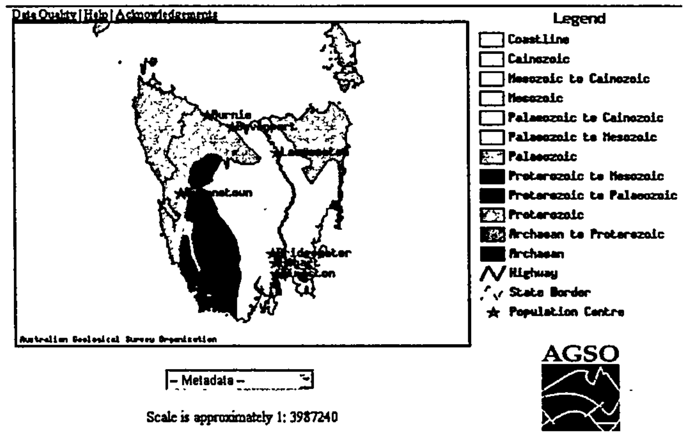
Check out this web site for the Portland State University Department of Geology:
http://www.geol.pdx.edu/

Get ready for the October Friday evening meeting!

Enjoy the Y2K Olympics? Visit the website for the Australian Geological Survey Organisation (yes, that IS spelled correctly), the national geoscientific research and information agency of Australia at:
http://www.agso.gov.au/

Website has online geological maps, data, and links to other organizations.

Here is a map sample for Tasmania:



Also check out the Geological Society of Australia, Inc.:
http://www.gsa.org.au/

Website has links, publications, education, and more!

THE GEOLOGICAL NEWSLETTER

GSOC

OCTOBER 2000

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THE GEOLOGICAL NEWSLETTER

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Evelyn Pratt - 223-2601

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PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm. 371, 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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TRIP LOGS: Write to the same address for names and price list.
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THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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Children under age 18______________________________

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Geologic Interests and Hobbies______________________________
____

Please indicate Membership type and include check for appropriate amount:
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GEOLOGICAL NEWSLETTER

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VISITORS WELCOME AT ALL MEETINGS
INFORMATION: www.gsoc.org *or* gsoc@teleport.com
Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

VOL. 66, No. 10
OCTOBER 2000

OCTOBER ACTIVITIES

Fri. Oct. 6, 12:00-1:30 PM: Glacial Lake Missoula Floods Don Barr, Past President. Central Library, 801 SW 10th St.

Fri. Oct. 13, 8:00 PM: Guided Tour: PSU's Geology Dept. Laboratories and Equipment. Introduction by Michael L. Cummings, PSU Professor of Geology Rm. 371 Cramer Hall, PSU, 1721 SW Broadway.

Seminars: Your special interest? Ideas wanted! Time: January through May or June. Evelyn Pratt, 503-223-2601, and Richard Bartels, 503-292-6939.

****

Field Trip: Nov. 4 The Non-boring Boring Volcanoes. Find out what Mt. Sylvania, Mt. Tabor, and Larch Mt. have in common, and what their curious association is with much-older Troutdale Formation. Meet at PCC Sylvania, 12000 SW 49th Ave. parking lot, 8:30 AM for signup, handout, orientation & carpooling. Depart before 9:30 AM; no-host lunch at budget restaurant; end near Troutdale 4:00 PM. Leader Clay Kelleher, 503-775-6263, or e-mail ClayKelleher@cs.com.

Preview of Coming Attractions:

Mon. Nov. 6, 12-1:30 PM: The Ever-changing Coastline of the Pacific Northwest Evelyn Pratt, past president Central Library, 801 SW 10th St.

Fri. Nov. 10, 8:00 PM: The Case of the Disappearing Bridge: Some observations on the Eliot Branch Debris Flow of Nov. 25, 1999, in the Northern Oregon Cascade Range. Chris Hedeen, M.S. in Geology and Instructor of Earth Science, Lakeridge H.S., Lake

---

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601; or e-mail folkdans@aol.com.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Carl Fullman
Jerome Fulton
Al and Trudi Kempin
Pamela Parks
Teresa Coleman

VOLCANIC VOCABULARY

From the USGS Cascades Volcano Observatory website:
http://vulcan.wr.usgs.gov
Definitions from Tilling, 1985, Volcanoes: USGS General Interest Publication except as noted.

Calderas

The largest and most explosive volcanic eruptions eject tens to hundreds of cubic kilometers of magma onto the Earth's surface. When such a large volume of magma is removed from beneath a volcano, the ground subsides or collapses into the emptied space, to form a huge depression called a caldera. Some calderas are more than 25 kilometers in diameter and several kilometers deep.
From: Brantley, 1994, Volcanoes of the United States: USGS General Interest Publication

Cinder Cones and Scoria Cones

Cinder cones are the simplest type of volcano. They are built from particles and blobs of congealed lava ejected from a single vent. As the gas-charged lava is blown violently into the air, it breaks into small fragments that solidify and fall as cinders around the vent to form a circular or oval cone. Most cinder cones have a bowl-shaped crater at the summit and rarely rise more than a thousand feet or so above their surroundings. Cinder cones are numerous in western North America as well as throughout other volcanic terrains of the world.

Composite Volcanoes and Stratovolcanoes

Some of the Earth's grandest mountains are composite volcanoes -- sometimes called stratovolcanoes. They are typically steep-sided, symmetrical cones of large dimension built of alternating layers of lava flows, volcanic ash, cinders, blocks, and bombs and may rise as much as 8,000 feet above their bases. Some of the most conspicuous and beautiful mountains in the world are composite volcanoes, including Mount Fuji in Japan, Mount Cotopaxi in Ecuador, Mount Shasta in California, Mount Hood in Oregon, Mount St. Helens and Mount Rainier in Washington. Most composite volcanoes have a crater at the summit, which contains a central vent or a clustered group of vents. Lavas either flow through breaks in the crater wall or issue from fissures on the flanks of the cone. Lava, solidified within the fissures, forms dikes that act as ribs which greatly strengthen the cone. The essential feature of a composite volcano is a conduit system through which magma from a reservoir deep in the Earth's crust rises to the surface. The volcano is built up by the accumulation of material erupted through the conduit and increases in size as lava, cinders, ash, etc., are added to its slopes. Composite volcanoes tend to erupt explosively and pose considerable danger to nearby life and property.
From: Tilling, Topinka, and Swanson, 1990, Eruptions of Mount St. Helens: Past, Present, and Future: USGS General Interest Publication

Shield Volcanoes

Shield volcanoes are built almost entirely of fluid lava flows. Flow after flow pours out in all directions from a central summit vent, or group of vents, building a broad, gently sloping cone of flat, domical shape, with a profile much like that of a warrior's shield. They are built up slowly by the accretion of thousands of flows of highly fluid basaltic (from basalt, a hard, dense dark volcanic rock) lava that spread widely over great distances, and then cool as thin, gently dipping sheets. Lavas also commonly erupt from vents along fractures (rift zones) that develop on the flanks of the cone. Some of the largest volcanoes in the world are shield volcanoes. In northern California and Oregon, many shield volcanoes have diameters of 3 or 4 miles and heights of 1,500 to 2,000 feet. The Hawaiian Islands are composed of linear chains of these volcanoes including Kilauea and Mauna Loa on the island of Hawaii -- two of the world's most active volcanoes. The floor of the ocean is more than 15,000 feet deep at the bases of the islands. As Mauna Loa, the largest of the shield volcanoes (and also the world's largest active volcano), projects 13,677 feet above sea level, its top is over 28,000 feet above the deep ocean floor.

Lava Plateaus

In some shield-volcano eruptions, basaltic lava pours out quietly from long fissures instead of central vents and floods the surrounding countryside with lava flow upon lava flow, forming broad plateaus. Lava plateaus of this type can be seen in Iceland, southeastern Washington, eastern Oregon, and southern Idaho.

Submarine Volcanoes, Ridges, and Vents

Submarine volcanoes and volcanic vents are common features on certain zones of the ocean floor. Some are active at the present time and, in shallow water, disclose their presence by blasting steam and rock-debris high above the surface of the sea. Many others lie at such great depths that the tremendous weight of the water above them results in high, confining pressure and prevents the formation and explosive release of steam and gases. Even very large, deepwater eruptions may not disturb the ocean surface.

Lava Domes

Lava (usually dacite or rhyolite) that is too sticky to flow far from its vent forms steep-sided mounds called lava domes.
Wright and Pierson, 1992, USGS Circular 1973

Maars and Tuff Cones

Also called "tuff cones", maars are shallow, flat-floored craters that scientists interpret have formed above diatremes as a result of a violent expansion of magmatic gas or steam; deep erosion of a maar presumably would expose a diatreme. Maars range in size from 200 to 6,500 feet across and from 30 to 650 feet deep, and most are commonly filled with water to form natural lakes. Most maars have low rims composed of a mixture of loose fragments of volcanic rocks and rocks torn from the walls of the diatreme.

Monogenetic Volcanic Fields

Composite volcanoes erupt episodically over tens to hundreds of thousand of years and can display a wide range of eruption styles. Monogenetic volcanoes typically erupt for only brief time intervals weeks to perhaps centuries and generally display a narrower range in eruptive behavior. Most monogenetic volcanoes are basaltic in composition but a few are of andesite and dacite composition; that is, with a relatively higher silica content.
From: Walder, et.al. 1999, Volcano Hazards in the Mount Jefferson Region, Oregon: USGS Open-File Report 99-24.

Monogenetic volcanic fields are collections of cinder cones, and/or Maar vents and associated lava flows and pyroclastic deposits. Sometimes a stratovolcano is at the center of the field.
From: Wood and Kienle, 1990, Volcanoes of North America: United States and Canada: Cambridge University Press, 354p.

Tuyas

A volcano formed under a glacier.

"Island-Arc" Volcanoes

In a typical "island-arc" environment, volcanoes lie along the crest of an arcuate, crustal ridge bounded on its convex side by a deep oceanic trench. The granite or granite-like layer of the continental crust extends beneath the ridge to the vicinity of the trench. Basaltic magmas, generated in the mantle beneath the ridge, rise along fractures through the granitic layer. These magmas commonly will be modified or changed in composition during passage through the granitic layer and erupt on the surface to form volcanoes built largely of non-basaltic rocks.

"Oceanic" Volcanoes

In a typical "oceanic" environment, volcanoes are aligned along the crest of a broad ridge that marks an active fracture system in the oceanic crust. Basaltic magmas, generated in the upper mantle beneath the ridge, rise along fractures through the basaltic layer. Because the granitic crustal layer is absent, the magmas are not appreciably modified or changed in composition and they erupt on the surface to form basaltic volcanoes.

"Continental" Volcanoes

In the typical "continental" environment, volcanoes are located in unstable, mountainous belts that have thick roots of granite or granite-like rock. Magmas, generated near the base of the mountain root, rise slowly or intermittently along fractures in the crust. During passage through the granite layer, magmas are commonly modified or changed in composition and erupt on the surface to form volcanoes constructed of non-basaltic rocks.

SNEAK PREVIEW

Pictures from the Ice Age Floods field trip submitted by Duane Diller:

Photo of the group: "**GSOC Missoula Floods Tour 2000 - arm-wavers and detailers.**"

Photo of pillow rock: "**Sleep hard tonight with a basalt pillow!**"

Photo of Taylor Hunt and Don inspecting sediment near Ellensburg: **"Note the layering, this is water-borne deposit, not aeolian, right?"**

The girls are crying, **"Fresh salmon, two dollars a pound!"**

After the Flood

Geologist James Gilluly was extremely critical of Harlan Bretz' interpretations until he saw the region for himself. Then he was heard to mutter, "How could anyone have been so wrong?"

A glacier once 'neath its collar got hot
And out o'er the scablands a mighty flood shot.
Now truly, Gilluly, t'will fool ye,
For Bretz has been there and he says there is not
A shadow of doubt what occurred on that spot.
'Tis true, it has Jim Gilluly's goat got.
But speaks he not truly, Gilluly?

Source: Michael Parfit, "The Floods That Carved the West" in 4/95 Smithsonian magazine; author of the poem is anonymous.

Evelyn Pratt

Editor's Note:
We'll have lots more about the trip in subsequent newsletters – keep tuned!

Also, for more info, attend Past President Don Barr's presentation at the Central Library (see schedule).

-WANTED-
-FIELD TRIP ASSISTANTS-

Taylor Hunt, acting Field Trip Chairperson, is developing about 24 local fieldtrips which can be changed and/or updated as needed. He could use help in developing itinerary and trip logs for these and ideas for other day trips. He would also like for someone to help organize and review this information and possibly lead some of these trips in the future. Please contact Taylor Hunt at (503) 662-4790 if you have time to assist or a desire to learn more about the Northwest. **THANKS**!

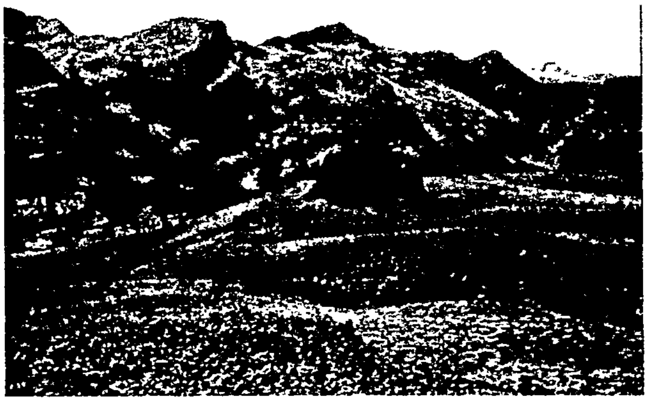
HOSPITALITY – Help Needed!!!

Tom Gordon has graciously accepted the Refreshments Chairperson role for our Friday evening meetings. **Thank you, Tom!**

This is a really important job if you like cookies and a beverage along with stimulating conversation. If **YOU COULD HELP** by opening up the room and setting up coffee pot, creamer, etc, about 7:15 pm, and/or bringing some sort of cookies or munchies, please contact Tom Gordon at (360) 835-7748. **Thanks!**

PS – I may **help** have to keep posting **out** these (not subliminal) messages until we get **RATS!** some response!!!!

GEOLOGICAL SNAPSHOTS



This field of what appears to be volcanic ash is perched at the crest of the Wallowa Mountains. This photo was taken near Hummingbird Mountain.

"The Wallowa Mountains…began as a mass of continental-shelf and ocean floor sediments scraped off onto the edge of the continent about 200 million years ago, quite early in the sequence of geologic events that make Oregon. A large mass of granite intruded those rocks about 150 million years ago and now makes the resistant core of the higher parts of the range." – from Alt, David, and Hyndman, Donald, Roadside Geology of Oregon, Montana Press Publishing Co., 1989.

Submitted by John Hasenberg.

WEB TEASERS

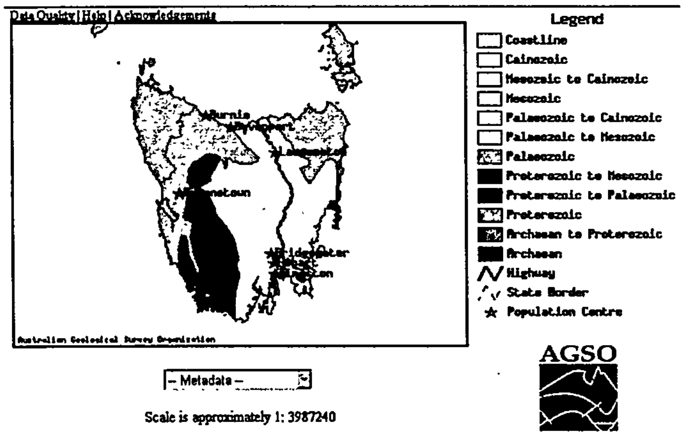
Check out this web site for the Portland State University Department of Geology:
http://www.geol.pdx.edu/

Get ready for the October Friday evening meeting!

Enjoy the Y2K Olympics? Visit the website for the Australian Geological Survey Organisation (yes, that IS spelled correctly), the national geoscientific research and information agency of Australia at:
http://www.agso.gov.au/

Website has online geological maps, data, and links to other organizations.

Here is a map sample for Tasmania:



Also check out the Geological Society of Australia, Inc.:
http://www.gsa.org.au/

Website has links, publications, education, and more!

THE GEOLOGICAL NEWSLETTER

GSOC

NOVEMBER 2000

GEOLOGICAL SOCIETY
OF THE OREGON
COUNTRY
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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

SINCE 1935

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Calendar:
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VOL. 66, No. 11
NOVEMBER 2000

NOVEMBER ACTIVITIES

Mon. Nov. 6, 12-1:30 PM: Pyramid Lake Tofu Formations Ray Crowe, President
Central Library, 801 SW 10th St.

Fri. Nov. 10, 8:00 PM: The Case of the Disappearing Bridge: Some observations on the Eliot Branch Debris Flow of Nov. 25, 1999, in the Northern Oregon Cascade Range. Chris Hedeen, M.S. in Geology, Instructor of Earth Science, Lakeridge H. S.

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Preview of Coming Attractions:
Mon. Dec. 4, noon-1:30 PM: Origins and Features of Lava Caves Tom Kline
Central Library, 801 SW 10th St.
Family Field trip: Thursday, Dec. 28: Where can we find FOSSILS on buildings? Why do sidewalks sparkle? Come and bring the kids for a great tour of downtown Portland with Taylor Hunt!

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601; or e-mail folkdans@aol.com.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Jeff Hartnett
Linda Wilson
Art and Beth Johnstone

COMPLETELY FRACTURED GEOLOGY

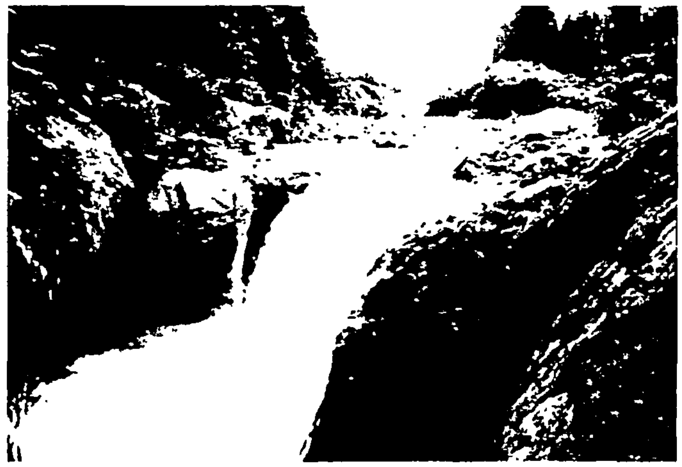
From Sept. 2000 President's Field Trip, compiled by E. Pratt

1. **Plunging anticline:** When our dear aunt, Mrs. Cline, fell over a cliff, we sadly waved goodbye to our plunging Auntie Cline. Rosemary Kenney
2. **Erratics:** A rock group from Oregon and Washington that makes frequent pit stops - gravel, that is. Louise Tolle
3. **Diabase:** The disease that made my Uncle Fred cut down on sugar. anonymous
4. **Scabland:** (1) union-busting territory (2) healing surface of a lava flow. Taylor Hunt
5. **Channeled scabland**: (1) cracked and infected **Scabland**: (2) the routes taken by non-strikers when the union is striking. Fran Pearson
6. **Mylonite:** For good health, you should walk a mylonite. Jean Hunt
7. **Craton:** The weight of a big box of rocks after a geology trip. Fran Pearson et al
8. **Granitic intrusion:** (1) when Granny catches you in the act [whose?] (2) unfriendly party crasher. Elaine Weinberg
9. **Playa:** A scissor-like device in a tool box. Ken Yost
10. **Dip fault:** when a potato chip breaks in the guacamole. Don Gedney

To be continued. Apologies to anyone that I didn't credit correctly - let me know!
Correct definitions on Page 58.

SCENES FROM THE SOUTH SIDE

These pictures are taken by Taylor Hunt on the July 8 field trip to the south side of Mt. St. Helens:



Muddy Creek in Lava Canyon –
This area was buried under tens of feet of gravel prior to the May 18, 1980 eruption. Rock on left side is 25 Ma. Skamania highly altered rock – rock on right side is Mt. St. Helens basaltic andesite. The creek flows down contact of both formations. Note large boulder wedged in the chute.

column tops

Here Muddy Creek crosses Mt. St. Helens flow to reach opposite side and create 50 foot waterfall between outcrops of Eocene altered basalt. Notice top of columns of basalt which indicate that before re-exposure, the entablature had been worn away. The bridge goes to the "deck of cards" formation.

columnar basalt

Muddy Creek at Lower Canyon –
This shot shows columnar basalt as reverse topography (the tall columns on the left once filled a depressed area), creek fill, Eocene altered basalt on both sides of the creek.

Lower Canyon where erosion has exposed at least five different canyon creations exposed by May 18, 1980 eruption. View is towards Pine Creek drainage.

-WANTED-
-FIELD TRIP ASSISTANTS-

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PS – I may have to keep posting these messages until we get some response!!!!

Members of this year's Nominating Committee were selected at the October 6, 2000 Board Meeting. They are Richard Bartels, Chairman, Don Barr, and Rosemary Kenney. Our thanks to members of the Nominating Committee!

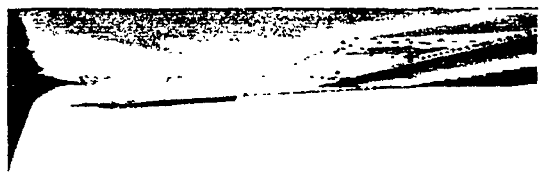
SCABLANDS FROM THE AIR

Once again, these were taken by Taylor Hunt from the Ice Age Floods field trip:

Frenchman Hills Coulee and Scablands Cascade –
Note the expansion bar on the delta of gravel along the bank at the top of the photo. An expansion bar is created by a widening of a stream channel, where the speed of the fluid decreases, and sediment is dropped.

Frenchman Hills "Dry Falls" -
Scabland occurs on both sides of this feature. The smoother area in the center of the photo is an expansion bar of gravel with ripple marks. Note also the lineation in the eroded basalt. Dark patches are part of the airplane.

Potholes Area, Moses Lake Wash –
Vegetated, dry and flooded barchan sand dunes (crescent-shaped dune whose long axis is transverse to the dominant wind direction) can be seen in this photo. Water table rose and filled depressions when O'Sullivan Dam was created.



Potholes Reservoir –
Flooded in the early 1950's by excess water from fields watered by Grand Coulee and Banks Lake Project.

Drumheller Channels below O'Sullivan Dam

WEB TEASERS

Scablands from Space!!! This is a LANDSAT photo of eastern Washington from space:

for more info, see this website:
http://daac.gsfc.nasa.gov/DAAC_DOCS/geomorphology/GEO_4/GEO_PLATE_F-27.HTML
Geomorphology from Space is an out of print 1986 NASA publication edited by Nicholas M. Short, Sr. and Robert W. Blair, Jr. designed for use by the remote sensing science and educational communities to study landforms and landscapes. The core of this book is a gallery of space imagery consisting of 237 plates, each treating a geographic region where a particular landform theme is exemplified. Commentary, photographs, locator maps, and sometimes a geologic map accompany each plate.

Another good website that explains fluvial processes:
http://www.geog.ouc.bc.ca/physgeog/contents/11i.html

COMPLETELY FRACTURED GEOLOGY

Correct definitions adapted from AGI Dictionary of Geological Terms, 3rd Ed., Bates & Jackson, by E. Pratt

1. **Plunging anticline:** a convex-upward fold with a core of older rocks, one end of which dives downward.
2. **Erratics:** rock fragments carried by glacial ice and deposited at some distance from the outcrop from which they were derived.
3. **Diabase:** an intrusive rock consisting of labradorite and pyroxene, including plagioclase feldspar crystals in the shape of thin strips.
4. **Scabland:** an upland area underlain by flat-lying basalt flows and scoured by floods, with a thin soil cover and sparse vegetation.
5. **Channeled scabland:** as above, with deep dry channels scoured into the surface by floods.
6. **Mylonite:** a cherty rock with streaky or banded structure; microbreccia with flow texture.
7. **Craton:** a part of the earth's crust that has been stable and little deformed for a long time; refers to continents.
8. **Granitic intrusion:** an igneous rock mass formed by high-silica magma being emplaced in a pre-existing rock.
9. **Playa:** a dry, barren area in the lowest part of an undrained desert basin, often marked by a seasonal lake, and underlain by fine sediments and commonly by soluble salts.
10. **Dip fault:** a fault that parallels the dip of the strata involved.

GEOLOGICAL SNAPSHOTS

Forest Fires and other "natural disasters" can be agents of geological change:

In case you haven't already heard it, here's the story behind the Fire in the Bitterroots picture that I sent awhile back. Quoting from an Associated Press release:
"MISSOULA, Mont. - The picture is both frightening and beautiful - two elk standing in a river at night, as a mountainside of flame rises behind them. The photo, with no credit line, made its way into cyberspace. It now anchors the online photo gallery of the National Interagency Fire Center and has been e-mailed around the country. The identity of the photographer and details of the blaze, however, seemed lost, until a Montana newspaper tracked him down. 'I just happened to be in the right place at the right time,' fire behavior analyst John McColgan told the Missoulian newspaper Thursday from his home in Fairbanks, Alaska. 'I've been doing this for 20 years and it ranks in the top three days of fire behavior I've seen.'
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Submitted by Charles A. 'Cap' Pearson

THE GEOLOGICAL NEWSLETTER

GSOC

NOVEMBER 2000

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GSOC LIBRARY: Rm. S7, Open 7:30 p.m. prior to meetings.
PROGRAMS: EVENING: Second Friday Evening each month, 8:00 p.m., Rm. 371, 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: 503/235-5158 or 503/892-6514.
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Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

VOL. 66, No. 11
NOVEMBER 2000

NOVEMBER ACTIVITIES

Mon. Nov. 6, 12-1:30 PM: Pyramid Lake Tofu Formations Ray Crowe, President
Central Library, 801 SW 10th St.

Fri. Nov. 10, 8:00 PM: The Case of the Disappearing Bridge: Some observations on the Eliot Branch Debris Flow of Nov. 25, 1999, in the Northern Oregon Cascade Range. Chris Hedeen, M.S. in Geology, Instructor of Earth Science, Lakeridge H. S.

▪▪

Seminars: Your special interest? Ideas wanted! Time: January through May or June. Evelyn Pratt, 503-223-2601, and Richard Bartels, 503-292-6939.

****

Field Trip: Nov. 4 The Non-boring Boring Volcanoes. Find out what Mt. Sylvania, Mt. Tabor, and Larch Mt. have in common, and what their curious association is with much-older Troutdale Formation. Meet at PCC Sylvania, 12000 SW 49th Ave. parking lot, 8:30 AM for signup, handout, orientation & carpooling. Depart before 9:30 AM; no-host lunch at budget restaurant; end near Troutdale 4:00 PM. Leader Clay Kelleher, 503-775-6263, or e-mail ClayKelleher@cs.com.

▪▪

Preview of Coming Attractions:
Mon. Dec. 4, noon-1:30 PM: Origins and Features of Lava Caves Tom Kline
Central Library, 801 SW 10th St.
Family Field trip: Thursday, Dec. 28: Where can we find FOSSILS on buildings? Why do sidewalks sparkle? Come and bring the kids for a great tour of downtown Portland with Taylor Hunt!

▪▪

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601; or e-mail folkdans@aol.com.

WELCOME

We welcome the following new members to the Geological Society of the Oregon Country

Jeff Hartnett
Linda Wilson
Art and Beth Johnstone

COMPLETELY FRACTURED GEOLOGY

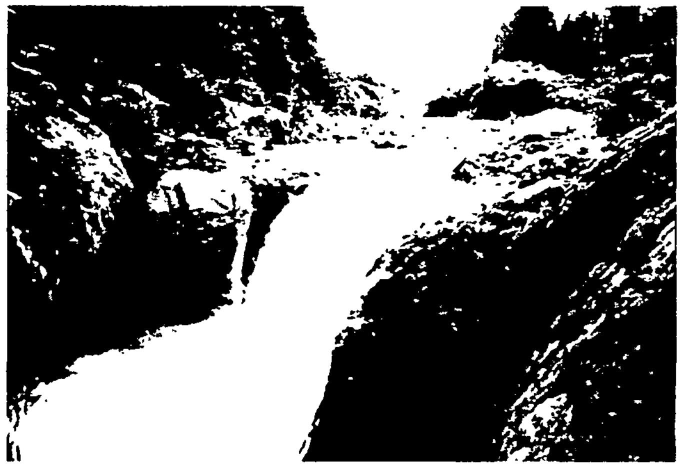
From Sept. 2000 President's Field Trip, compiled by E. Pratt

1. **Plunging anticline:** When our dear aunt, Mrs. Cline, fell over a cliff, we sadly waved goodbye to our plunging Auntie Cline. Rosemary Kenney
2. **Erratics:** A rock group from Oregon and Washington that makes frequent pit stops - gravel, that is. Louise Tolle
3. **Diabase:** The disease that made my Uncle Fred cut down on sugar. anonymous
4. **Scabland:** (1) union-busting territory (2) healing surface of a lava flow. Taylor Hunt
5. **Channeled scabland**: (1) cracked and infected **Scabland**: (2) the routes taken by non-strikers when the union is striking. Fran Pearson
6. **Mylonite:** For good health, you should walk a mylonite. Jean Hunt
7. **Craton:** The weight of a big box of rocks after a geology trip. Fran Pearson et al
8. **Granitic intrusion:** (1) when Granny catches you in the act [whose?] (2) unfriendly party crasher. Elaine Weinberg
9. **Playa:** A scissor-like device in a tool box. Ken Yost
10. **Dip fault:** when a potato chip breaks in the guacamole. Don Gedney

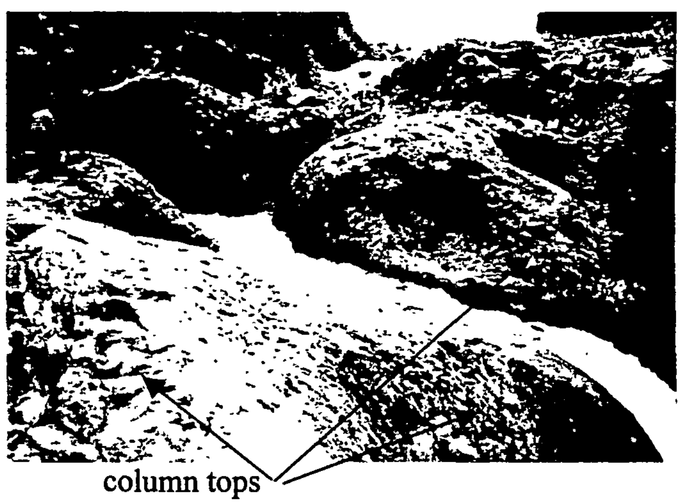
To be continued. Apologies to anyone that I didn't credit correctly - let me know!
Correct definitions on Page 58.

SCENES FROM THE SOUTH SIDE

These pictures are taken by Taylor Hunt on the July 8 field trip to the south side of Mt. St. Helens:



Muddy Creek in Lava Canyon –
This area was buried under tens of feet of gravel prior to the May 18, 1980 eruption. Rock on left side is 25 Ma. Skamania highly altered rock – rock on right side is Mt. St. Helens basaltic andesite. The creek flows down contact of both formations. Note large boulder wedged in the chute.



Here Muddy Creek crosses Mt. St. Helens flow to reach opposite side and create 50 foot waterfall between outcrops of Eocene altered basalt. Notice top of columns of basalt which indicate that before re-exposure, the entablature had been worn away. The bridge goes to the "deck of cards" formation.

columnar basalt

Muddy Creek at Lower Canyon –
This shot shows columnar basalt as reverse topography (the tall columns on the left once filled a depressed area), creek fill, Eocene altered basalt on both sides of the creek.

Lower Canyon where erosion has exposed at least five different canyon creations exposed by May 18, 1980 eruption. View is towards Pine Creek drainage.

-WANTED-
-FIELD TRIP ASSISTANTS-

Taylor Hunt, acting Field Trip Chairperson, is developing about 24 local fieldtrips which can be changed and/or updated as needed. He could use help in developing itinerary and trip logs for these and ideas for other day trips. He would also like for someone to help organize and review this information and possibly lead some of these trips in the future. Please contact Taylor Hunt at (503) 662-4790 if you have time to assist or a desire to learn more about the Northwest. **THANKS**!

HOSPITALITY – Help Needed!!!

Tom Gordon has graciously accepted the Refreshments Chairperson role for our Friday evening meetings. **Thank you, Tom!**

This is a really important job if you like cookies and a beverage along with stimulating conversation. If **YOU COULD HELP** by opening up the room and setting up coffee pot, creamer, etc, about 7:15 pm, and/or bringing some sort of cookies or munchies, please contact Tom Gordon at (360) 835-7748. **Thanks!**

PS – I may have to keep posting these messages until we get some response!!!!

Members of this year's Nominating Committee were selected at the October 6, 2000 Board Meeting. They are Richard Bartels, Chairman, Don Barr, and Rosemary Kenney. Our thanks to members of the Nominating Committee!

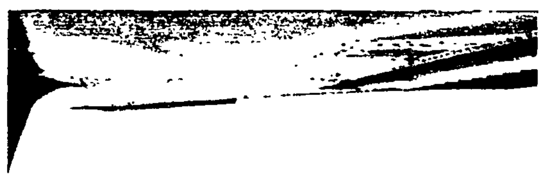
SCABLANDS FROM THE AIR

Once again, these were taken by Taylor Hunt from the Ice Age Floods field trip:

Frenchman Hills Coulee and Scablands Cascade –
Note the expansion bar on the delta of gravel along the bank at the top of the photo. An expansion bar is created by a widening of a stream channel, where the speed of the fluid decreases, and sediment is dropped.

Frenchman Hills "Dry Falls" -
Scabland occurs on both sides of this feature. The smoother area in the center of the photo is an expansion bar of gravel with ripple marks. Note also the lineation in the eroded basalt. Dark patches are part of the airplane.

Potholes Area, Moses Lake Wash –
Vegetated, dry and flooded barchan sand dunes (crescent-shaped dune whose long axis is transverse to the dominant wind direction) can be seen in this photo. Water table rose and filled depressions when O'Sullivan Dam was created.



Potholes Reservoir –
Flooded in the early 1950's by excess water from fields watered by Grand Coulee and Banks Lake Project.

Drumheller Channels below O'Sullivan Dam

WEB TEASERS

Scablands from Space!!! This is a LANDSAT photo of eastern Washington from space:

for more info, see this website:
http://daac.gsfc.nasa.gov/DAAC_DOCS/geomorphology/GEO_4/GEO_PLATE_F-27.HTML
Geomorphology from Space is an out of print 1986 NASA publication edited by Nicholas M. Short, Sr. and Robert W. Blair, Jr. designed for use by the remote sensing science and educational communities to study landforms and landscapes. The core of this book is a gallery of space imagery consisting of 237 plates, each treating a geographic region where a particular landform theme is exemplified. Commentary, photographs, locator maps, and sometimes a geologic map accompany each plate.

Another good website that explains fluvial processes:
http://www.geog.ouc.bc.ca/physgeog/contents/11i.html

COMPLETELY FRACTURED GEOLOGY

Correct definitions adapted from AGI Dictionary of Geological Terms, 3rd Ed., Bates & Jackson, by E. Pratt

1. **Plunging anticline:** a convex-upward fold with a core of older rocks, one end of which dives downward.
2. **Erratics:** rock fragments carried by glacial ice and deposited at some distance from the outcrop from which they were derived.
3. **Diabase:** an intrusive rock consisting of labradorite and pyroxene, including plagioclase feldspar crystals in the shape of thin strips.
4. **Scabland:** an upland area underlain by flat-lying basalt flows and scoured by floods, with a thin soil cover and sparse vegetation.
5. **Channeled scabland:** as above, with deep dry channels scoured into the surface by floods.
6. **Mylonite:** a cherty rock with streaky or banded structure; microbreccia with flow texture.
7. **Craton:** a part of the earth's crust that has been stable and little deformed for a long time; refers to continents.
8. **Granitic intrusion:** an igneous rock mass formed by high-silica magma being emplaced in a pre-existing rock.
9. **Playa:** a dry, barren area in the lowest part of an undrained desert basin, often marked by a seasonal lake, and underlain by fine sediments and commonly by soluble salts.
10. **Dip fault:** a fault that parallels the dip of the strata involved.

GEOLOGICAL SNAPSHOTS

Forest Fires and other "natural disasters" can be agents of geological change:

In case you haven't already heard it, here's the story behind the Fire in the Bitterroots picture that I sent awhile back. Quoting from an Associated Press release:
"MISSOULA, Mont. - The picture is both frightening and beautiful - two elk standing in a river at night, as a mountainside of flame rises behind them. The photo, with no credit line, made its way into cyberspace. It now anchors the online photo gallery of the National Interagency Fire Center and has been e-mailed around the country. The identity of the photographer and details of the blaze, however, seemed lost, until a Montana newspaper tracked him down. 'I just happened to be in the right place at the right time,' fire behavior analyst John McColgan told the Missoulian newspaper Thursday from his home in Fairbanks, Alaska. 'I've been doing this for 20 years and it ranks in the top three days of fire behavior I've seen.'
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VOL. 66, No. 12
DECEMBER 2000

DECEMBER ACTIVITIES

Monday Dec. 4, noon-1:30 PM: Origins and Features of Lava Caves. Tom Kline, National Speleological Society member & photographer.
Central Library, 801 SW 10th St., Portland. ***MondayMondayMonday!!!***

Fri. Dec. 8, 8:00 PM: The Crater Lake Bathymetry Project. Edward P. Klimasauskas, Public Information Scientist, Cascades Volcano Observatory.
Rm. 371, CramerHall. PSU, 1721 SW Broadway, Portland.

Seminars: Time: January - May or June. Probable topic: General geology of GSOC field trip destinations. Richard Bartels, 503-292-6939, & Evelyn Pratt, 503-223-2601.

****

Family Field trip: Thursday, Dec. 28: The Gneiss (Nice) Rocks of Portland Buildings, or What Makes Bricks Red? Bring the kids for a great tour of downtown Portland with Taylor Hunt! For details, call him at 503-662-4790.

****

Preview of Coming Attractions:
Fri. Jan. 5, 12-1:30 PM: Geology of the Canadian Rockies. Linda Wilson, GSOC.
Fri. Jan. 12, 8:00 PM: Microbial Biosignatures at Life's Upper Temperature Limit.
Sherry L. Cady, Asst. Professor, Geology Dept., PSU. This talk will appeal to anyone interested in when, where, and how life on earth began.
Field Trip: Sat. 1/27: Taylor Hunt will take us to Missoula Flood scablands and quarries in the Sherwood area.

****

IF BAD WEATHER CLOSES CITY'S SCHOOLS, WE CANCEL GSOC MEETINGS!

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.

(Ray Crowe: "'Tofu Towers' - a Chinese restaurant?" Apologies for Nov. typo! EP)

WELCOME

We welcome the following new member to the Geological Society of the Oregon Country

Susan Ikeda

COMPLETELY FRACTURED GEOLOGY

By GSOC members traveling on Missoula Floods President's Field Trip

1. **Migmatite**: a close-together pattern flown by Russian fighter planes (Fran Pearson)
2. **Rhythmite:** (1) name of a barbershop quartet (Duane Diller) (b) 5 GSOC members who harmonize (Taylor Hunt)
3. **Incise:** as in, "That fellow's a troublemaker - always trying to incise a riot." (Ken Yost)
4. **High-grade metamorphosis:** when a D student suddenly gets all A's (Archie Strong)
5. **Drumlin:** a Munchkin percussionist (Ralph Pratt)
6. **OWL:** a geologic structure which is strictly fly-by-night (John Whitmer)
7. **Caliche:** (1) litchi nuts grown in California (Rosemary Kenney) (2) a low-fat litchi nut
8. **Core complex:** the charter members of GSOC (Taylor Hunt)
9. **Belt rock:** (a) a polished natural decoration on a belt buckle (b) a girdle of rocks around the equator that holds the crust to the mantle (c) Ethel Merman singing "Blue Suede Shoes" (?)

Next month will feature donors who wish to remain anonymous - or are afraid to confess!

NW Geology Activities

Upcoming NWGS meeting of interest -
WA - December 12: Northwest Geological Society (Meeting): Orrin Pilkey (Duke University), speaking on shoreline erosion in southwestern Washington. Time/Location:5:30 (social), 6:30 (dinner), 7:30 (speech), University Plaza Hotel, NE 45th Street, Seattle, Washington (near the University of Washington). Reservations and payment required for dinner by Thursday before meeting. The public is welcome to attend(lecture is free). For more information, see the NWGS web site:
http://www.scn.org/tech/nwgs/

WEB TEASERS

NEW! On your GSOC website --
Were you folks as disappointed as I was with the way the photos turned out in the November newsletter? If so, check out the GSOC website for color versions of the pictures for the Ice Age Floods field trip. There are lots of great pictures, some new ones from Phyllis Thorne, plus an article on Day 1 by Evelyn Pratt.
Also on the website in the field trip schedule page is the Boring Lava field trip itinerary. If you did not get a chance to go, or if you went and want a copy, download the itinerary before the end of the year. Look for information or announcements for upcoming events on the website!
Check it out!
www.gsoc.org

SEVEN SIMPLIFIED STRATA

Introduction to Clay Keheller's Boring Lava field trip with embellishments from the Editor. Also references to Orr, Orr, and Baldwin, Geology of Oregon, 4th Edition, Kendall/Hunt Publishing Company, 1992.

The seven major rock units in the Portland metropolitan area are as follows:

Tos – 30 Ma. Marine sediments, exposed in Tryon Creek State Park, Sellwood, and Waverly Country Club.
Tcr - Columbia River Basalt Group flows between 16 Ma. and 12 Ma. in the Portland area (Grande Ronde, Wanapum, and Saddle Mountain formations). The Tualatin Mountains (Portland

Hills) and bedrock for east Multnomah County are composed of these basalt flows.

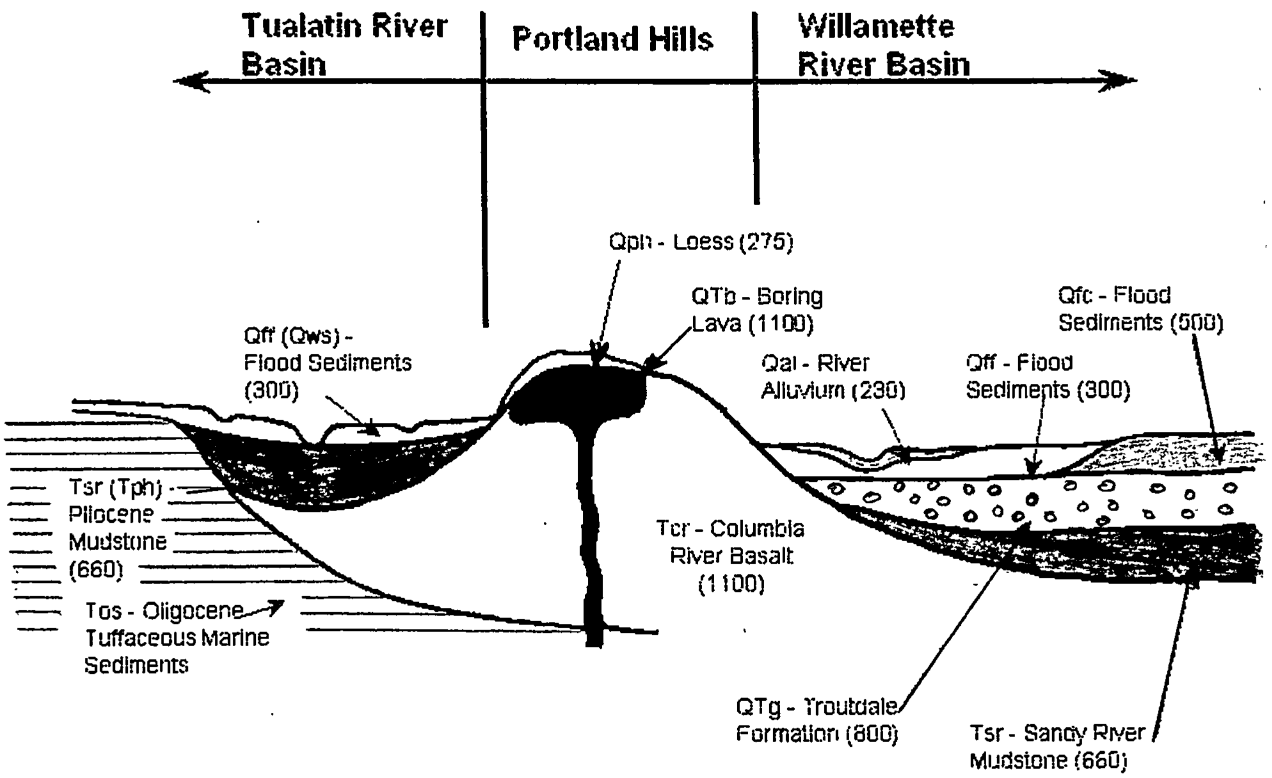
Tsr – Sandy River Mudstone from late Miocene to early Pliocene is lake and river deposited sediments created in a basin formed by the ancestral Willamette and Columbia rivers. This layer underlies the Troutdale formation in east Portland and east Multnomah County.

Tt - Troutdale formation from late Miocene and throughout Pliocene. Conglomerate composed of "well-rounded pebbles and cobbles of Columbia River Basalt and exotic volcanic, plutonic, and metamorphic rocks". These deposits are from the ancestral Columbia River due to their composition of rocks from the ancestral continental margin and associated plutonic rocks. The Springwater Formation is similar to the Troutdale formation, somewhat younger, with rock composition more local in origin.

QTb - Boring Volcanics – 3 Ma. to 250,00 a., westward younging flows of light gray to gray basaltic and basaltic andesite flows which erupted in small vents and cones to larger shield volcanoes. Larch Mountain, Mt. Sylvania, Rocky Butte, Mt. Tabor, Powell Butte, Mt. Scott, and many other buttes in the Portland area, especially west of the town of Boring, contain Boring lavas.

Qph – Portland Hill Silt deposited within the last 700,000 years blankets much of the Tualatin Mountains (Portland Hills). The silt is believed to be wind-blown in origin and is similar to the soil in the palouse area of southeastern Washington.

Qff/Qfc – Ice Age Flood deposits, both fine-grained and gravelly, were left by the catastrophic flooding from glacial Lake Missoula in western Montana. These deposits are 16,000 to 12,000 years in age.



Schematic Cross Section - Geology of Portland Metropolitan Area

THE NOT-SO-BORING VOLCANICS

Saturday, November 4, 2000
By Carol Hasenberg
Field Trip leader Clay Kelleher.
Look for a GSOC website feature on the Boring Volcanics field trip to be completed this winter.
For a more complete description of Boring Lava, and a location map of the vents, refer to these pages of the USGS/Cascades Volcano Observatory website:
http://vulcan.wr.usgs.gov/Volcanoes/Oregon/BoringLavaField/description_boring_lava.html

Looking out across the Willamette Basin east toward Mt. Hood from the Portland Hills, one sees a series of "bumps" starting with Mt. Tabor and Rocky Butte and continuing toward the horizon, especially ESE towards the town of Boring. They look like a series of little volcanoes, and indeed that is what they are. One might wonder if these are somehow associated with the volcanic processes which created the Cascade Mountains, or even the Columbia River basalts which erupted in the Miocene epoch.

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References:

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a large crystal in a porphyritic rock, a texture in igneous rocks in which conspicuously large crystals (phenocrysts) are imbedded in a finer-grained or glassy groundmass. "Definitions of Some of the More Common Petrographic Terms", O. Don Hermes, Department of Geology, University of Rhode Island, http://borealis.lib.uconn.edu/neld/definitions.html

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COMPLETELY FRACTURED GEOLOGY

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1. **Migmatite:** a mixed igneous and metamorphic rock
2. **Rhythmite:** one unit of a series of beds developed by a succession of sedimentary events such as massive floods
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4. **High-grade metamorphosis:** metamorphosis which occurred under conditions of high temperature and pressure
5. **Drumlin:** a long, low, streamlined hill made of till and shaped by ice flow, with its blunt end pointing toward the direction from which the ice came
6. **OWL:** acronym for Olympia-Wallowa Lineament, a fault-related feature which can be seen from space and is probably related to shearing of major tectonic plates past each other (Geology of the Pacific Northwest, by Orr & Orr)
7. **Caliche:** gravel, sand, or desert debris cemented by porous calcium carbonate, or the calcium carbonate itself
8. **Core complex:** a mass of metamorphic or igneous rock older than the layers enclosing it, which has been tectonically raised from deep in the crust to near the surface (ibid., Orr & Orr)
9. **Belt rock:** rock formed in a late Precambrian seaway between western Montana, northern Idaho, and southeastern British Columbia (ibid., Orr & Orr)

Nominating Committee Results

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

President............Sandra Adamson
Vice President............Tom Gordon
Secretary............Beverly Vogt
Treasurer............Phyllis Thorne
Director, 3 years............John Newhouse
Director, 2 years............Taylor Hunt
Director, 1 year............Archie Strong

Nominations will also be open at the December club meeting on Friday, December 8, 2000. Consent of the nominees must be secured prior to their nomination. Nominations will be closed after the December meeting. Final nominations will be published in the January newsletter. The slate of officers will be voted on and approved at the February monthly meeting.

The Nominating Committee members are Richard Bartels, Chairman, Don Barr, and Rosemary Kenney. Our thanks to the selected members and members of the Nominating Committee!

Don't forget that annual **DUES PAYMENTS** are coming up! Think about all those great member benefits for a mere annual fee of $20 (individual)!!!

THE GEOLOGICAL NEWSLETTER

GSOC

DECEMBER 2000

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

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

SINCE 1935

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

2000-2001 ADMINISTRATION
BOARD OF DIRECTORS

THE GEOLOGICAL NEWSLETTER

ACTIVITIES:

ANNUAL EVENTS: President's Field Trip—Summer or Fall; Banquet—March; Annual Meeting—February.
FIELD TRIPS: Usually one per month, by 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. 371, 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: 503/235-5158 or 503/892-6514.
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:

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.
WEBSITE: www.gsoc.org. Email address: gsoc@teleport.com.

APPLICATION FOR MEMBERSHIP-
THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Name______________________________ **Spouse**____________________
Children under age 18______________________________________

Address ______________________________ **City** ___________ **State** ___ **Zip**_______-______
Phone (____)_____-_________ **Email address**____________________

Geologic Interests and Hobbies______________________________________
____

Please indicate Membership type and include check for appropriate amount:
Individual $20.00 _________ **Family $30.00** __________ **Student $10.00** __________

Make Check Payable to: **The Geological Society of the Oregon Country**
PO Box 907
Portland, OR 97207-0907

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P.O. BOX 907, PORTLAND, OR 97207

VISITORS WELCOME AT ALL MEETINGS
INFORMATION: www.gsoc.org *or* gsoc@teleport.com
Ray Crowe, 503-640-6581 or
Evelyn Pratt, 503-223-2601

VOL. 66, No. 12
DECEMBER 2000

DECEMBER ACTIVITIES

Monday Dec. 4, noon-1:30 PM: Origins and Features of Lava Caves. Tom Kline, National Speleological Society member & photographer.
Central Library, 801 SW 10th St., Portland. ***MondayMondayMonday!!!***

Fri. Dec. 8, 8:00 PM: The Crater Lake Bathymetry Project. Edward P. Klimasauskas, Public Information Scientist, Cascades Volcano Observatory.
Rm. 371, CramerHall. PSU, 1721 SW Broadway, Portland.

Seminars: Time: January - May or June. Probable topic: General geology of GSOC field trip destinations. Richard Bartels, 503-292-6939, & Evelyn Pratt, 503-223-2601.

****

Family Field trip: Thursday, Dec. 28: The Gneiss (Nice) Rocks of Portland Buildings, or What Makes Bricks Red? Bring the kids for a great tour of downtown Portland with Taylor Hunt! For details, call him at 503-662-4790.

****

Preview of Coming Attractions:

Fri. Jan. 5, 12-1:30 PM: Geology of the Canadian Rockies. Linda Wilson, GSOC.
Fri. Jan. 12, 8:00 PM: Microbial Biosignatures at Life's Upper Temperature Limit.
Sherry L. Cady, Asst. Professor, Geology Dept., PSU. This talk will appeal to anyone interested in when, where, and how life on earth began.

Field Trip: Sat. 1/27: Taylor Hunt will take us to Missoula Flood scablands and quarries in the Sherwood area.

****

IF BAD WEATHER CLOSES CITY'S SCHOOLS, WE CANCEL GSOC MEETINGS!

Calendar items must be received by 15TH of preceding month. Call Evelyn at 503-223-2601, or e-mail folkdans@aol.com.

(Ray Crowe: "'Tofu Towers' - a Chinese restaurant?" Apologies for Nov. typo! EP)

WELCOME

We welcome the following new member to the Geological Society of the Oregon Country

Susan Ikeda

COMPLETELY FRACTURED GEOLOGY

By GSOC members traveling on Missoula Floods President's Field Trip

1. **Migmatite**: a close-together pattern flown by Russian fighter planes (Fran Pearson)
2. **Rhythmite:** (1) name of a barbershop quartet (Duane Diller) (b) 5 GSOC members who harmonize (Taylor Hunt)
3. **Incise:** as in, "That fellow's a troublemaker - always trying to incise a riot." (Ken Yost)
4. **High-grade metamorphosis:** when a D student suddenly gets all A's (Archie Strong)
5. **Drumlin:** a Munchkin percussionist (Ralph Pratt)
6. **OWL:** a geologic structure which is strictly fly-by-night (John Whitmer)
7. **Caliche:** (1) litchi nuts grown in California (Rosemary Kenney) (2) a low-fat litchi nut
8. **Core complex:** the charter members of GSOC (Taylor Hunt)
9. **Belt rock:** (a) a polished natural decoration on a belt buckle (b) a girdle of rocks around the equator that holds the crust to the mantle (c) Ethel Merman singing "Blue Suede Shoes" (?)

Next month will feature donors who wish to remain anonymous - or are afraid to confess!

NW Geology Activities

Upcoming NWGS meeting of interest -
WA - December 12: Northwest Geological Society (Meeting): Orrin Pilkey (Duke University), speaking on shoreline erosion in southwestern Washington. Time/Location:5:30 (social), 6:30 (dinner), 7:30 (speech), University Plaza Hotel, NE 45th Street, Seattle, Washington (near the University of Washington). Reservations and payment required for dinner by Thursday before meeting. The public is welcome to attend(lecture is free). For more information, see the NWGS web site:
http://www.scn.org/tech/nwgs/

WEB TEASERS

NEW! On your GSOC website --
Were you folks as disappointed as I was with the way the photos turned out in the November newsletter? If so, check out the GSOC website for color versions of the pictures for the Ice Age Floods field trip. There are lots of great pictures, some new ones from Phyllis Thorne, plus an article on Day 1 by Evelyn Pratt.
Also on the website in the field trip schedule page is the Boring Lava field trip itinerary. If you did not get a chance to go, or if you went and want a copy, download the itinerary before the end of the year. Look for information or announcements for upcoming events on the website!
Check it out!
www.gsoc.org

SEVEN SIMPLIFIED STRATA

Introduction to Clay Keheller's Boring Lava field trip with embellishments from the Editor. Also references to Orr, Orr, and Baldwin, Geology of Oregon, 4th Edition, Kendall/Hunt Publishing Company, 1992.

The seven major rock units in the Portland metropolitan area are as follows:

Tos – 30 Ma. Marine sediments, exposed in Tryon Creek State Park, Sellwood, and Waverly Country Club.
Tcr - Columbia River Basalt Group flows between 16 Ma. and 12 Ma. in the Portland area (Grand Ronde, Wanapum, and Saddle Mountain formations). The Tualatin Mountains (Portland

Hills) and bedrock for east Multnomah County are composed of these basalt flows.

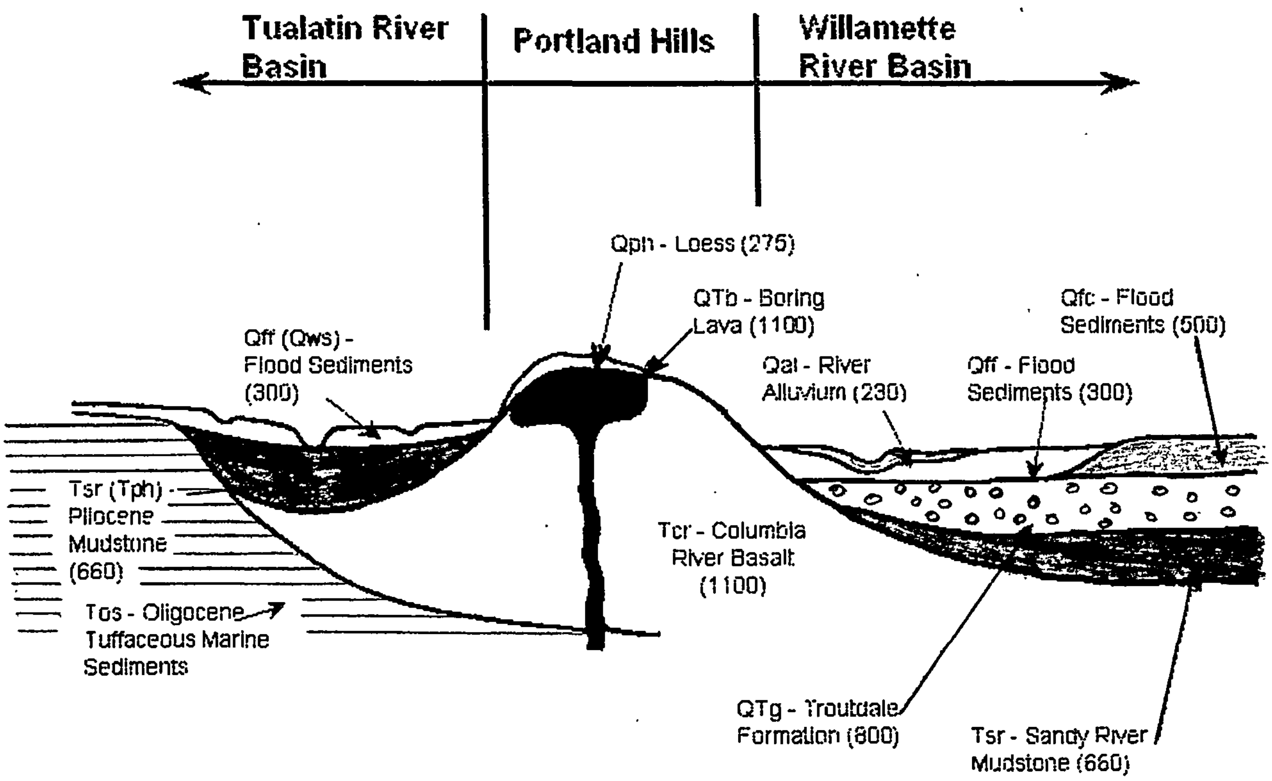
Tsr – Sandy River Mudstone from late Miocene to early Pliocene is lake and river deposited sediments created in a basin formed by the ancestral Willamette and Columbia rivers. This layer underlies the Troutdale formation in east Portland and east Multnomah County.

Tt - Troutdale formation from late Miocene and throughout Pliocene. Conglomerate composed of "well-rounded pebbles and cobbles of Columbia River Basalt and exotic volcanic, plutonic, and metamorphic rocks". These deposits are from the ancestral Columbia River due to their composition of rocks from the ancestral continental margin and associated plutonic rocks. The Springwater Formation is similar to the Troutdale formation, somewhat younger, with rock composition more local in origin.

QTb - Boring Volcanics – 3 Ma. to 250,00 a., westward younging flows of light gray to gray basaltic and basaltic andesite flows which erupted in small vents and cones to larger shield volcanoes. Larch Mountain, Mt. Sylvania, Rocky Butte, Mt. Tabor, Powell Butte, Mt. Scott, and many other buttes in the Portland area, especially west of the town of Boring, contain Boring lavas.

Qph – Portland Hill Silt deposited within the last 700,000 years blankets much of the Tualatin Mountains (Portland Hills). The silt is believed to be wind-blown in origin and is similar to the soil in the palouse area of southeastern Washington.

Qff/Qfc – Ice Age Flood deposits, both fine-grained and gravelly, were left by the catastrophic flooding from glacial Lake Missoula in western Montana. These deposits are 16,000 to 12,000 years in age.



Schematic Cross Section - Geology of Portland Metropolitan Area

THE NOT-SO-BORING VOLCANICS

Saturday, November 4, 2000
By Carol Hasenberg
Field Trip leader Clay Kelleher.
Look for a GSOC website feature on the Boring Volcanics field trip to be completed this winter.
For a more complete description of Boring Lava, and a location map of the vents, refer to these pages of the USGS/Cascades Volcano Observatory website:
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4. **High-grade metamorphosis:** metamorphosis which occurred under conditions of high temperature and pressure
5. **Drumlin:** a long, low, streamlined hill made of till and shaped by ice flow, with its blunt end pointing toward the direction from which the ice came
6. **OWL:** acronym for Olympia-Wallowa Lineament, a fault-related feature which can be seen from space and is probably related to shearing of major tectonic plates past each other (Geology of the Pacific Northwest, by Orr & Orr)
7. **Caliche:** gravel, sand, or desert debris cemented by porous calcium carbonate, or the calcium carbonate itself
8. **Core complex:** a mass of metamorphic or igneous rock older than the layers enclosing it, which has been tectonically raised from deep in the crust to near the surface (ibid., Orr & Orr)
9. **Belt rock:** rock formed in a late Precambrian seaway between western Montana, northern Idaho, and southeastern British Columbia (ibid., Orr & Orr)

Nominating Committee Results

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

President.......Sandra Adamson
Vice President.......Tom Gordon
Secretary.......Beverly Vogt
Treasurer.......Phyllis Thorne
Director, 3 years.......John Newhouse
Director, 2 years.......Taylor Hunt
Director, 1 year.......Archie Strong

Nominations will also be open at the December club meeting on Friday, December 8, 2000. Consent of the nominees must be secured prior to their nomination. Nominations will be closed after the December meeting. Final nominations will be published in the January newsletter. The slate of officers will be voted on and approved at the February monthly meeting.

The Nominating Committee members are Richard Bartels, Chairman, Don Barr, and Rosemary Kenney. Our thanks to the selected members and members of the Nominating Committee!

Don't forget that annual **DUES PAYMENTS** are coming up! Think about all those great member benefits for a mere annual fee of $20 (individual)!!!