THE GEOLOGICAL NEWS LETTER

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The
Official Bulletin
Of The

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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Volume No. II
January 8th to December 25th
1936

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Vol. 2 - No. 1. Portland, Oregon January 8, 1936

LECTURE ANNOUNCEMENTS

January 23 - "The Crystallin World and the World of Crystals"
By Dr. W. D. Wilkinson, Professor of Mineralogy, Oregon State College

February 13 - "Caves and Cave Dwellers"
By Dr. S. M. Mayfield, Professor of Geology, Linfield College

February 27 - The annual meeting - Rumor states that a magnificent program has been arranged. A fine banquet at a moderate cost, exceptional entertainment, a fine lecture by an authority and some surprises. Save that date!!!

See Page 9.

March 12 - "The Harney Basin"
By Arthur M. Piper, U. S. Geological Survey's representative in the Northwest for ground water resources.

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Field Trips Planned

January 19 - Portland and vicinity
February 16 - Newberg, the Nehalem and Parrett Mountain
March 15 - Vancouver and vicinity
April 12 - The soil types in the vicinity of Portland
April 30 and 31 - McMinnville and vicinity
May 19 - Mollala and vicinity

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Very Important Announcement

See page 9. Speak now or for the next year be satisfied and enthusiastic.

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Win A Big Prize

The Executive Committee authorizes a price of one year's membership in each of the following contests for papers submitted for publication in the Bulletin in the year 1936:

1 - Best written report of a geological lecture.

2 - Best series of five reviews from current literature on topics bearing on the geology of the Oregon country.

THE GEOLOGY OF THE MOUNT ADAMS COUNTRY

Resume of Lecture by

CLAUDE S. FOWLER

The following resume constitutes a brief summary of facts accumulated from some four years study, and over 200 days and nights during three summers spent on the top of Mount Adams.

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The Mount Adams area embraces portions of Klickitat, Skamania, Yakima and Lewis counties in the Cascade Mountains of southern Washington. The region around the mountain is drained by four major streams, the Cispus, Lewis, Big White Salmon and Klickitat, all heading at the mountain andforking out in their various directions. The ridges formed are notably V-shaped. Inasmuch as the exposed rocks of the region are lavas, mining and prospecting have been at a minimum, but some mining men say it is one of the greatest unexplored mineral localities in the Pacific Northwest.

The Mount Adams country is located on the western edge of the great Columbia Lava Plateau whih covers some 250,000 square miles. Exposed in the eastern portion of the region about Mount Adams are these basalts of Miocene Age. Beds of sandstones and shales were laid down in numerous lakes on the surface of the plateau, and numerous plant fossils are found in these rocks. These lake beds were covered with lavas younger in age. All of these lavas and associated rocks have been folded and faulted until they stand nearly vertical at places. Capping the basalts are the andesitic lavas making up Mount Adams.

In the western portion of the area under consideration are sandstones and shales deposited in shallow marshy lakes and lagoons. Included in the rocks are many fossils and even coal seams, the coal being mainly sub-bituminous. The low grade of the coal coupled with the wildness of the locality has made development of the beds impractical to date. The rocks in this area may belong to the coal-bearing rocks of Eocene Age which are exposed farther to the west.

In the region southwest of the Mount Adams area are granites - rocks which have cooled from a molten magma at a depth of a mile or more from the surface. As the molten material cools and crystallizes, hot gases and vapors are forced into fissres in the overlying rocks, and in this manner, veins are formed. Gold, silver, cooper and vandium are the more common metals found in the region. Inasmuch as these granite batholiths are commonly of great extent laterally, it is possible that the granite southwest of Mount Adams is an out-lier of the Cascade belt and is connected with the granite of the Cascade Mountains. The field evidence suggests that this is the case. It is reasonable to expect that with thorough prospecting of the area around Mount Adams, ore deposits of economic importance will be shown to exist.

One of the interesting, and somewhat out of the ordinary features of the geology of the region is Potato Hill, a small volcano, ten miles north of Mount Adams. It has a distinct crater and also the characteristic conical shape. The summit is some 800 feet above the level of the plateau on which the hill was built. Potato Hill is one of several cones parasitic to Mount Adams, built up over fissures in the older rocks thru which the adesitic lavas were forced up from within the earth. These cones date from the period of volcanic activity during which Mount Adams itself was built up.

In the many lava beds, some representing flows from Mount Adams and others from minor craters and fissures in the surrounding region, are to be found almost innumerable lava tunnels. In length, the tunnels vary from a few hundred feet to a few thousand feet. Some have "rooms" with ceilings from 25 to 50 feet high, while other tunnels are so small that there is hardly room enough for a person to crawl through. One outstanding tunnel, the Ice Cave, about eight miles wouthwest of Trout Lake, contains a great deal of ice in the form of huge pillars. In places the roofs of some of these tunnels have caved in leaving steep-walled gorges in the surface. Other tunnels were later filled with lava which, upon cooling formed an interesting rosette formation.

In a block of recent lava are some impressions resembling human hand and moccasin-clad foot prints. Legendary as "squaw tracks", they have been the subject of much interest and controversy. Mr. J. Harlen Bretz, of the department of geology of the University of Chicago, in a letter to the Forest Supervisor of the Columbia National Forest, stated that the prints had been chisled in the rock and were not impressions made in a viscous lava. This statement was based on evidence much of which is highly controversial.

Mount Adams proper, is located in the extreme southwestern corner of Yakima county. It is about 40 miles from White Salmon, Washington, 20 miles from Trout Lake and a like distance from Randall. Entrace to the mountain may be made through Glenwood or Yakima as well as through the towns mentioned.

Mount Adams, a snow capped volcanic cone, is the second highest mountain in Washington, rising to an elevation of 12,307 feet. Its sides are steep, the east and west slopes being so precipitous as to be practically impossible of ascent. Enormous ice falls and cliffs, hundreds of feet high, are not uncommon. Both the north and south sides are not too steep to afford fairly good trails for hikers and even for horses. The slopes of the mountain become steeper as the summit is approached. Around the base are stair-like benches with nearly flat tops. From these the mountain rises abruptly, the slopesnot being steep, however, at the 9,500 foot elevation. On the south slope is a bench the slope of which is very gentle, in fact, almost flat, but from this bench, the slope increases up to the first summit to an elevation of 11,500 feet. From the first summit to the foot of the last summit, is a large flat nearly half a mile across. The last summit is steep, having slopes of about 35 degrees. The many changes in slope can be explained by the inherent differences in the rocks of the various parts of the mountain. We know that the more basic the magma, the more fluid and mobile the lava; while the more acid lavas, containing a higher content of silica, will not flow far but will often be extruded violently into the air, settling as ash, lapilli, bombs, etc. Around the base of the mountain the rocks are crystalline with recognizable mineral crystals. These rocks are dark dolored andnot excessively vesicular. They are basic. At successively higher elevations the rocks are glassy but carry large phenocrysts of plagioclase feldspar. Around the summit, the rocks are glassy and in places scoriaceous. Volcanic ash, tuffs, and volcanic breccias are common in the summit rock material where the slopes are steep.

At the present time, steam and hydrogen sulphide gas are issuing from vents in and around the margins of the ice-filled crater. Steam was observed at only one place, a fumerole on the south crater wall. Hydrogen sulphide issues from every crevasse bounding the crater. At times, when weather conditions are favorable, the odor of hydrogen sulphide gas can be deteced for as far away as six miles from the mountain top. The gas is expelled as the lava down inside of the volcano is cooling and solidifying into rock. Mount Adams is in the very last stages of its long history of volcanic activity.

In the crater of the mountain are extensive sulphur deposits. The sulphur ore lies directly beneath the ice and the extent of the field is not known, its extremities not having been found. That portion of the crater which has been explored, about one-third covers over seventy acres. At four places the ore crops out through the ice and lies exposed during the summer. Sulphur ore was seen in four crevasses. In the seventy acres bounded by the outcrops and crevasses, sixteen test holes, totalling 2300 feet, were drilled with a diamond drill. About 360 feet of test pits were dug. It was found that sulphur ore existed beneath the ice over the area prospected. Only one-third of the crater has been prospected to date.

The sulphur ore is light, in places, porous, but in the main, it is compact. It consists of fragments of lava, volcanic ash and cinders, cemented with sulphur. Even the vesicles of the lava fragments are filled with sulphur. The color of the ore varies greatly. The clear crystalline sulphur has a metallic appearance. Much of the ore contains a high proportion of sulphur, nearly pure, but the average runs between fifty and sixty percent. Thicknesses as high as twenty-seven feet have been measured.

As to origin, the sulphur deposits on Mount Adams are unique. Hydrogen sulphide gas issuing from vents in the lava rocks into the mantle of volcanic ash, cinders and scoria, all loosely compacted and porous, was broken up, the hydrogen uniting with oxygen to form water, the free sulphur being deposited in the pore spaces of the rocks. The cold ice aided in the deposition of the sulphur. Eventually, as the pores of the rock became filled with crystalline sulphur, the resultant sulphur ore became impervious to the gas, forming an effective seal. This seal spread from the numerous vents, finally uniting, so that at present, the crater floor is covered with the ore. With continued expulsion of gas, sulphur was deposited beneath the seal, thus thickening the deposit. Even over fissures in the outside of the crater rim, sulphur was deposited.

Associated with the sulphur deposits are deposits of alum minerals, alunogen, alumia and aluminite being easily recognizable. These minerals are hydrous sulphates of aluminum. In an exposure in what appears to be a hot spring area is a deposit of alum varying in thickness from twenty to thirty feet over a distance of 300 feet. Overlying the alum is a thin layer of white volcanic ash. A sulphur bed three feet thick overlies the volcanic ash. Where the sulphur bed is absent, there is no alum. The alum is solft and upon exposure to air, crumbles easily. It varies from white to red to green in color. Although much of the alum is crystalline, some of it is earthy. Apparently, the alum was formed from an andesitic lava by hot waters containing sulphuric acid. The volcanic ash was not easily acted upon but does contain some alum.

Gypsum, the hydrous sulphate of calcium, is found over wide areas of the upper part of the mountain. The gypsum is crystalline, appearing as rosettes, as flat masses and as selenite crystals. It is vari-colored, red, green, purple, gray and white being quite common. As is the case with the alums, the gypsum is a secondary mineral produced by the reaction of acid waters with the minerals of the lava rocks.

The geologic history of Mount Adams and the surrounding country is extremely interesting. The lavas of the Columbia Lava Plateau were extruded in Miocene time and were folded either at the end of Pliocene or during late Pliocene. Mount Adams was built up on the up-turned, eroded edges of these lavas. The building up of Mount Adams required a long time as is evidenced by the erosion surfaces found in the rocks. Also, there were periods of glaciation, followed by extrusions of lava which covered the glacier-scratched and striated rocks. Afterwards, and up to the present time, extremely rapid erosion has been decreasing the size of the mountain. The rate at which Mount Adams is being eroded is appalling. It is immediately apparent that the history of Mount Adams covers an almost unbelievable length of time if measured in years, but by the geologist's yardstick of time, the events occurred in a short while. The whole of the Miocene, Pliocene and Glacial epoch includes only a meager two percent of the time involving Earth History!

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The above lecture was presented before members of the Society on October 10, 1935, in the auditorium of the Public Service Building.

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NOTICE:- Please send all announcements and any material you would like to have appear in the Bulletin to:-

Gladys C. Randolph
2726 Northeast 63rd Avenue
Portland, Oregon

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SCIENCE NEWS LETTER

LAST CHANCE! All members who wish to subscribe to the Science News Letter should speak to the Secretary AT ONCE. In Clubs, this splendid digest of the world's sicence may be obtained at the rate of $2.60 per year. This is approximately half of the regular price. Geological subjects are given a good share of space in the publication.

* * * *

DO YOU KNOW that the finest cross-section of a composite volcano in Oregon is found in the bergschrund wall of Milk Glacier on the west side of Mount Jefferson?

EXECUTIVE BOARD AND COMMITTEE CHAIRMEN MEET

A meeting of the executive board and committee chairmen was held at the home of Mr. A. D. Vance on the evening of October 5, 1935. Reports of committee chairmen were heard and extracts of such reports will be published in future issues of the News Letter.

Most of the evening was devoted to a discussion of the future policies of the Society.

It was decided that the Society hold an Annual Banquet sometime in February, the date to be set by the Annual Meeting Committe. Trips are to be held once each month during the winter and early spring, on the first or third Sunday of the month. Definite schedules will be announced in the Bulletin or newspapers.

Trip fees will be charged for non-members on future trips.

The following committees were appointed:-

<u>Membership Committee:</u>

L. B. Macnab, Chairman; Leo Simon; Frank Bigler; Leo Bissonnette; Frances Cookman; Dr. Arthur Jones; Clarence Phillips.

<u>Nomination Committee:</u>

J. R. Collins, Chairman; F. L. Davis; Dr. Arthur Jones; L. E. Kurtichanof; H. L. Jennison.

<u>Annual Meeting Committee:</u>

Joseph Wimmer, Chairman; Mrs. Mabel Smith; Mrs. Irene L. Poppleton, and her committee.

<u>Museum Committee:</u>

Dr. Courtland L. Booth, Chairman; Leo Simon; C. F. Wiegand; Miss Jessie M. Short; E. S. Collins; Dr. H. C. Dake; A. D. Vance.

<u>Historian:</u>

Lawrence A. McNary.

<u>Education Committee:</u>

Miss Glenna M. Teeters, Chairman; Julian A. Rice; Miss Hazel Henkle; Dr. Alice M. Bahrs; Miss Marian Bolin; N. M. Sloan.

<u>Program Committee:</u>

J. C. Stevens, Chairman; Dr. E. W. Lazell;, F. L. Davis; Kenneth N. Phillips; Dr. Edwin T. Hodge.

<u>Public Relations Committee:</u>

J. C. Stevens, Chairman; Dr. Courtland L. Booth; L. B. Macnab.

Trip Committee:

Harold B. Schminky, Chairman, R. E. Thorne, Raymond L. Baldwin.

Washington Park Committee:

J. C. Stevens, Chairman.

Report submitted by:

A. F. Pratt, Secretary

TREASURER'S REPORT - October 3,1935

RECEIPTS:

114 members at $2.50	$285.00	
7 junior members at $1.00	7.00	
		$292.00

DISBURSEMENTS:

Entertainment	.65	
Paper & Stencils for Bulletin	50.10	
Stamps - Bulletin $14.04		
Miscellaneous 7.00	21.04	
Stationery	17.00	88.79
Balance		$203.21

Balance in Bank - $203.21

Report submitted by:

Lillian Neff, Treasurer

* * * * *

DO YOU KNOW that only copper and sulpher are found in appreciable quantities as native elements?

DO YOU KNOW that in general, the eath's crust is formed of igneous rocks, 95%;shale, 4%; sandstone, .75% and limestone, .25%?

DO YOU KNOW that spodumens sometimes occurs in crystals so large that an entire mine will be excavated within a single crystals as in South Dakota?

DO YOU KNOW that one-fourth of the earth's surface has no drainage to the sea?

DO YOU KNOW that if the basins of the Great Lakes continue for another 1600 years to tilt toward the Southwest as they are now doing, they will drain by way of the Chicago river into the Mississippi?

DO YOU KNOW that if the Antartic and Greenland ice sheets were to melt, the sea level all over the earth would rise 80 or more feet?

DO YOU KNOW that a half billion years ago the land surfaces were low and the seas shallow?

"Rockologist Norton"

To Members of The Geological Society of the Oregon Country:

The nominating committee, consisting of J.R.Collins, Chairman, F.L.Davis, Dr.Arthur C.Jones, L.E.Kurtichanof and H.L.Jennison, has submitted the names of the following members for your consideration for officers for the year 1936:

For--President..............................Clarence D. Phillips
Vice-President..........................J. C. Stevens
Treasurer...............................Mabel C. Smith (Mrs. Ben)
Secretary...............................Lillian W. Neff
Director................................Allyne F. Pratt

The Constitution provides the following method for the election of officers:

ARTICLE VI. Nomination and Election of Officers.

Section I. The Executive Committee shall appoint a Nominating Committee of five members, none of which shall be officers or directors of the Society. Not less than sixty days previous to the annual meeting the Nominating Committee shall file with the Secretary a ticket, to be known as the regular ticket, containing the name of one nominee for each office to be balloted on. The Secretary shall mail a copy of this ticket to each member of the Society not less than forty-five days previous to the annual election.

Any ten members may file with the Secretary other nominations for any or all offices, but such nominations must reach the Secretary not less than thirty days previous to the annual meeting. A list of these nominations, to be known as a special ticket, with the names of the members nominating each special ticket, shall be mailed not less than fifteen days previous to the annual meeting, to each member of the Society. A letter ballot containing the nominees of the regular and special tickets shall be enclosed with the special ticket. All ballots must be returned and in the hands of the Secretary previous to the annual meeting at which meeting the Secretary shall announce the result thereof.

In case a majority of all the ballots shall not have been cast for any candidate for any office, the Society shall proceed to make an election, in open meeting, for such office from the two candidates having the highest number of votes.

Allyne F. Pratt
Secretary

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HIGHER EDUCATION RESEARCHES

As reported in Research News Bulletin of the Oregon State System of Higher Education, the following research work of interest to our society has been done in the year 1935:

Recent publications by IRA S. ALLISON, professor of geology at the State college, in connection with his studies of the Pleistocene history of the Willamette Valley, are: "Glacial Erratics in Willamette Valley", Geological Society of America Bulletin, XLVI (1935), 615-32; "Use of Soils in Correlation of Glacial Stages in the Pacific Northwest" (abstract), Geological Society of America, Proceedings for 1934; "Late Pleistocene Topographic Correlations on the Pacific Coast", read before the Cordilleran Section, Geological Society of America, April, 1935, abstract to be printed in the Proceedings for 1935. Professor Allison's research is financed in part by the National Research Council and the General Research Council.

EDWIN T. HODGE, Ph.D., Professor of economic geology at the State College, reports the completion of the following formal reports of research undertaken for Federal agencies: Dam Sites on the Lower Columbia River, U.S. Engineers, pp. 300, 30 plates; Bed Rock of the Bonneville Dam Sites, U.S. Engineers, pp. 20, 10 plates; Geology of Ruckel Slide, Oregon, U.S. Engineers, pp. 30, 10 plates; Proposed Tunnel through Tooth Rock, Federal Bureau of Roads, pp. 30, 15 plates; Raw Mineral Supplies for a Pacific Coast Iron and Steel Industry, U.S. Engineers, pp. 600, 40 plates. This last report is being mimeographed for limited distribution. A paper by Professor Hodge, "Volcanic and Seismic History of Oregon", was published in the Proceedings of the Fifth Pacific Science Congress, III (1934), 2451-60.

E. L. PACKARD, Ph., professor of geology at the State College, reports progress on a detailed investigation of the geology of the Dayville Quadrangle in Central Oregon, in cooperation with W. D. WILKINSON, Ph.D., assistant professor of geology at the State College, and scientists from other institutions. Professor Wilkinson is studying the petrography of the extensive igneous flows and intrusives that constitute large areas of the quadrangle. The stratigraphic sequences of the Tertiary are being differentiated upon the basis of the large vertebrate faunas collected this summer. The Mesozoic and Paleozoic formations are being further studied and mapped, and their rich faunas described, by Professor Packard and cooperating scientists. This project was begun in 1926. Field work during the summer of 1935 was financed by the Carnegie Institution of Washington.

ETHEL I. SANBORN, Ph.D., associate professor of botany at the State College, is continuing her work on the fossil flora of Oregon with the study of fossils collected on the Powell Ranch, Scio, Linn

County. The work includes classification of the plants preserved, and determination of relationship to other fossil floras in the state and in the world, and of relationship to living floras. Professor Sanborn's work on "The Comstock Flora of West Central Oregon" was published in Carnegie Institution of Washington Publication No. 465 (July 20, 1935), 1-28. Her research is financed by the Carnegie Institution and the General Research Council.

WARREN D. SMITH, Ph.D., professor of geography and geology at the University, spent the summer at Crater Lake continuing his study of the geology of the lake under the auspices of the National Park Service. A long article concerning his discoveries supporting the explosion theory (as opposed to the collapse theory) of the formation of the lake appeared in the Sunday Oregonian during the summer. A technical discussion of this problem will appear shortly in the Bulletin of the Geological Society of America. During the past year Professor Smith supervised an FERA geographical and geological survey of Lane County. A book by Professor Smith, The Oregon Coast, its Geology, Physical and Human Geography, and Scenery, is ready for publication.

JAMES H. BATCHELLER, B.S., professor of mining engineering at the State College, is the author of a recent leaflet published by the Oregon State Mining Board, Aid to the Identification of Some Minerals that May Be Found in Oregon. Professor Batcheller is secretary of the board.

Liming Western Oregon Soils, by W. L. POWERS, Ph.D., soil scientist. Station Bulletin No. 325.

"The Chemical and Biological Nature of Certain Forest Soils", by W. L. POWERS, Ph.D., and W. B. BOLLEN, Ph.D., Assistant bacteriologist. Soil Science, XL (1935), No. 4.

"Some Anomalies of Siliceous Matter in Boiler-Water Chemistry", a paper by R. E. SUMMERS, M.S., assistant professor of mechanical engineering at the State College, appeared in Combustion, VI (1935), 13. Professor Summers is investigating siliceous boiler scales formed from soft natural waters of Western Oregon and their treatment. A monograph, Boiler-Water Troubles and Treatments with Special Reference to Problems in Western Oregon, by Professor Summers, was recently published as Bulletin No. 5 of the O.S.C. Engineering Experiment Station. His work is financed by the Engineering Experiment Station.

ENGINEERS FINISH DETAILED REPORT

Result of Iron and Steel Industry Survey Told

Completion of a report on the availability of raw materials for a Pacific coast iron and steel industry was announced here yesterday by the office of the division engineer, north Pacific division, corps of engineers.

The report, prepared by Dr. Edwin T. Hodge, consulting engineer, is a resume of analysis, in four volumes, of present available information on domestic and foreign suitable supplies of ores, fluxes, reducing agents and refractories, with probable cost of these raw materials delivered in the lower Columbia area, with some data relating to markets for finished products.

MEMBERSHIP LIST OF THE

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

CHARTER MEMBERS

Adams, Myra L.	GA. 8747	2614 NE Bryce St.
Adams, W. Claude Dr.	" "	" " "
Althof, L. W.	BE. 0578	1983 NW Flanders Street
Averill, Ed. F.	TR. 1571	3535 NE Tillamook Street
Avery, Delia	TA. 2420	3585 SE Clinton Street
Bahrs, Alice M. Dr.	BE. 7151	Martha Washington Hotel
Baldwin, Raymond L.	GA.6055	2725 NE 50th Avenue
Barnes, Farrel F. Dr.	BR. 0621-Ext. 35	514 Pittock Block
Barr, Amza	SU. 4081	5417 SE 99th Avenue
Barr, Elizabeth H.	" "	" " " "
Bean, Ormand R.	AT. 6141	423 City Hall
	AT. 1475	7300 SW Brier Place
Bennett, Helen A.	TR. 1862	1742 NE 48th Place
Bigler, J. Frank		410 Mcegley-Tichner Bldg.
Bissonnette, Leo. A.	TA.5743	636 SE 68th Avenue
Bliss, Percy H.	MU. 1725	3813 NE 20th Avenue
Bogue, Richard G.		1242 SE 60th Avenue
Bolin, Marion		1705 SE Burnside Street
Booth, Charles Frazier	LA 1450	2444 SE Clinton Street
Booth, Courtland L. Dr.	" "	" " " "
Botten, Isa	BR. 5175	2035 NW Everett St.
Bowie, Margaret	EA 6232	3014 SE Lincoln St.
Brady, Helen		5503 SE 92nd Avenue
Carey, Charles H.		808 SW Broadway
Carney, Alma Ruth	TA. 4570	7269 Thorburn St.
Carney, Thomas A.	" "	" " "
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Cole, Juliet A.		4205 NE Davis St.
Collins, E. S.	BE. 1822	2539 Westover Road
Collins, J. R.	EA. 9831	3310 SE Caruthers St.
Compton, Louise H.	AT. 0181	Congress Hotel
Cookman, Frances	AT. 7307	5121 SW Corbett Avenue
Cowperthwaite, Julia		2206 SW First Avenue
Dake, H. C. Dr.	BE. 2539	2385 NW Thurman St.
Danks, Margaret	BR. 8402	2364 NW Hoyt St.
Davis, F. L.	TR. 7568	4317 NE Tillamook St.
Dunn, J. H. Mrs.	EA. 9545	3104 NE Glisan St.
Ellis, Frederick E.	BE. 5931	1863 SW Montgomery Drive
Ellis, Robert H. Jr.	" "	" " "
Emerick, Chas. J.	BE. 5203	2503 NW Raleigh St.
Endres, Constance	GA. 6609	R. 5, 10632 NE Skidmore St.
Felts, Wayne M.	WA. 2140	8005 N. Delaware Avenue

Gorter, Jennie	SE. 0746	1605 S.E. Bybee Blvd.
Hancock, A. W.	SU. 5285	2704 SE 84th Avenue
Hann, Alys Mrs.	TR. 6849	3171 NE 35th Place
Hann, Eleanor M.	" "	" " " "
Hann, H. H.	" "	" " " "
Hansen, George		1622 SE 45th Avenue
Hawkins, Arthur L.	MU. 2264	3652 NE 43rd Ave.
Henkle, Hazel	SE. 4468	7418 SE 28th Avenue
Henshaw, J. R.	EA. 9940	4006 NE Davis St.
Hodge, Edwin T. Dr.	BE. 4821	2915 NW Luray Terrace
	BR. 0621 Ext. 35	514 Pittock Block
Hill, Joseph A.	GA. 1203	Hill Military Academy
Hofmann, Adna, J.		Bonneville, Oregon
Holdredge, Claire P.		Rt.5, Box 115, Vancouver, Wash.
Hooker, Hazel		4304 NE 112th Avenue
Horton, William	TA. 4044	455 NE 69th Avenue
Howell, Robert P.		Bonneville, Oregon
Howser, Thoron R.	AT. 6141	R. 5, Box 195, Portland
Imlay, Charles	Beaverton 3718	Reedville, Oregon
Iverson, Florence	TA. 7504	5125 NE Couch St.
Iverson, Helen	" "	" " " "
Jannsen, A. M.	Beaverton 0652	R. 1, Beaverton, Oregon
Jennison, H. L.		1561 SE Linn St.
Johnson, Albert G.	EA. 4450	2914 SE Salmon St.
Johnson, E. C.	TA. 7118	R. 9, Box 786, Portland
Jones, Arthur C. Dr.	BE. 3955	2640 SW Patton Road
Jones, Frank I.	AT. 2863	304 SW Hamilton Ave.
Kaufman, Charles R.		4303 SE 44th Ave.
Kimbrell, Geary	GA. 9995	2522 NE 57th Ave.
Kurtichanof, L. E.	EA. 6615	2523 SE Yamhill St.
Kurtichanof, Nan Mrs.	" "	" " "
Langdell, Marie-Louise	BR. 6295	118 NW King Ave.
Lazell, E. W., Dr.	BE. 7896	2015 NW Flanders St.
Mackenzie, Wm. Jr.	BE. 8772	1632 SW 12th Avenue
Mackenzie, Ray E.	MU. 2354	2420 NE 15th Avenue
Macnab, L. B.	WA. 3651	6406 N. Moore Avenue
Martin, Edward G.	BE. 3705	716 SW 18th Avenue
Martin, E. K.	TA. 2349	1715 NE 56th Avenue
MacTarnaghan, J. Telfer	WA. 4294	229 N. Shaver St.
MacTarnaghan, Robert M.	" "	" " " "
McCusker, J. R.	BE. 0468	2386 NW Glisan St.
McNary, Lawrence A.	AT. 8211	1125 Failing Bldg.
McNeil, Florence J.		R. 10, Box 302, Milwaukie, Ore.
McClure, C. A.	SE. 0462	3333 SE Rex St.
Miller, Edw. W.		Chamber of Commerce Bldg.
		Marshfield, Oregon
Meierjurgen, Herman		306 E. Webb St., Pendleton, Ore.
Miller, Katheryne F.	GA. 2543	3120 NE 19th Avenue
Murray, Samuel	EA. 5980	3568 NE Couch St.

Neff, Lillian	TA. 5755	R. 9, Box 251, Portland
	AT. 2666	337 SW Oak Street
Newell, Leslie P.	TR. 7077	2947 NE Glisan St.
Norton, Russell R.	GA. 8981	1934 NW 29th Avenue
Oberson, Louis E.		631 SW 6th Avenue
Olaine, Francis S.	BE. 4161, Local 255, Granada Court, Apt. 207	
Olaine, Lolita A. Mrs.		" " " "
Osgood, Edwin E. Dr.	AT. 2503	5523 SW Menefee Drive
Ostervold, Evelyn L.	GA. 0775	4736 NE 17th Avenue
Packard, Earl L. Dr.	1168 W	2735 Jackson St., Corvallis
Pagonis, Beatrice		2545 SE 17th Ave.
Patterson, Dorothy	TA. 7657	2545 SE 37th Ave.
Peterson, Lucy W.		2141 NW Davis St.
Phillips, Clarence D.	TR. 1960	3111 NE 9th Ave.
Phillips, Kenneth N.	TA. 5091	2213 SE 52nd Avenue
Plummer, Horace E.	TA. 5265	4135 SE Oak St.
Poppleton, Grace M.	BR. 6700	R. 1, Oswego, Ore.
Poppleton, Irene L.	" "	" "
Potter, H. M.		Silverton, Ore.
Pratt, Allyne F.	AT. 6141, Ext. 301, City Hall	
	SE 4578	7824 SE 27th Ave.
Preer, Karola	GA. 9215	2310 NE Stanton
Randolph, Gladys C.	MU. 2411	2726 NE 63rd Ave.
Randolph, Paul H.	" "	" " " "
Redman, James	Oak Grove 282 J 3, Box 749, Milwaukie, Ore.	
Reimers, Fred	TA. 0951	6535 SE Clinton St.
Reichen, Sam	SU. 6412	R. 3, Box 521, Portland
Renton, J. Lewis	GA. 2923	3366 NE Beckey St.
Rice, Julian A.	TR. 6849	
	135-J. Camas	Camas, Washington
Richards, Carl P.		706 24th St., Milwaukie, Ore.
Richardson, H. G.	TR. 5750	100 N. Cook St.
Robert, Elmer H.		3826 SE Morrison St.
Rydell, Louis E.		U. S. Custom House.
		Res. Willamina, Oregon
Sandborn, Ethel I.	447 W.	2916 Jackson St., Corvallis
	College 97	
Schminky, Harold B.	TR. 2168	2200 NE 54th Ave.
Short, Jessie M.	EA. 2600	3935 SE Ash St.
Simon, Leo	AT. 0438	531 SW Washington St.
Skerry, Harry W. Major	BE. 0856	1821 SW Hawthorne Terrace
Sloan, N. M.	EA. 0681	3135 NE Everett St.
Smith, Mabel C.	SE. 0916	1350 SE Flavel St.
Smith, Warren D. Dr.	1334 W	1941 University St., Eugene
Stevens, J. C.	EA. 9333	434 NE Royal Court

Teeters, Glenna M.	WA. 1368	5415 N. Albina Ave.
Thorne, R. E.	AT. 9504	5834 NE 26th Avenue
Underwood, H. L. Dr.	WA. 1558	10 NE Ainsworth St.
Vance, A. D.	WA. 5204	5516 Rodney Ave.
Wade, Tracy	TR. 6060	4204 NE Broadway
Westby, Harvey O.	BR. 2008	715 SW King St.
Wiegand, C. F.	TR. 4459	1100 NE Imperial Ave.
Wimmer, Joseph	TA. 0597	1261 NE 52nd Ave.
Wilkinson, W. D. Dr.		345 N. 25th St., Corvallis
Winestone, Robert	SE 4860	2613 SE 28th Place

Charter members

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(End of Charter Members)

NEW MEMBERS

Catlin, Eva	BE. 5551	651 NW Culpepper Terrace
Foster, William W.	243 W	1035 5 St., Camas, Wash.
Gekler, Ruth S. Mrs.	GA. 4631	3219 NE 37th Ave.
Hurst, Jane A.	BR. 1321	333 NW 20th Ave.
Lidell, H. S.		Admiral Hotel
Maxwell, J. I.	AT. 6044	1524 W. Burnside St.
Mayfield, Sam M., Dr.		Linfield College McMinnville, Ore.
Motley, Ruth L.		4604 NE Halsey St.
Piper, Arthur M.	TA. 8344	516 Couch Building
Shepherd, Geo. S.	AT 4721	725 Failing Bldg.
Travis, H. F.	GA. 6349	5905 NE Milton St.

(Namesof our new members will appear in future numers of our News Letter).

Clare, Milo R. Dr.	SE 4570	8002 SE 34th avenue
Conway, D. J.		6645 SE Yamhill street
Conway, Ray		3312 SE Crystal Springs Boulevard
Irving, Lewis H.		Madras, Oregon
Lewellen, G. E. Mrs.		510 S. Baker street, McMinnville, Ore.
Lucas, H. S.		Admiral Hotel
O'Neil, Chas.	EA 2640	707 SE 12th avenue
Reichen, Sam, Mrs.		Box 521, Route 3, Portland, Ore.
Swartley, A.M.		Corvallis, Oregon

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THE RIVERS OF OREGON

(Given before the Geological Society of the Oregon Country at Portland, Oreg., December 12, 1935)

by

Kenneth N. Phillips.

"All the rivers run into the sea, yet the sea is not full; unto the place from whence the rivers come thither they return again." (Ecclestiastes, 1:7).

The writer of the above quotation was no doubt thinking of his own country of Palestine. But the fundamental truths of his statement are not limited to time or space; and hence, 2,100 years after that author's time, we find the waters of Oregon following the physical laws which he so plainly expressed. Not only are the physical laws the same; the climate and topography of Oregon - factors which largely determine the regimen of streams - bear certain resemblances of those of Palestine.

For example, both Oregon and Palestine lie in the north temperate zone, in the so-called "belt of prevailing westerlies." Each lies just east of a large body of comparatively warm water. Each has 2 dominant mountain chains, with a general north-south trend and a large valley between, in which the rainfall is much less than on the adjacent mountain slopes. The prevailing westerly winds, being tempered by the equable seas, impart a marine climate to the western portion of both countries, warm in winter, cool in summer; and they drop the major portion of their load of water vapor on the westward-facing mountain slopes. The Palestinian farmer can rely upon the "former" rains in October, followed by general rains until about Easter; the "latter" rains of spring are his warning of the coming of the dry, hot summer season. The rainfall cycle in Oregon is practically the same, altho of course our rains are more copious, and our climate is cooler because of our more-northerly latitude.

During the winter and spring, our westerly winds are influenced by a series of low-pressure areas which travel irregularly eastward thru southern Canada or northern United States. The air flows from high-pressure areas toward these low-pressure areas, with the result that the prevailing winter winds are from the southwest. The warm air from the sea is cooled by passing over the colder land, and perhaps slightly by passing to more northerly latitudes. These effects, however, are slight compared to the cooling resulting from expansion of the air as it is forced upward by hills or mountains over which it passes. Since the ability of the air to retain water vapor decreases with decreasing temperature, rain falls with greatest intensity upon west or southwest slopes, over which the air is ascending rapidly.

Our summer winds, predominantly from the northwest, carry as much water as our winter winds, or possibly more; but several factors combine to prevent precipitation. The land is now warmer than the sea, instead of cooler; the air is warmed by the land and by its passage into more southerly latitudes, to such an extent that its expansion and cooling as it passes up the mountain slopes usually results only in the formation of "fairweather" clouds.

The total area of the State of Oregon is 96,699 square miles, of which 1,092 square miles is covered with river, lake, or tidal water. There are 1,018 lakes in the state, according to our Game Commission, which also informs us that the state has over 16,000 miles of streams suitable for fishing. Such a varied and variable resource can not be discussed in all its phases. This paper is intended to cover only such features of Oregon streams as are of particular interest to a student of geology.

The rivers of Oregon are, without doubt, her greatest mineral resource. Water is a mineral and the word "mineral" is therefore used advisedly. The U. S. Geological Survey has obtained records of flow of streams or canals, or the variations in lake levels, at about 7,000 points in United States, including about 700 points in Oregon. Most of these are short-term records; only 72 of these records in Oregon had been continued over 10 consecutive years, at the latest count (Sept. 30, 1934). At present there are being maintained 206 gaging stations, in cooperation with the Oregon State Engineer, for the purpose of measuring the flow of Oregon streams. Records from these stations are used to design or operate structures for navigation, irrigation, drainage, flood control, power, domestic supply, recreation, fish and game propogation, log driving, sewage disposal, industrial processes - in fact, anything demanding a dependable supply of water.

In the records and in this discussion, the discharge of a stream may be expressed in second-feet, in acre-feet, or in depth in inches on the drainage area. "Second-foot" is an abbreviation for "cubic foot per second"; it is a rate of flow, not a volume. An "acre-foot" is the volume of water required to cover an acre one foot deep (43,560 cu. ft.). "Run-off in inches" is the depth to which the drainage basin would be covered if all the water flowing from it in a given time were uniformly distributed over its surface. It is used for comparing run-off with rainfall.

Based upon climate, topography, and rainfall, the state of Oregon may be divided into 3 hydrographic units: (1) the mountain-valley portion of Oregon lying west of the Cascade divide, drained by the lower Columbia and by Pacific Coast streams; (2) the portion lying east of the Cascades, generally a plateau, drained by tributaries of Columbia and Snake Rivers in Oregon, and by California streams; and (3) the closed basins, or areas having no surface drainage, in southeastern Oregon. In this connection, it is interesting to note that Goose Lake and its tributaries are considered as a part of the Sacramento River Basin, owing to the fact that in 1869 and again in 1881 for more than 2 hours it overflowed, sending a stream southward into North Fork of Pit River, the principal head-water stream of the Sacramento River Basin. In recent years, the water of the lake has entirely evaporated, leaving - temporarily, we hope - a barren waste where the map shows Oregon's largest lake, whose area, according to a report in 1930 by the U. S. Board of Surveys and Maps, was 186 square miles.

The named rivers and creeks of Oregon number about 5,000. (One map shows 4,057 distinct, individually-named streams.) The regimen of each of these streams depends upon its climate, topography, and geology. The rivers range in size from creeks less than a mile in length to the mighty Columbia. A few facts about the Columbia River may be of interest. The record at the gaging station at The Dalles has been continuous since 1878, with high-water records since 1858, the longest continuous record of stream flow west of the Mississippi. On June 6, 1894, the greatest known flood reached a stage of 59.6 feet at The Dalles, about 8 feet above the level of the main street; the discharge at that time was 1,170,000 second-feet. On Jan. 18, 21, 1930, and Feb. 3, 4, 1932, the all-time minimum discharge of 40,000 second-feet was recorded. These minima occurred during periods of very cold weather, and were largely due to temporary storage of water in the form of ice above. The ordinary low-water flow is about 80,000 second-feet in January; the average discharge is 201,000 second-feet. The records at The Dalles were the basis for the hydraulic design of Bonneville dam; they form its hydrologic foundation, as the Eagle Creek (Warrendale) formation forms its geologic foundation.

The relation of Columbia River to other large rivers of the world, in point of size of drainage basin, is shown in the accompanying table.

LARGE RIVER BASINS OF THE WORLD

Number	River System	Length	Drainage Area Sq.Miles	Authority
1	Amazon	3,420	2,720,000	a
2	Congo	2,880	1,430,000	a
3	Mississippi-Missouri	4,330	1,250,000	a
4	Rio de la Plata	2,410	1,200,000	a
5	Ob	2,260	1,130,000	a
6	Nile	3,680	1,080,000	a
7	Niger	2,580	1,080,000	a
8	Yenesei	2,950	992,000	a
9	Lena	2,860	896,000	a
10	Amur-Kerulen	2,780	803,000	a
11	Yangtze	3,290	685,000	a
12	MacKenzie	2,860	641,000	a
13	Volga	2,420	564,000	a
14	Zambesi	1,650	552,000	a
15	St. Lawrence	2,170	463,000	a
16	Hoang Ho	2,580	378,000	a
17	Indus	1,990	373,000	a
18	Orinoco	1,860	364,000	a
19	Murray	1,780	351,000	a
20	Yukon	2,300[c]	330,000[b]	c, b
21	Danube	1,800	315,000	a
22	Columbia	1,270[c]	259,000[b]	c, b
23	Brahmaputra	1,800	259,000	a

a - Encyclopaedia Brittanica, 14th Edition, Vol. 19, p. 326.
b - "Design of Dams," - Hanna and Kennedy, 1931.
c - World Almanac, 1935, p. 766.

The geologic work of such a large stream is difficult to imagine. Large volumes of sediment are carried in suspension or rolled along the stream bed; surprisingly large amounts of mineral matter are carried away in solution. From 1910 to 1912 the Geological Survey took samples of waters at Cascade Locks, and made detailed analyses to determine its character, week by week. The suspended matter (bed load excluded) during this period varied from 1,800 tons to 185,000 tons per day. The total removal indicated by the suspended sediment was 14 million tons in 1911, and 7 million tons in 1912. The dissolved matter was practically <u>double</u> the suspended matter in average amount. These volumes are so large that they are difficult to visualize; yet the rate of denudation over the drainage basin is only one inch in 1,600 years, as compared to one inch in 750 years which has been estimated as the average for United States (Dole and Stabler).

The portion of Oregon drained by Columbia River include 56,044 square miles, of which 19,149 square miles is tributary to Snake River. The state is bounded by the "middle of Columbia River"--- and the "middle of Snake River----" for a distance of over 500 miles, as defined in the Oregon State constitution of 1857, supplemented by a Congressional act of Feb. 14, 1859. A portion of the Snake River near the northeastern corner of the state is renowned as the site of the famour "Hells Canyon." Here the Snake has carved a gorge between Bear Mountain in Oregon, and He Devil Butte, in Idaho, which is 6,748 feet deep as measured below a line connecting the tops of these peaks, 7.8 miles apart. This is somewhat deeper than the better known Grand Canyon of the Colorado, which at its greatest depth is 5,600 feet below its north rim. (The average wideth of Grand Canyon is about 10 miles.)

One of the principal tributaries of the Snake River is Grande Ronde River, which drains 3,717 square miles in northeastern Oregon. While the Snake has been carving its gorge, the Grande Ronde has kept pace with it, and now joins the Snake at a common level. The map of the lower portion of the Grande Ronde shows conspicuous meanders deeply entrenched, and a remarkable uniformity of river gradient.

John Day River, in north-central Oregon, is perhaps the "flashiest" stream in the state, from the point of stream flow. It is characterized by large freshet flows of muddy water from March to May, while its normally-low summer flow has been decreased by irrigation use until it at times approaches the vanishing point.

No discussion of Oregon rivers would be complete without mention of Deschutes River. This stream, which drains 10,502 square miles of the mountain-and-plateau region of north-central Oregon, has perhaps the largest sustained flow of any stream of its size in United States. Above White River, floods are practically unknown; and in some of the upper tributaries and on the Metolius, the range of stage from low-water to ordinary high water is so slight that some local residents tell the visitor that the river "never changes." Above Bend, lava flows from the east have crowded the Deschutes out of its former channel. In passing these lava beds, the river loses about 7% of its total flow, or, on the average, about 100 second-feet, between Bonham Falls and Bend.

A disparity like that between the characteristics of John Day River and those of the Deschutes may also be noted between other adjacent streams. For example, Silvies River, which annually brings a large flood flow into Malheur Lake, has been wholly dry for two months at a time; while Donner und Blitzen River, which feeds the same lake, is characterized by a steady, moderate flow. One not familiar with the river basins might jump to the conclusion that the uniform flow of Deschutes and Blitzen Rivers was the result of regulation by a dense forest cover. However, the percentage of forest cover in John Day Basin is almost as great as in Deschutes Basin; the Silvies River watershed supports a large lumbering industry, while that of the Blitzen contains only sagebrush, with here and there a scraggly juniper. Other examples suggest themselves. The streams which drain the dense fir and hemlock forests of the humid northern Pacific Coast invariably have a very small low-water discharge; but flood flows of 200 second-feet or more per square mile are fairly common. Luxuriant forests of the tropics are found in river basins where the range between low water and high water level is 90 feet or more; while the treeless Niobrara River has a flow that is well sustained, as compared to many mid-western streams. Forest cover may have some effect on river behavior; but that effect is negligible as compared to that of the geology - the character of the soil and rocks of the basin. "The cause of uniform or non uniform flow can almost invariably be traced to the influence of soil and topography." (J. C. Stevens, Geological Survey W.S.P. 263.)

The Deschutes River has an immense natural storage reservoir in the blanket of volcanic dust and the underlying lavas of its basin. This hugh "sponge" absorbs the rain or melting snow at the surface, conducts it to a lower level, and releases the water, sometimes many miles away, in large springs. The porous beds are hundreds of feet in thickness, and their water capacity must be measured in terms of millions of acre-feet. The Steens Mountain fault block and gravel outwash furnish a similar reservoir to regulate the flow of the Blitzen. Such porous beds are lacking in Silvies and John Day Basins, and are much thinner or lacking in the short coastal streams.

In speaking of the Silvies and Blitzen Rivers, it should be mentioned that those streams drained into Malheur River during portions of Pliocene and Pleistocene time. In the late Pleistocene, a lava flow dammed the ancient river at what is now called Malheur Gap. That lava dam has never been overflowed, altho the lake has at times been much larger than it is now. (Piper, et. al., unpublished U.S.G.S. report.)

In August 1933, a large part of the forest cover of Trask and Wilson Rivers was removed by the most disastrous Oregon fire of recent years. Further south, the basin of the Siletz River was not touched by the fire. A comparison of the low-water flow of these streams before and since the fire fails to show any change in the low-water flow of Trask and Wilson Rivers that can be attributed to the fire. In fact, the records might be construed to indicate that the low-water flow of Trask and Wilson Rivers was relatively greater since the fire; but the probable accuracy of the records does not seem to warrant that conclusion. The total annual run-off and the flood flows of these streams are subject to variable factors that render impossible any definite deduction as to the effect of the removal of the forest cover. However, it may be remarked that some students of the subject are inclined to the belief that the forests of western Oregon and Washington may actually have a tendency to cause floods to be greater than they would be if the forests (or brush cover) did not exist.

Low-water discharge, in second-feet, of -

Date	Siletz River (204 sq. mi.)	Trask River (152 sq. mi.)	Wilson River (162 sq. mi.)
Aug. 11-20, 1931	103	91	97
Sept. 1-30, 1932	82	81	76
Oct. 1-10, 1932	70	65	64
Aug. 21-28, 1933 (Fire)	104	99	99
Sept. 2-4, 1933	101	98	95
Sept. 1-10, 1934	81	82	81
Sept. 1-12, 1935	80	85	83

Records of precipitation show that an annual rainfall of 150 inches or more may occur in the northern Cascades or Coast Range of Oregon. The maximum recorded annual rainfall in Oregon is 167.29 inches at Glenora (Wilson River Basin) in 1896. Records of stream flow show that this rate of rainfall must be considerably exceeded at times. For example, the run-off on Bull Run River Basin in 1921 was 132 inches; on Siletz River in 1910 it was 147 inches. The average rainfall on the basin above the stations in those years must have been at least 25 or 30 inches more than the measured run-off from the entire basin. In addition, the maximum rainfall must have been considerably greater yet, because the rainfall and run-off are known to increase rapidly from the coast inland, and then to decrease rapidly toward the summits of the mountains. All the streams which drain foot-hill areas, not extending up to the Cascade or Coast Range divides, show values of run-off greater than adjacent streams which drain the higher mountains. The greatest recorded annual run-off on any Oregon river was 182.2 inches on North Fork of Wilson River in 1914. This stream drains only the foothills of the Coast Range; its general course is south, so that the hills of its upper basin are favorably exposed for a maximum of rainfall. The record of Nestucca River represents flow only from the high area near the divide; Trask, Wilson, Siletz, and Youngs Rivers are measured near their mouths, and the records thus are about average values for the basin. In the Cascades, the Little North Santiam River and Little Sandy River drain foothills only; the adjacent streams drain higher reaches and produce less water per square miles.

Inches of Run-off, years ending Sept. 30.

	1929	1930	1931	1932	1933	1934	Mean
Nestucca River	----	----	----	62.97	75.14	63.51	67.21
Wilson River	----	----	----	113.96	129.99	132.30)	
Siletz River	----	----	----	117.26	143.88	110.81)	
Trask River	----	----	----	98.23	113.69	103.98)	113.45
Youngs River	----	----	----	98.01	105.15	94.13)	
Little N.Santiam R.	----	----	----	101.33	119.64	88.28	
Breitenbush River	----	----	----	------	82.46	70.94	
N.Santiam River at Detroit	----	----	----	60.35	67.47	58.27	
Little Sandy River	76.42	58.92	62.71	85.72	105.80	84.12	
Sandy River near Marmot	56.58	50.54	50.42	73.07	85.24	72.84	

By contrast with the coastal or Cascade Mountain streams the annual run-off of Owyhee River, in southeastern Oregon, prior to the construction of Owyhee Dam, was only 1.48 inches from its drainage area of 11,100 square miles, of which 5,597 square miles is in Oregon. The total flow at the mouth has of course been somewhat depleted by diversions for irrigation.

The springs of Oregon constitute one of its major geological features. It is generally agreed that we have many "large" springs, but probably few people have a definite idea as to just how big a "large" spring really is. The U. S. Geological Survey has arbitrarily classified springs on the basis of their average flow as follows:

First magnitude	100 second-feet or more
Second "	10 - 100 "
Third "	1 - 10 "
Etc.	

Of the 65 first magnitude springs in United States, Oregon has 16 (Geological Survey W.S.P. 557). All are very regular in flow; the annual maximum is very little more than the annual minimum. Some springs no doubt follow old stream channels buried under lava to their point of emergence; an example is Spring River, north of Diamond Lake, where smooth river cobbles may be seen in the clear water of the spring, which could never have worn them to that shape.

Of these 16 first-magnitude springs, 8 are in Deschutes River Basin, 4 in McKenzie River Basin, 2 in Klamath River Basin, 1 on North Umpqua River, and 1 on Ana River at Summer Lake.

The largest groups of springs in the state are those on the Metolius and Crooked Rivers. The former have a combined discharge of about 1,300 second-feet; the latter about 1,000. By comparison, the springs which enter Snake River between Milner and King Hill, Idaho, aggregate about 5,000 second-feet, and form probably the largest spring group in the world, in point of sustained flow. A spring which issues from a limestone cavern in France has a flow reported to vary between 160 and 5,300 second-feet.

Lenz Spring (Big Spring Creek), on Upper Klamath Marsh, is one of less than first magnitude. The measurements of discharge present an interesting, and, for Oregon, a unique record. During the period shown in the following table, the flow of Spring Creek near Chiloquin decreased only about 19%, undoubtedly owing to the large storage capacity of the lava above the fault from whose base it emerges;

while Lenz Spring, lacking the generous ground-water storage, dwindled and ceased to flow.

Miscellaneous Measurements of Discharge, in second-feet

	Lenz Spring	Spring Creek near Chiloquin
1914	61-62	337
1915	57	320
1916	50-58	343
1917	52	315
1918	45	---
1919	34	397
1920	[illegible]-28	301
1921	26-31	291
1922	26	300
1923	22-28	294
1924	-----	282
1925	12	309
1926	4	270
1927	6-7	288
1928	-----	293
1929	-----	292
1930	0	274

Another unique spring is that on Sheep Creek at Prospect. The channel is normally dry; but after several wet years it has been known to flow as a stream large enough to require temporary bridges for sheep crossings - hence the name. Because of the rarity of surface discharge, no discharge measurements have ever been made. Since 1917 there has been no flow. The spring is apparently the surface manifestation of a large underground stream which appears as large springs in Rogue River canyon, a mile southwest of Sheep Creek. It is not practicable to measure the latter springs directly; but records upstream and downstream indicate definitely that their flow is more than 100 second-feet, and hence another spring of first magnitude.

On the drainage map of Oregon, Crater Lake has been doubtfully included in Klamath River Basin. The annual precipitation in the region is about 58 inches; the evaporation is certainly less than at Klamath Falls, and probably not over 36 inches. The annual excess of rainfall must be dissipated by leakage from the lake into the ground, to reappear as springs, "probably in Klamath River Basin" (Diller). The excess of rainfall over evaporation (assumed to be 22 inches) would amount to about 33,000 acre-feet in a year; this is equivalent to an average flow of 46 second-feet.

Within a radius of 30 miles of Crater Lake are springs which have a combined flow of more than 1,000 second-feet, all of which are popularly believed to be derived from leakage from Crater Lake. The fallacy of such an assumption is evident from a consideration of the fact that the total drainage area of Crater Lake is only 28 square miles, while the pumice blanket in the adjacent region absorbs practically all precipitation on several hundred square miles. Chemical tests of the waters of Crater Lake, Rogue River, and Link River have been made; but the percentage of spring flow that could be attributed to leakage from Crater Lake is so slight that there is no possibility of making any positive proof of the lake's drainage by that method.

Some of the stream-flow measuring stations of the state disclose geologic facts not suspected when the stations were established. The record of Lake Creek at the outlet of Diamond Lake is a case in point. Here the annual run-off is only 10 or 11 inches, very much less than should be expected. This suggests that the lake occupies a perched water table, and does not receive all the rainfall which, topographically, would be tributary to it. The lack of any tributaries to the lake on its western shore, and the further fact that the record on Clearwater River 13 miles northwest shows an annual run-off of about 47 inches, suggests strongly that the area just west of Diamond Lake, at least, is hydrologically tributary to Clearwater River, rather than to Diamond Lake as the surface topography would indicate.

The quality of the surface waters of Oregon can not be discussed here in detail. In 1910 and 1911, samples were taken from 26 Oregon streams for chemical analysis, some streams being sampled daily for over a year. (W.S.P. 363; Bulletin 770,U.S.G.S) These studies show that on most Oregon streams the total dissolved matter is much greater than the total silt in suspension. Bull Run River above the Portland water-supply headworks annually carries only 650 tons in suspension, while the material removed in solution is 21,000 tons per year. Even this great load of soluble matter is not sufficient to produce a "hard" water. On the contrary, the Portland water supply has a hardness index of only 8, the lowest of any large city in United States. (U.S.G.S. press release, Aug. 29, 1934.) On the other extreme we have John Day River, which at its mouth carries 365,000 tons per year of dissolved matter and 760,000 tons of silt.

Chemical analyses of river and lake waters bear a distinct relation to the geology of the region drained (W.S.P. 363; Bull. 770). For example, the salinity of Goose Lake, as determined in 1912, is so much less than that of nearby Abert and Summer Lakes as to suggest that over 90% of its inflow has been spilled into Sacramento River, since Abert and Goose Lakes became landlocked. Analyses of the salts from the waters of Abert, Summer, and Malheur Lakes and their principal feeder streams indicate a marked difference between the composition of the salts in solution in those lakes and the salts now being carried into those lakes, for no readily-apparent reason.

Percentage of anhydrous residue, waters of closed basins, Oregon
(Bull. 695; analyses in 1912)

	Goose Lake	Silvies R.	Malheur L.	Ana R.	Summer L.	Chewaucan R.	Abert L.
Cl	10.92	2.88	4.55	7.07	18.27	0.66	36.23
S O 4	4.92	7.35	7.64	5.21	4.18	5.99	1.91
CO 3	34.30	34.76	44.63	3.73	35.57	28.79	20.82
P O 4	.12	-----	.33	----	-----	-----	-----
B 4 O7	-----	-----	Pres.	----	-----	-----	-----
NO 3	.16	.92	.50	.13	.02	.46	Tr.
Na	38.23	10.42	24.17	)25.08	39.48	9.06	38.78
K	3.71	2.45	5.58	)	1.59	3.33	1.69
Ca	1.96	12.88	5.58	3.15	Tr.	10.13	Tr.
Mg	.22	3.13	4.13	2.83	Tr.	2.54	Tr.
Si O2	5.46	25.13	2.89	23.79	.62	38.64	.36
Al2 O3	----	-----	Tr.	-----	.27	-----	.21
FE 2 O3	Tr.	.08	Tr.	.01	Tr.	.40	Tr.
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Salinity, parts per million	916	163	484	156	16,633	75	29,564

As a mineral, water possesses a number of unique properties. Physically, it changes from liquid to solid or gaseous states with only slight changes in temperature. It is unique in that it renews itself annually. The absolute dependence of all life upon it makes water a limiting resource; so that no country can expand beyond its dependable water supply. Its variableness makes necessary a continuing inventory of supply, if the greatest use of water is to be economically attained.

THE GEOLOGICAL NEWS LETTER

Official Bulletin

of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol. 2 - No. 3 Portland Oregon February 5, 1936

LECTURE ANNOUNCEMENTS

Caves

If you are a human your ancestors lived in caves; if you were normal you repeated your ancestral cave life when a child; and if you are a geologist you plan to explore many caves. Hence take notice.

February 13 - "Caves and Cave Dwellers".
By Dr. S. M. Mayfield, Professor of Geology,
Linfield College

....

Spring Will Be In The Air

February 16 - Field Trip, Newberg, the Nehalem and Parrett Mountain

....

An Ommission

In issue Vol. 2 - No. 1, under "Win a Big Prize", the third (3d) contest is for the best report on an amateur research project.

....

Mr. Hancock's committee deserves much credit for the interesting exhibits arranged for each meeting.

....

New chapters of the Society are being promoted in Salem and in Eugene.

....

We Can Hardly Wait

Joseph Wimmer, chairman, announces, tentatively, the following program for the Annual Meetting February 27, 1936:

Toastmaster - Kenneth Phillips.

Speaker of the evening - Mr. L. A. McNary - our historian.

Speaches by Past and Incoming Presidents.

Motion pictures on related subjects by Mr. Renton.

Talk on subject of interest - Fauna of Willamette Valley, by Mr. E. Stevens.

Mrs. Poppelton's committee have numerous and interesting stunts prepared - also some surprises.

Announcement of Insignia for Society by Gerry Kimbrell, Chairman of the Insignia Committee.

A three piece orchestra is to play for us at dinner.

Cards are to be mailed to membership on which reservations are to be made - these to go out in February.

Cost will be $1.00 per plate and informal.

Mr. Wimmer will welcome suggestions to make the Annual Meeting more interesting.

....

To assure Portland's prestige and rating as an intellectual center it must soon build a Science Museum of comparable size and quality to its fine Public Libraty and Art Museum. What finer gift could some public spirited citizen give than "The Natural Science Museum of the City of Portland"?

....

THE CORVALLIS WEEK END TRIP - NOVEMBER 23rd - 24th, 1935

More than seventy members of the Geological Society of the Oregon Country responded to the invitation extended by the Department of Geology at the State College, and drove to Corvallis on November 23rd. Nearly all of the group were on hand for the hot coffee served with the home-packed lunches in the Mines Building.

Immediately after lunch, inspection of the many excellent exhibits, prepared for the occasion, began.

The two-day program provided a Saturday afternoon for the inspection of fossils, minerals and general museum specimens; a banquet at 6 P.M.; a most interesting lecture on "The Fossil Forests of Oregon", at 7:45 P.M., by Dr. Ralph W. Chaney, internationally known paleobotanist; and a field trip under the leadership of Dr. Allison, on Sunday.

Such a full program can best be reported by taking one feature at a time.

FOSSILS

Many specimens of the fossil fauna and flora of Oregon which are not part of the regular museum display were laid out for examination.

Dr. Ethel Sanborn had an entire room filled with fossil leaves and woods from the Goshen, Bridge Creek and other important fossil flora horizons of the state.

All specimens which had been definitely identified were labelled for the information of the visitors. It was in this room that Dr. Chaney, guest speaker for the evening, naturally spent most of his afternoon. The Goshen fossils have been given much detailed study by both Dr. Sanborn and Dr. Chaney and they are convinced that the Oligocene climate of western Oregon was tropical.

Dr. Packard gave his personal attention to the exhibit of marine fossils. The now famous Baker skull of the fossil whale from the Miocene at Otter Rock was on display, all missing parts having been restored under the direction of Dr. Packard. Marine Cretaceous fossils from eastern Oregon, fish bones from Fossil Lake and shelled invertebrata from the Oregon coast were shown. A magnificent fossil ammonite which must have measured at least 12 inches across rested on top of a case which contained casts showing the evolutionary stages through which the horse passed reducing the number of his toes from five to one. Casts of the fossilized portions of skulls of early man from the Heidelberg jaw up, were in the same case with the skull of a gorilla.

The museum proper is housed in the old gymnasium and contains many items of great interest. Among these are several cases of Indian artifacts and the large collection of rocks and minerals recently acquired from the Sherwood family. -- Reported by A. D. Vance.

ROCKS AND MINERALS

Under the direct charge of Dr. Wilkinson, assisted by Wayne Felts and students, were the exhibits relating to Mineralogy and Volcanism, including crystal models, optical instruments, goniometers and all the paraphernalia with which a mineralogist makes voodoo.

The crystallographic model display included a set of celluloid transparent models with red threads for the axes, and also many wood forms which were mounted on large sheets of cardboard to permit labelling for the occasion. Many fine crystallographic specimens illustrating the various systems and special occurrences such as twinning, were of special interest.

The mineralogical laboratory contains equipment and specimens which made a wonderful exhibit. Here was a microscope of the latest type costing $2500.00. It was complete with numerous accessories for examination of thin sections in so many different ways that one wonders if even the professor himself could use them all!

Also in this room were displayed all the sedimentary and igneous material collected on the field trip by Dr. Wilkinson's classes during the summer in the Suplee quadrangle. Hundreds of these specimens are carefully arranged, labelled as to location, occurrence, etc., and are being worked up during the winter as to identification and all the other things that mineralogists wish to know about rocks. Here, too, was Dr. Wilkinson's method for the identification of igneous rocks drawn to a large scale and the various rocks named were attached to the chart in the proper places.

In the laboratory of Economic Geology was displayed one of the finest collections of rock, ore and rare minerals on the Pacific coast. A collection of educational rocks from the valuable Krantz collection was an object of much interest. Perhaps the best showing was a set of ores arranged according to method of origin. Also original research maps as yet unpublished were on display.

In the metallurgical laboratory in the basement of the building, an assay was run of a gold bearing ore and a button of gold produced.

The crystallographic and mineralogical display held a fascinating interest for the members of the group who are taking the University Extension Course at Lincoln High on Monday nights, and the numerous questions with which they plied Dr. Wilkinson, indicated that his course is "taking".

-- Reported by Franklin L. Davis.

BANQUET AT MEMORIAL UNION BUILDING

On Saturday evening, November 23rd, 1935, a banquet was served in the beautiful Memorial Union Building on the Campus at Corvallis, to members of the Geological Society, faculty members, friends and our honor guest, Dr. Ralph Chaney, of the University of California.

Some seventy persons were seated at the tables. In the center of the Speakers' table was displayed a replica of an active volcano which seemed quite appropriate as we listened to the forceful speakers and the flow of oratory that poured forth from their mouths. A spirit of informality and good fellowship prevailed thoughout the dinner.

Dr. E. T. Hodge, President of the Society, presided as toastmaster, and kept things lively by his clever sallies. In the course of the evening, many jokes of great antiquity were brought out of storage for the occasion, as had been the other fossils for the benefit of the visitors in the afternoon.

The first speaker called on was Dean Earl L. Packard, who welcomed the visiting guests to the campus. The response was made by Mr. K. N. Phillips, Vice-President, on behalf of the Society. Mr. Kelley, the President of the scientific honor society at O.S.C., responded for the student group.

Dr. W. D. Wilkinson was earnest in his appeal for a deeper and more serious study of geology and kindred subjects, and urged our group to avail themselves of the opportunity of study in order to be able perhaps to make some real contributions toward the solution of our geological problems. He suggested group study of different phases of geology, the segregation being made according to the individual preferences for certain fields.

Dr. I. S. Allison's talk was on research and the opportunities it presents to all interested in the geology of the Oregon Country.

Mr. J. C. Stevens spoke on the subject, "Why I am an Amateur Geologist", and another of the boys from our home town made good.

The very delightful occasion was necessarily brought to an early close to make way for Dr. Chaney's lecture in the Library Auditorium.

-- Reported by Dr. Claude Adams.

THE FOSSIL FORESTS OF OREGON

The lecture at 7:45 P. M. by Dr. Ralph W. Chaney was intensely interesting not only because "The Fossil Forests of Oregon" was the subject, but because the personality of the speaker was so pleasingly evident that many a listener would have given much to have travelled with him even on his walk through the tick-infested sections of Central America.

The speaker told of his search for living trees bearing leaves like the fossils of the Goshen area and of inding them in the tropical jungles of South America, in Guatemala and in other countries of Central Ameria.

Dr. Chaney said that the fossil flora of eastern Oregon indicated a moist, temperate climate and he traced the migration of the Redwoods through their fossils to their present home in California and also northward along the Pacific coast to the vicinity of Nome, Alaska, and across the Aleutian Island bridge to Siberia, and thence down into China and Japan where there are no redwoods living today.

The lecture was well illustrated with excellent lantern slides.

In mentioning his investigations in China, Dr. Chaney told of finding a Hackberry seed associated with the bones and artifacts of the Pekin man indicating that the cave dwellers of one million years ago included this source of vitamin "D" in their diet. -- Reported by A. D. Vance.

....

The area geologically mapped is less in the State of Oregon than in any other state in the Union.

....

Dues for next year are now acceptable.

Bonneville Power and an Iron Industry

by

Edwin T. Hodge,
Consulting Geologist
Corps of Engineers, North Pacific Division, U. S. Army

A problem that concerns all interested in the future growth of the Northwest is the ultimate disposal of Bonneville power. The Bonneville Power Project belongs to the people and they only have the entire right to dispose of the power in any way they wish. It is thought by many that the use which will give the greatest benefit to the largest number will be by heavy industries.

In the last few years there has been much discussion of the various heavy industries that may use the large blocks of cheap power. The consensus of national expert opinion is that the fabrication of mineral products not only uses the largest amount of electro power, but demands the power at a low cost. Consequently many recommendations have been made as to mineral products that would appear to be important. Studies made by the writer as to the amount of power required by a list of some twenty products indicate that most of those widely discussed could not use more than a few per cent of Bonneville power.

The investigation on iron and steel, however, gave results based upon per capita consumption that indicate a demand for power in excess of 55 per cent of all the power that can be generated at Bonneville (1,578,552,000 kwh|yr) or 139 percent of the power that can be generated by two units sometime in 1937 (640,356,000 kwh|yr) both at an 85 per cent load factor.

In view of the above findings, a report was made entitled, "Available Raw Materials for a Pacific Coast Iron Industry". This is perhaps the most exhaustive study that has ever been published on the economic feasibility of an iron smelting and fabricating industry that might be located on the Pacific Coast. It is published in four volumes and contains over 1000 pages.

The report indicates that all the raw materials for an iron industry can be laid down in the Lower Columbia Valley at a cost comparable to that at which they are now laid down at the older centers of production. The report also shows an available market for iron and steel products in excess of one million tons. These two facts, combined with the expected electro power on tidewater that may be "the cheapest power on tidewater in the United States" is a conclusion that should grip the attention of all citizens in the northwest.

A brief summary of all the salient facts of the report is as follows:

(1) <u>Need for study</u>. - No survey of the supply of raw minerals for the electric smelting of iron ores of the Pacific area has ever been made. Only two detailed investigations for blast furnace smelting have been made and they are, respectively, ten and seventeen years old. Both investigations gave but little attention to fluxes, refractories and manganese. The supplies for electric smelting differ profoundly from those required for blast furnace use. National inventories of supply are made for and pointed to consumers in the eastern centers of production. For all of these reasons this investigation is not only justified by perhaps too long delayed.

(2) Economic setting. - The Lower Columbia River Valley has almost a perfect economic setting. It is in the geographic center of both the Pacific Coast and Far East market and the source of raw materials; it has deep water transportation for both; it has the other geographic and human ingredients for large electro-metallurgical industries and it soon will have "the cheapest large supply of low cost electric power on tide water in the United States".

(3) Market. - No published, or available private reports on the market for ferrous products in the Pacific Coast market area have ever been written. The cost of raw mineral supplies depends upon the quantity purchased or sonsumed. Hence a market study was necessarily made. The source of basic information has been good and the results are considered dependable. These show that there is a market not now supplied by producers in the Western United States for products that can be competitively produced in comparatively small iron and steel plants in excess of one million tons.

(4) History. - Several elaborate and costly investigations of the problem have been made and in each case the decision was not to establish an industry. All of these studies were postulated upon blast furnace practice except one in British Columbia and one at Heroult, California.

(a) The British Columbia study was limited to mineral supplies of the province, to a western Canadian market and upon power costs in excess of $27.00 per horse power year. The Heroult attempt had fair ore, good flux but a long rail haurl to the market and a power cost of $25.00 per horse power year.

(b) Blast furnace investigators found the iron ores, fluxes, fuels and market were sidely separated from each other. The most available ores were magnetites, not the most desirable ores for blast furnace practice, and requiring much fuel and a coke of properties not available within economic transportation distances. These investigators all found the market of requisite size and found no danger of foreign competition.

(5) Scrap. - The present production of one million tons and the prospective production of another million tons will require metal in excess of the available scrap metal supply. This investigation indicates that the available scrap metal supply is about 1,400,000 tons a year. Hence there will be needed 600,000 tons of new metal derived from ores. It is probable that even more new metal will be required because of the high cost of using such a large proportion of scrap metal, i.e., of 2 to 1. The present nation usage is 1 to 2.

(6) Iron ore supply. -

(a) The iron ores of the deposits recommended by this report are of a higher grade than those used by the Nation as a whole. They average over 60 per cent metallic iron. Hence, on the above basis, there will be needed 960,000 tons of ore, which for a 333-day year is 2,882 tons a day. The figure of 1,000 tons a day requirement is therefore a conservative figure. The cost figures in this report are based upon that quantity.

(b) There are many deposits of iron ore in the western part of the Americas. Many of them are large but undeveloped. Some of these deposits may become available a few years after an iron and steel industry is established. All such deposits have been located, considered, and are described in the report.

(c) Proven deposits within economic transopórtation range are the following:

(1) Kasaan Peninsula, Alaska, magnetite ore 60 per cent metallic iron, Bessemer, semi-self fluxing, low sulphur and copper, several million tons, 3 months to produce, 1,000 miles water carriage, cost delivered $4.14 to $5.08 a ton.

(2) Louise, Texada and Vancouver islands, magnetite, 60-63 per cent metallic iron, Bessemer, semi-self fluxing, moderate sulphur and copper, several million tons, 3 months to produce, 710 and 440 mile water haul, cost delivered $4.50 to $4.15 a ton.

(3) Iron Mountain, Washington County, Idaho, hematite, magnetite, 57 per cent metallic iron, Bessemer, 3 million tons, one year to produce, 420 miles rail haul, cost delivered $4.70 a ton.

(4) Dayton, Nevada, hematite and magnetite, 62 per cent metallic iron, Bessemer, 1,500,000 tons, 3 months to produce, 310 miles rail and 650 miles water carriage, cost delivered $4.75 a ton.

(5) Cave Canyon, San Bernardino county, California, hematite and magnetite, 60 per cent metallic iron, Bessemer, semi-self fluxing, 5-10 million tons, 225 miles rail, 989 miles water carriage, can be put into operation quickly, cost delivered $4.32 a ton.

(6) Ship Mountain, San Bernardino County, California, 65 per cent metallic iron, Bessemer, many million tons, 270 miles rail, 989 miles water carriage, 3 months to produce, cost delivered $5.14 a ton.

(7) El Tepustete, Baja California, Mexico, hematite and magnetite, 65 per cent metallic iron, partially Bessemer, very large, 3 months to produce, 1185 miles water carriage, cost delivered $2.50 a ton.

(8) El Mamey, Colima, Mexico, magnetite and hematite, 56 per cent metallic iron, Bessemer, 24,000,000 tons, 4 months to produce, 2,180 miles water carriage, cost delivered $3.60 a ton.

(9) Las Truchas, Michoacan, Mexico, hematite and magnetite, 63 per cent metallic iron, Bessemer, 50,000,000 tons, 5 months to produce, 2,300 miles water carriage, cost delivered $3.60 a ton.

(10) Marcona, Peru, hematite, 63 per cent metallic iron, Bessemer, 50,000,000 tons, 6 months to produce, 4,850 miles water carriage, cost delivered $4.30 a ton.

(11) Taltal, Chile, magnetite and hematite, 63 per cent metallic iron, Bessemer, 50,000,000 tons, 6 months to produce, 5,284 miles water carriage, cost delivered $4.05 a ton.

(12) Algarrobo, Chile, magnetite, hematite, 65 per cent metallic iron, Bessemer, 50,000, 000 tons, 4 months to produce, 5,494 miles water carriage, cost delivered $4.75 a ton.

(13) Chenar Quemado and Dorado magnetite, hematite, 63 per cent metallic iron, Bessemer, both several million tons, 6 months to produce, 5,500 miles water carriage, cost delivered $4.25.

(14) El Tofo, Chile, magnetite, hematite, 64 per cent metallic iron, Bessemer, 100,000,000 tons, 1 month to deliver (operating), 5,569 miles water carriage, cost delivered $4.30.

(7) Reducing Agents. - In the electric furnace carbonaceous materials are not needed as fuels but only as reducing agents. Hence there is a reduction of two-ninths of the weight and one-third of the volume of the load by using an electric furnace instead of a blast furnace. Also the electric furnace can use a wide variety of substances as long as they have good deoxidizing properties.

Such substances should be low in phosphorus, sulphur and ash. The ash adds to the flux charge and lowers the electrical resistance. Consequently charcoal or petroleum coke are preferred over coal coke. For blast furnace use a coke of high crushing strength is demanded and such cokes are rare and expensive. This property is not as essential in electric furnace practice.

The supply of wood wastes for the production of charcoal is abundant, but due to direct charges and lack of a market for by-products, the lowest cost of charcoal that may be expected is $9.00 a short ton.

The production of petroleum coke in Portland is in excess of 40,000 tons a year and has a market at prices much above that which an iron smelting industry can afford to pay. An increase of production of petroleum coke is limited by lack of market for the by-product, gas.

Subject to investigations that still remain to be made on charcoal, the only available reducing agent is coal coke. Good blast furnace cokes are made at Crow's Nest, British Columbia, and Durango, Colorado, both of which are out of economic transportation range.

Oregon has only lignite and sub-bituminous coals. Coking coals occur in Alaska; Nanaimo, British Columbia; and several places in Washington. The cokes for the Washington coals are decidedly superior to the Alaskan and Nanaimo cokes and are located close to Portland. Wilkeson Field, Pierce County, Washington, is the recommended supply.

Average analysis of Wilkenson coke.

	Per cent
Moisture	1.06
Volatile matter	1.30
Fixed carbon	81.44
Ash	15.20
Sulphur	0.45

The fixed carbon is high and almost equal to that of charcoal or petroleum coke. An analysis of the ash is: -

	Per cent
SiO_2	51.60
Al_2O_3	39.09
Fe_2O_3	4.84
CaO	4.20
MgO	0.22
Mn_3O_4	0.20
S	0.48
P_2O_5	0.0607

The above coke is very low in phosphorus as compared with most cokes and contains only an average amount of sulphur. The silica is high and it will act as a flux with the iron ores recommended above. Its low crushing strength is no objection to its use. In a word, it is a good coke for electric furnace use. This coke should be delivered at Bonneville for $6.50 a ton.

(8) Limestone. - Because the ores are self fluxing and because the Wilkeson coke is partially self fluxing, the amount of limestone required will be less than 1,00 pounds per ton of pig iron.

Limestone of satisfactory quality (over 98 per cent $CaCO_3$), should be delivered at Portland from one of the following places at $2.50 a ton:

Dall Island, Alaska,
Concrete, Skagit County, Washington,
Lime, Oregon,
Santa Cruz, California (mine run)

The deposits at: -

Texada Island, British Columbia,
Cle Elum, Kittitas County, Washington,
Santa Cruz, California (selected),

Should be delivered for $2.75 a ton.

It appears that limestone may be obtained for as low a price as $2.00 a ton from the San Juan and Orcas Islands, Washinton, and from Whatcom County.

(9) Dolomite. - Dolomite, with a composition of 2.90 per cent silica and 1.37 per cent iron oxide and alumina, from Colville, Washington, should be obtained from an old established quarry for $4.00 a ton. Near Lime, Oregon are thick beds of equally good dolomite. These beds might be opened and their product shipped in conjunction with limestone flux from the same place and delivered in Portland for $3.75 a ton, or less. These prices are about one-half the cost of dolomite available to the eastern iron and steel plants.

About 22,000 tons of dead-burned dolomite will be required annually and it could be calcined at the iron and steel plant using electric furnaces for that purpose.

(10) Magnesite. - An iron and steel industry in the Lower Columbia River Valley has an advantage over all other iron and steel industries of the United States in being close to a very large and high grade deposit of magnesite. Since magnesite is preferred over dolomite and would replace dolomite, if cheap enough, this is a real economic advantage. The Chewelah deposit, Stevens County, Washington, contains 7,000,000 tons that have the following analysis: MgO 85.5 per cent; CaO 3.4 per cent; SiO2 6.5 per cent; Fe2O3 and Al2O3 7.25 per cent; ignition loss 0.5 per cent. The material is admirably suited for the manufacture of magnesia brick. Because of the small market, calcined magnesite is now sold for $22.00 f.o.b. Chewelah and can be delivered for $25.00 a ton. If 20,000 tons a year of magnesite are used, it should be delivered to Bonneville for not more than $7.00 a ton, and dead-burned and made into brick for $2.00 a ton, thus affording a supply at less than one-half that available to present iron and steel manufacturers.

(11) Silica. - The ores are self-fluxing and the recommended coke contains 8 per cent silica. Hence little silica will be required to flux the ores. However, the acid process is preferred in the electric furnace but is not used because of its high cost. The amount that might be required would be about 10,000 tons of silica a year. A deposit near Denison (Spokane County) Washington, appears to be the only available source and its size and quality remain to be proven. If reports are true, it contains 500,000 tons of quartz - a quantity sufficient to serve for fifty years.

(12) Fire clays. - From Mica, Washington, along the State boundary to Moscow, Idaho, are a number of deposits of fire clays that have the following analysis: Silica 47.3 per cent; alumina 37.8 per cent; ferric iron 0.9 per cent; magnesia 0.1 per cent; lime 0.1 per cent; water 0.3 per cent; titania 0.9 per cent; ignition loss 12.6 per cent. The clay has been sold for $11.44 a ton, which is too high a price. Foreign fire clays, as well as California fire clays, can be imported at a lower cost.

It is probable, however, that a steady market, created by an iron and steel industry, will enable the Washington producers to deliver fire clay to Portland for about $6.00 a ton.

(13) Chromite. - About 2,500 tons a year may be needed. The reserves in Alaska, British Columbia and the Western States is 1,000,000 tons. Most of these deposits

are too small to be mined and shipped at a low cost. Deposits at Port Chatham and Rc Mountain, Kenai Penensula, Alaska, contain 240,000 tons of 45 per cent Cr_2O_3 that should be delivered to Portland at a cost of $10.00 a ton.

The foreign sources of present supply for eastern furnaces are as near or nearer to the Pacific Coast than to the eastern coast and some of these can deliver chromite as return ballast cargo on lumber and wheat ships at a lower cost than they can deliver it to the present iron plants of the eastern coast.

(14) Manganese. - About 18,000 tons of ore of over 35 per cent manganese may be required by an iron and steel plant at Bonneville. No known deposits of high grade ore occur in the western states that can be mined cheaply or transported at a low cos

Very large and high grade deposits exist in India and Chile. India has an established industry and has for a long time supplied foreign markets, including that of the United States. The known ores carry 48-50 per cent manganese. They should be delivered on returning lumber and wheat ships at 17 cents a unit which is several cents lower than eastern producers pay for their supply.

(15) Costs. - The estimated costs of raw mineral supplies, laid down in Portlan are as follows:

Iron ore, 60 per cent metallic iron, Bessemer grade, a ton..	$ 4.50
Coke, 81 per cent fixed carbon, a ton	6.50
Limestone, 90 per cent $CaCO_3$, a ton	2.50
Dolomite, raw, a ton	3.75
Dolomite, Calcined, a ton	7.50
Magnesite, raw, a ton	7.00
Magnesite, calcined, a ton	9.00
Silica rock, a ton	6.00
Chromite, 45 per cent Cr_2O_3, a ton	10.00
Manganese, 48-50 per cent Mn, a unit	0.17

If pig iron or hot metal is produced wholly from iron ore, the probable cost of raw minerals will be:

1.66 ton 60 per cent iron ore at $4.50 a ton	$ 7.47
800 lbs. coke, 81 per cent fixed carbon at $6.50 a ton	2.60
1000 lbs. limestone, 98 per cent $CaCO_3$ at $2.50 a ton	1.25
Dolomite or magnesite	0.20
Chromite	0.06
Manganese	0.09
Total	$ 11.67

If the required iron ore tonnages are only 500 tons a day and the other mineral supplies are of the same proportionate order, the costs per ton of raw minerals will be:

Iron ore	$ 5.25
Coke	7.00

If only 250 tons of iron ore are required, the costs per ton will be only:

Iron ore	$ 5.50
Coke	7.25
Limestone	2.75
Dolomite	4.25

If 100 tons of iron ore are required the costs per ton will be:

Iron ore	$ 6.50
Coke	7.50
Limestone	3.00
Dolomite	4.25
Dead-burned magnesite	20.00

Consequently the smallest scale of operation for successful iron smelting plants demands the consumption of 1,000 tons of iron ore a day.

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol. 2 - No. 4 Portland, Oregon February 21, 1936

FIRST ANNUAL MEETING

of
The Geological Society of the Oregon Country

NORTONIA HOTEL - PORTLAND, OREGON

THURSDAY - FEBRUARY 27, 1936

SAVE THIS DATE

The following program has been arranged:

6:00 to 6:30 P.M. Business Meeting
6:30 to 8:00 P.M. Dinner

Announcement of Insignia for Society - Gerry Kimbrell

8:00 to 10:00 P.M. Address by Dr. E.T. Hodge, Retiring President
Address by Mr. C.D. Phillips, Incoming President
Speaker of the Evening - L.A. McNary, Historian
Toastmaster - K.N. Phillips

Stunts - Movies - Liars contest (all be prepared to tell one) - Music - 5 piece orchestra - group picture.

And all for the price of $1.00 - Informal

Cards for reservations will be mailed early in February to all members.

Mrs. R.R. Poppleton, Chairman Social Committee
Mr. J. Wimmer, Chairman Annual Meeting Committee

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FIELD TRIP

March 15, Vancouver, Washington, and vicinity.
Mr. Claire Holdredge, leader of this trip has been making extensive explorations and will show and explain many things of great interest to all who want to know about their own country.

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A PROPOSED CONSTITUTIONAL CHANGE

The executive committee recommends to the society,

(1) that the annual dues be changed from $2.50 a year to $3.50 a year effective March 1, 1936.

(2) that these dues shall include a membership for the wife but for no other adult member of the family.

(3) that the dues for Junior members remain unchanged and remain at $1.00 a year but that no bulletin be sent to Junior members.

(4) that the above dues shall include free admission to all lectures, free attendance on all trips and a years subscription to the bulletin.

(5) that membership or guest cards be required by all who attend lectures, and

(6) that trip fees be strictly enforced for non-members.

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THE LAND OF MYSTERY

Southeastern Oregon is a land of mystery for most Oregonians. Hence great interest has been aroused by the announcement of the lecture, March 12 by Arthur M. Piper on The Harney Country.

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GET ACQUAINTED WITH THEM

The addition of every new professional geologist to the Oregon Country is evidence of the awakening of interest by our people in the geological foundation upon which the Oregon Country is built. We welcome these professional geologists because of the researches that will come from their work, because of the contributions they will offer to our Bulletin and because of the leadership they will give to our society.

Arthur L. Piper, geologist Ground Water Division, United States Geological Survey. Mr. Piper has established an office at 516 Couch Building. He will supervise the investigations made by the U. S. Geological Survey in the Northwestern States.

Dr. Thomas Thayer is a new geologist added to the geological staff of Bonneville Dam. Dr. Thayer took his undergraduate work at the University of Oregon and has done advanced work at the University of Cincinnati, Northwestern University and at California Institute of Technology, where he obtained his doctorate degree. He also has done work for the United States Geological Survey in California and Oregon.

His addition to the Bonneville staff is an indication that this is one great engineering project where they have made every effort to ensure complete success by a thorough study of the geological factors involved.

Mr. Ray Treasher. The Oregon State Planning Board is making an investigation of all the sources of information on the economic geological and mineral resources of Oregon. This information will be tabulated and published. Mr. Treasher is in charge of this investigation.

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ENGINEERS OF MINES AND GEOLOGISTS

The function of the geologist is to determine the kind, quality, extent and distribution of the minerals and the rocks that lie beneath the surface of the earth.

The function of the engineer of mines is to extract, bring to the surface and place at the mill, smelter, or buyer the minerals and rocks after the facts of occurrence have been furnished to him by the geologist.

Some men are both geologists and mining engineers. In the olden days all miners were possessed of the technology in both fields. However it takes two different types of minds to do the two rather divers functions. The geologist has an analytical mind; the engineer a synthetic mind.

In this day of specialization no geologist pretends to be a mining engineer and no engineer lays claim to geological training.

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STATE GEOLOGISTS AND MINERALOGISTS

Most states of the Union have state geologists. California has a state mineralogist. Well established state geological surveys and the United States Geological Survey had been in existence before California became a mining state.

After minerals, other than placer gold began to be sought in California the miners sought some means to determine the many unusual minerals that occur within the boundaries of our southern neighbor. California set up an assay office for that purpose. As time passed the office expanded but the man in charge has always been called a "mineralogist".

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MINERALOGY AND GEOLOGY

To the mineralogist and the geologist there is no doubt about the meaning of these words. They both accept the standard dictionary and encyclopedic definitions;

Geology is the science of the earth - the whole earth.
Mineralogy is one of the specialties within the field of geology and is the science of minerals. Other specialties in the field of geology are:
Petrography - the science of rocks
Paleontology - the science of fossils
Paleoanthropology - the science of fossil man
Meteorology - the science of the atmosphere, and many others.

The field is so large that most geologists specialize in some field. Thus, Drs. Wilkinson, Lazell and Dake specialize in the field of minerals, Dr. Packard in paleontology, etc.

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ENGINEERS OF MINES IN OREGON

Oregon has been backward in the development of her mineral resources, hence the opportunities for professional activity in mining has and still is limited. Yet once a man has been infected with the ore hunting fever he never recovers. Thus a number of mining engineers in Oregon and now engaged in other activities have retained a deep interest in mining. The consequence is that the Oregon section of the American Institute of Mining and Metallurgical Engineers have kept alive a section. Below are the officers and members of the Oregon Section. Those double starred names are members of our geological society and singly starred were men trained as geologists.

Officers and Directors

Herbert F. Byram, Chairman, 375 Edgecliff Road, Portland, Oregon
F. Whalley Watson, Vice-Chairman, 437 N. W. 16th Ave., Portland, Oregon
James H. Batcheller, Corvallis, Oregon.
Pierre R. Hines, Portland, Oregon
Alton E. Klitz, Portland, Oregon

Washington

Seattle	Roberts, Milnor	Mining Dept., Univ. of Wash.

Northwestern Oregon

Bonneville	Peacock, D. C., Jr.	Columbia Construction Co.
Carlton	Dennis, William B.	
Corvallis	**Allison, Ira S.	2210 Van Buren Street
	**Swartley, Arthur M.	510 N. Fifth Street
Eugene	Betts, Robert M.	Miner Building
	Moye, Bertch W.	1507 Walnut Street
Hillsboro	*Reynolds, W. Reginald	1265 Fifth Street
Portland	Byram, H. F.	375 Edgecliff Road
	Cappa, Francis X.	5715 S. E. Taylor Street
	Cook, Frederick S.	2221 N. Albina Avenue
	Cox, W. Ray	560 Elizabeth Street
	Davis, Loveratt	812 American Bank Bldg.
	Elmer, William W.	404 Fitzpatrick Building
	**Felts, Wayne H.	8005 N. Delaware Avenue
	*Gamer, Robert	2442 S. E. 11th Avenue
	Hines, Pierre R.	Box 293, Old P. O. Bldg.
	**Hodge, Edwin T.	2915 N. W. Luray Terrace
	Klitz, Alton E.	1006 Porter Building
	Schultz, Earl G.	5137 N. E. Wistaria Ave.
	Shumaker, Henry E.	3141 N. E. 73rd Avenue
	Strowger, A. W.	1208 American Bank Bldg.
	Watson, F. Whalley	437 N. W. 16th Street
Sherwood	Ledesma, Honorato	Route 1, Box 3
Corvallis	Batcheller, J. H.	

Eastern Oregon

Cornucopia	Herdlick, Jared A.	Cornucopia Gold Mines
Haines	Wimber, Raymond E.	Highland Mine

Southeastern Oregon

Central Point	McCaskey H. D.	Bora da Orchards
Disston	Sheythe, Donald E.	Noonday Mine
Grants Pass	Derwent, Ernest	811 E. "D" Street
	Leeson, Grant	817 Orchard Avenue
	Robertson, Jasper T.	Box 388
Medford	Burch, Albert	Black Oak Ranch
	McCormick, D. Ford	Box 1038
Rogue River	Ferry, Douglass, H.	

Affiliate Members

Eugene	**Smith, Dr. W. D.	1941 University Street
Disston	Watkins, Kenneth	
Portland	Brandes, A. C.	615 E. 32nd Avenue
	Friedle, Frank J.	345 . 10th Avenue
	Haas, J. C.	Porter Building
	Irion, Don G.	3231 N. E. Shaver St.
	Mears, H. S.	349 Montgomery Drive

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GEOLOGICAL WORK ON THE WILLAMETTE RIVER

The U. S. Engineers are making a study of the Willamette basin for the purpose of flood control. The plan is based upon the theory that much of the rainfall can be held back in storage reservoirs. Whether this is sound geology may be questioned by many. If sound, its success will depend wholly upon the integrity of the dams which hold back the storage waters. If the dams fail the water of the reservoir will be let loose suddenly and may result in great loss of life and property.

A search at present is being made for places where dams may be safely built. This necessarily must be done largely by drilling. The following young geologists are inspectors of the drilling: Ernest McKittrick, Robert Gamer, Monty Stone, and Allan Griggs.

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WILLAMETTE SOUND

January 9, 1936, Dr. Ira S. Allison addressed a very large audience (250) on Willamette Sound. Professor Allison stated that Professor Condon's theory of a sound could not be accepted because of the absence of sea cliff, beaches or evidence of wave work within the valley. He presented the theory that a flood or floods came down the Columbia River with such violence that the waters backed up Willamette Valley as far as Eugene. These waters carried silts and icebergs. The waters were not turbulent because they did not disturb the old soils of the valley floor and yet they had sufficient velocity to float icebergs to the tops of the hills near Eugene. The silts settled over the valley floor and the icebergs melted and dropped glacial erratics. He showed a map of the erratics just noticed by Condon, later by Diller and still later by many other geologists.

Dr. Allison also read a list of fossil remains of vertebrates that have been found on the valley floor. He stated that most of the finds are useless because of the incomplete information on their exact occurrence. Nevertheless, he gave the audience the impression that at the time of his floods that giant sloths, mastodon and elephants lived in the valley. The lecturer did not explain why the water flooded the valley without rushing on out to sea nor what the causes of the floods were.

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CORVALLIS, ALBANY AND JEFFERSON GEOLOGICAL TOUR

November 23rd, 1935. Professor Ira Allison, Leader.

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Sunday morning, November 23rd, seventy five members of the Geological Society of the Oregon Country assembled in front of the Mines Building on the Oregon State College campus, for a geological tour in the vicinity of Corvallis, Albany and Jefferson, Oregon. Professor Allison, leader of the group, lectured on the geology of the areas visited.

The twenty-one car caravan first drove north on the West Side Pacific Highway making their first stop at a road cut about four miles from Corvallis. At this point the tuffaceous sandstone shales of the Eocene Age were observed. In a continuation of the road cut, about 150 feet away, and under a hematite-stained soil, were old broken down gravels said to be a part of a gravel sheet that existed in the Willamette Valley in Middle Pleistocene times.

About a quarter of a mile down the road the silt soil containing small granite glacial erratics was pointed out. The erratics were carried into the Willamette Valley by the backwater from the Columbia River during the Glacial Period and they can be found up to an elevation of about 400 feet. At a road cut about two miles north on the highway some hematite deposits were seen and some interesting samples were picked up.

About six and a half miles north of Corvallis the party turned east on the road toward Albany. At different points along this road Dr. Allison pointed out more quartzite and granitic glacial erratics. One of these granite erratics noted was about five feet in diameter and another showed glacial striae very clearly.

To prove his statement that deposits in this locality were water laid, Professor Allison stopped at one road cut north of Albany and dug out fossil clam and snail shells. No fossils of that "funny little fish that is built like a nut" were found, however.

The caravan proceeded on through Albany to a brick yard east of town. It was explained that in this area are silt deposits similar to those that were seen near Corvallis and which covered the Santiam gravels about fifteen feet in this locality.

An exposure of light colored tuffaceous sandstone shales on the west side of Knox's Butte was observed. These shales were said to be water laid deposits of the Oligocene Period. Knox's Butte is capped by a layer of basalt as are many of the other peaks in this district.

The next stop was in a cemetery on a hill east of Jefferson. Here were revealed some broken down gravels similar to those seen earlier in the day. However, it might be well to mention that no "fossils" were dug up, nor were samples of marble and granite, bearing dates, carried away as specimens!

The next place of interest to be seen was a barren pit, located on the road between Jefferson and Turner, which had been used by the railroad. The wall of this pit showed volcanic breccia lying between layers of basaltic lavas. The breccia was formed from oxidized glassy and frothy volcanic materials and is of a golden brown color. Upon close examination small particles of black glass can be seen. Hydrothermal alteration has taken place in many parts of the breccia and can be traced by its green, vein-like appearance.

At this point the party officially disbanded. The many members of the group extend their thanks and appreciation to Professor Allison for a most interesting and enjoyable trip.

Reported by J. R. Collins.

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol. 2 - No. 5 Portland, Oregon March 9, 1936

SPECIAL NOTICE

CHANGE OF MEETING PLACE

Beginning with the next meeting, and until further notice, the Society will hold its meetings in the Auditorium of the Public Library. The exhibits will be on display at 7:30 P.M. and after the lecture.

LECTURE

March 12 - Mr. Arthur M. Piper, geologist in charge of ground water division of the United States Geological Survey, will lecture before the Society on the Harney Country. Mr. Piper has made a thorough study of this little-known part of Oregon and will speak authoritatively and interestingly.

FIELD TRIP

March 15 - Vancouver, Washington, and vicinity. Leader, Mr. Clair Holdredge. The itinerary will be announced at the meeting on March 12.

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OUR SOCIETY EDUCATIONAL PROGRAM

The Geological Society of the Oregon Country will sponser two educational courses as given by the Portland Extension Center.

G 321. Elements of structural Geology - By Dr. W. D. Wilkinson

The course in structural geology is designed for those who have had a course in general geology or rocks and minerals. It will consider the details of major structures such as anticlines, synclines, faults, and so forth. As well as the equally important minor structures, special attention will be given to the methods of field recognition and to the economic importance of structural earth features.

The course is attracting much attention from our advanced students and promises to be very popular.

Class meets Monday evenings at 7:15 P.M. - Lincoln High School, classes begin March 23.

G 352. Geology of Oregon - Dr. Edwin T. Hodge

The course deals with the ancient geologic history of Oregon. It is an explanation of the mineral resources, ground waters, scenic and other economic resources as well as the general physical basis upon which the Oregon industrial and cultural development is based.

Class meets Wednesday evenings at 7:15 P.M. - Lincoln High School, classes begin March 25.

SECTIONAL AERONAUTICAL CHARTS

The sectional aeronautical charts published by the Coast and Geodetic Survey, U. S. Department of Commerce, are the best generalized maps showing the larger relief (surface) features available of the Pacific Northwest.

PORTLAND. December 1936. Scale, 1 : 500,000. Size, 20 by 33 inches. Price, 40 cents; 25 cents in lots of 20.

SEATTLE. January 1936. Scale, 1 : 500,000. Size, 22 by 32 inches. Price, 40 cents; 25 cents in lots of 20.

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FUTURE LECTURES AND TRIPS

April 12 - W. L. Powers, Professor of Soils, Oregon State College, will lead a trip to the type soil localities in the vicinity of Portland.

May 14 - Dr. Ethel Sanborn will lecture on the Ancient Forests of Oregon.

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Dues are now payable for the next fiscal year which begins March 1, 1936. One bulletin will be mailed out in March to those who are delinquent after which no bulletin will be mailed until dues are paid.

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A copy of the Bibliography of Oregon Geology will be mailed to each person who is a member of the society on the second week in March. Additional copies of this bibliography may be purchased at $1.00 a copy from the Secretary.

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CAVES AND CAVE DWELLERS

Resume of Lecture
by
Dr. Samuel M. Mayfield

Caves and caverns have always been interesting and useful topographic features. Evidently man did not live in caves in the earliest stages of his prehistory. This is regretable because the physical and chemical conditions which exist in caves are highly favorable to the long time preservation of human remains. In Europe, and probably in other parts of the world, men first took up their abode in caves toward the close of the last inter-glacial stage of the glacial period, approximately fifty thousand years ago. They did this in response to the rigorous climatic conditions brought on by the last great glacial advance.

From the time when men began to live underground, down almost to the present, the deposits of earth, sand and rock on cavern floors throughout the inhabited world have served as filing cases for preserving the records of man's life and progress. Thus the story of Neanderthal and Cro-Magnon was filed away in the stratified deposits in the caves of Germany and France, and the cliff dwellings of our own Southwest, including Mesa Verde, tell us of a people who were gone and forgotten before Columbus came to America.

Caves, natural and artificial, still serve as the homes of people in many parts of the world. For example, many people live in homes carved out of the chalk beds in Northern France, the loess deposits of Western China and the earth and rock of Northern Africa. Our modern buildings may be regarded as artificial caves.

Caverns are places of retreat for various forms of life. The most noticeable of those are bats, sightless crickets and blind fish.

Among the economic products of caves are bat guano, travertine or "Mexican Onyx", nitrates, water, ores in certain places, ice from ice caves and cave air which might be used in air conditioning in buildings. However, the scenic value of caves far outweighs all the others.

Caves are formed in a variety of materials and locations and by several different agents. There are sea caves excavated by the waves at the bases of sea cliffs. Melting by running water may form ice caverns in glaciers. Small caverns may occur behind waterfalls, where spray grom falling water saps weak rock from beneath more resistent beds as at Multnomah Falls and the Cave of the Winds at Niagara. Lava caves and tunnels are the result of lava freezing on all sides of a central core which remains molten. Later the central liquid mass breaks out at some point and flows away leaving a cavern or tunnel. Sandstone caves or rock shelters like those at Mesa Verde are formed on the sides of canyons by the erosion of weak strata from beneath resistent sandstone. There are caverns of solution in beds of gypsum and rock salt. Extensive artificial caves in various places are the result of man's mining and construction.

The most important type of large natural underground cavities is the limestone cavern which is the result of solution of beds of limestone by ground water charged with carbon dioxide. The best known examples of this type are Mammoth cave and Carlsbad Cavern.

Where limestone formations have a nearly flat upper surface, a large part of the surface water enters the rock by way of the joint spaces which it soon widens by solution into broad crevices with well rounded shoulders. At joint intersections solution of the limestone is so favored that the water may here descend in a sort of vertical shaft until it meets a bedding plane extending laterally and offering more favorable conditions for corrosion. Its journey now begins in a lateral direction and, solution of the rock continuing, a tunnel may be etched out and extended until another joint is encountered which is favorable to its further dexcent into the formation. By this process on alternating shafts and galleries the water descends to near the surface of the water table by a series of steps, and is eventually discharged into the river system of the district. Within the larger caverns, the water at the lowest level usually flows as a subterranean river to emerge into the light from beneath a rock arch.

From a plan of a system of connecting caverns it may often be observed that the galleries of the several levels are directed along two rectangular directions which indicates control by the main joints within the limestone formation.

By the above described process of limestone cavern formation all levels of a cavern system are developed above the ground water table and all at the same time. Another theory calls for the development of one level at a time at the water table. The successive levels being the result of successive downward shifts of the groundwater table in response to the downcutting of the master stream of the district and upward movements of the earth. According to a third theory all the levels of a cavern may develop at the same time and while all are entirely below the groundwater table. Later uplift and erosion may bring them above the water table.

Above the caverns of limestone formations there are selected points where the descending water dissolves out funnel-shaped depressions called sinks. Sinks are also formed by the caving in of the roofs of caverns.

When a cave becomes dry, because of the withdrawal of water to lower levels, deposition of lime carbonate begins. Loss of carbon dioxide and evaporation of the water causes this deposition. These deposits assume many interesting and beautiful forms. Among the most common forms are stalactites and stalagmites. A stalactite may start from a drop of water leaking through the roof of a cave. Lime carbonate is deposited about the margin of the drop in the form of a ring. Successive drops make deposits on the lower edge of the ring which grows downward into a hollow tube. Deposition in the tube may ultimately close it, while deposition from water trickling down its outside may greatly enlarge it. By deposition from water dripping onto the floor stalagmites may be built upward, even joining the stalactites to form columns. The deposits sometimes take the form of hangings and draperies of the most fantastic and beautiful designs. Alabaster, "gypsum flowers" and helectites are peculiar forms of deposition from cave water solutions.

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NEWBERG TRIP, FEBRUARY 15th, 1936

Nine o'clock Sunday found over a score of shivering geologists waiting for the shove-off for the Newberg trip. Harry Clark was to meet us at Six Corners at 9:30 but it seems that -- well, Harry said he couldn't start his car. Once I ran into a door and reported a beautiful black eye, but that is another story.

First stop was Pacific College, Newberg. This account is written up elsewhere. Professor Macey joined the party here and in the absence of Mr. Clark, agreed to guide the party. We stopped to pick up Mrs. Elliott, first student of our Doctor Condon. Although quite elderly, she never missed a stop and no hike was too long or too difficult for her. She was a real inspiration to the rest of us.

Our first field stop was at the Willamette River bridge. While a cutting wind fairly took the words out of his mouth, Dr. Hodge explained the general situation. The northward flowing Willamette fails to maintain its course, turns sharply to the east around Parrott Mt. before it resumes its northward journey over its rocky trail at Oregon City. What caused it to make this abrupt turn, instead of continuing northward was the main objective of the trip. Dr. Hodge pointed out that Newberg stood on an old terrace at an elevation of about 200 feet. A well dug here struck a log 200 feet down and quit in sandstone at 500 feet because of salt water. He digressed a moment to conjecture that perhaps this salt water was some of the original sea water entrapped in the sandstone millions of years ago.

The well log was used to support the contention that Newberg and the Chehalem valley is old river fill. If the river once was at this level, why did it not continue northward? Professor Macey pointed out that Old Timers claim that in times of extreme high water the Tualatin spills over into the Chehalem and thus into the Willamette. Three higher, distinct terraces were noted which further mystified the crew.

We rushed back to our cars dodging the fire apparatus on its way to a rural fire. Only iron determination and a keen interest in geology kept the party from bolting to the fire.

On the side of Parrott Mt. Clark and Macey had located a granite erratic at an elevation of 325 feet. Dr. Hodge traced its history from the molten magma in northern Idaho to its final resting place. Many smaller erratics were found throughout the adjoining orchard. Specimens were mainly pegmatitic. As we were somewhat sheltered here we ate lunch and then took a short side trip to locate an artifact locality between Sec. 35-36, t. 3 S., R. 2 W. Time was not allotted for any search.

We drove to the top of Parrott Mt. where we had a wonderful view of Mts. Adams, Hood and Jefferson. Dr. Hodge pointed out the even slope between the Willamette and the Clackamas, suggestive of an alluvial fan, composed of Troutdale formation. This is in the area which Dr. Hodge feels carried the old Columbia River. A short trip took us to a westward view of the Chehalem valley. The steep west slope and gentle east slope of Parrott Mt., and its continuation, Chehalem Mt., is suggestive (1) of faulting and tilting to the eastward and northward, (2) erosion along the crest of an anticline. The former seemed more feasible expecially after Professor Macey pointed out that ranges to the west also had this same steep westward slope.

Dr. Hodge's hypothesis was that the entire area was siltfilled from the east. That the Tualatin flowed southward through the Chehalem valley. As erosion proceeded, an eastward flowing stream pirated the Tualatin and the Chehalem alone occupied the former channel. This channel is far too wide and broad to be the work of the feeble Chehalem.

From here we went westward to some fossil localities. An old coal prospect, on a terrace 100 feet above the valley was observed. No coal of appreciable quantity was found. Silt was observed and the dump showed fossiliferous sandstone from the bottom of the shaft. The next stop at the farm of John Smith, where a southwest dipping sandstone containing shell fragments in abundance was found. Still further west we ascended a terrace 350 feet above the valley, where numerous erratics were found, some of these of considerable size. From here we could see the locality of a previous oil (?) well. Mr. Wade, manager of the farm, told us this well had been drilled over 32 years ago to a depth of 1200 feet and that the casing still stands above ground. We further observed evidence supporting the idea that the valley was once filled. The Chehalem valley comes from the northward in a flat col, too wide a valley for this minor stream to cut. The decisive speech of all concerned on this trip was a feature, they fairly bit off their words; through chattering teeth.

Dr. Hodge explained that the tributary to the present Tualatin which occupies the channel formerly used by the Tualatin, could not move the quantities of silt which it formerly did. Tributary streams coming into it, still carried their usual large amount of suspended material which the parent tributary could not handle. This caused the damming of the stream, forming Wapato Lake.

A stop was made at a basalt quarry where road metal was taken from a southwest dipping sill of basalt. From there to another old coal mine where evidence of spontaneous firing of the coal seam was noticed, caused by heat generated from oxidizing pyrite. Our Newberg party left us here and we swung over to the Tualatin valley on our way to Portland.

We might say in passing that Harry Clark joined our party as we were preparing to leave Pacific College for the field trip.

We want to congratulate Harry and Professor Macey on the trip they had scouted. The day was ideally clear. The sun did its best to make us comfortable although the wind did its best otherwise. There were more than thirty people on the trip despite the cold not a car left the party until the official disbanding in the gloom of that February evening. In spite of the discomfort experienced by all, the trip was well worth while in clearing another window through which we can look into the past of our Oregon country.

Ray C. Treasher

PACIFIC COLLEGE MUSEUM

The first stop of the day was at Pacific College at Newberg where President Pennington and Professor Macoy conducted us through the college museum which, though small, has many items of great interest.

The first object to attract our attention was a large linen tapestry on the wall of the main hallway. It was woven by a congregation of Quakers in Ireland for the Centennial Exposition at Philadelphia in 1876. It depicts William Penn's treaty with the Indians. President Pennington is authority for the statement that this treaty is the only one ever made with the Indians which was not ratified by an oath and the only one that was ever kept, unbroken.

In the museum itself, probably the most interesting object from a historical standpoint is a small printing press which was used by Mr. Pittock when he was state printer of Oregon.

There is also much of a geological interest in the museum, several sections of jaw bones with teeth intact of mammoth and mastodon with a section of the trunk from one of these animals as well as several leg bones. These were obtained from the Willamette River at Aurora and at Ash Island a mile above Newberg.

Another curious diplay is a section of a tree with a rock imbedded in it. The tree having grown completely around the rock.

One case contains Indian basket and pottery work from Mexico.

Another case contains Indian artifacts mostly picked up around the town of Gaston, mortars and pestles of several sizes and shapes, one stone paint mixing bowl, rubbing stones and war clubs. In this collection is a skull from the Grand Ronde Indian Reservation which is remarkable from the fact that it has a perfect set of teeth in it. One dentist in the party remarked that he had examined in his lifetime twenty six thousand sets of teeth and he had seen only seven perfect sets; this was one of them. A fine reptile skull, probably an ichthyosaur, from eastern Oregon is one of their rare treasures.

The party was much interested in a three foot section of a carboniferous fern from the coal measures of Pennsylvania. And finally but by no means of least importance was a handful of coarse hair from a mastodon dug out of the ice in Alaska.

H. L. Jennison

BUSINESS MEETING OF SOCIETY

The First Annual Business Meeting of the Society was held at the Nortonia Hotel in a room adjoining the banquet hall. The meeting was called to order by Dr. Hodge.

Several measures of importance to the Society were passed and other items of interest were discussed.

The Committee on Insignia for the Society reported that Frank Bigler was the winner of the contest, but the selection of the insignia had been postponed for a few weeks.

Miss Neff read the financial report which was adopted.

At the request of the Treasurer and Auditing Committee was authorized.

The Society moved to incorporate.

The Society voted (1) to raise the annual dues from $2.50 to $3.50 a year effective March 1, 1936 (2)that these dues shall include a membership for the wife, but for no other adult member of the family (3) that the dues for junior members remain unchanged and remain at $1.00 a year but that no bulletins be sent to junior members.

The report of tellers showed that the regular ticket had been elected by an almost unanimous vote.

Clarence D. Phillips	President
J. C. Stevens	Vice President
Miss Lillian Neff	Secretary
Mrs. Mabel Smith	Treasurer
A. L. Pratt	Director

Meeting adjourned.

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FIRST ANNUAL BANQUET What date ?

MR. WIMMER and MRS. POPPLETON deserve great credit for the highly successful annual meeting. It will be remembered down through the years as a glorious and happy occasion. It gave eloquent evidence of the success of our Society. One hundred and forty four (144) people sat down to the banquet.

Toastmaster Ken Phillips officiated and introduced Dr. Arthur Jones who read a poem on Paleozoic love and as an encore sang a parody of geological importance. A liars contest was well manned, first prize going to the fluent Dr. Edwin Osgood. He received a rubber geologists pick for a reward. A number of impromptu (?) talks were given. Leslie Jewell, a bed time story, Leo Simond on leolites, A. D. Vance on "From Pectin to Certo", Dr. Arthur Jones, on "African Bones". Dr. Alice Bahrs responded to "The Amateur Geologist" and Miss Jessie M. Short on "Geology for Fun".

After a brief intermission an illustrated lecture by J. C. Stevens, showed some fauna of Willamette Sound, the likes of which the world has never seen, thank heaven. The discourse was cleverly prepared and a real contribution to fossil nonsense.

As retiring president, Dr. Edwin T. Hodge reviewed the work of the Society since its inception 10 months ago. Organized as a society for intellectual study it has organized the first lectures of their kind in Portland, the first geological trips of their nature, the development of a project at Mt. Tabor. Dr. Hodge paid his respects to the various members who have actively helped with the work of the Society. Toward the future attention should be paid to the establishment of new chapters, and a permanent museum of natural history. The amateur geologist is a "G - man", searching out evidence and intelligently learning of what he has found.

The Society in a special session called by Ken Phillips elected Dr. Hodge to honorary life membership as Honorary Fellow and presented him with a folder in which to file the Geological Society bulletins. These tokens carried with them the heartfelt thanks of an appreciative Society for his untiring interest.

Mr. C. D. Phillips, as incoming president, reviewed the constitution and by laws. He requested that every one should actively serve on a committee. If you are not assigned, offer your services. Incorporation was fortunate as it allows the Society to make contracts, to receive gifts and endowments, with no personal liability to individual members. The increase in dues will allow the Society to broaden the scope of its work. Our educational committee will arrange contacts with outside groups and supply speakers to attempt the organization and housing of a permanent museum. There are people who might be interested in endowing the Society. On our trips this year, the establishment of a noon commissary will be attempted. Mr. Phillips discussed the joys of amateur geology as a means of using our own leisure time and also as interesting new members.

Toastmaster Phillips said he regretted to announce that Mr. L. A. McNary, Society Historian and Speaker of the Evening, was ill and unable to be with us.

Ken Phillips had been using a geologist's pick as a gavel. This pick was Dr. Condon's, loaned by his grandson, Commissioner Bean. Commissioner Bean briefly reviewed Dr. Condon's life. Born in south of Ireland 1822, landed in New York in 1833, lived on a farm where Central Park now is. Graduated from Auburn Theological Seminary in 1852 and came to St. Helens, Oregon, stayed there 2 years, then to Forest Grove 2 years, then to The Dalles where he became interested in geology. In 1866 took chair of geology at Pacific University. In 1872 state legislature created position of State Geologist for Dr. Condon. In 1876, Dr. Condon went to the University of Oregon where he taught for 28 years. Died in 1907 - 84 years of age.

Mr. Bigler was awarded the prize for the best design for a new emblem.

Two reels of movies, "The Recent Eruption of Marina Loa", were shown through the courtesy of Mr. Renton. A group picture was taken by Leo Simon and the first annual meeting of the Geological Society of the Oregon Country came to a close.

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NEW MEMBERS

Borum, C. J.	2235 N. E. 28th Avenue	Portland, Oregon
Ellis, Dr. R. H.	1863 S. W. Montgomery Drive	Portland, Oregon
Elmer, W. W. Jr.,	c/o U. S. Engineers Department	Bonneville, Oregon
Morehouse, A. K.	016 S. W. Bancroft Street	Portland, Oregon
Nelson, Clara	9529 N. Edison Street	Portland, Oregon
Olson, James C.	2700 S. W. Patton Road	Portland, Oregon
Phillips, Mildred T.	3111 N. E. 29th Avenue	Portland, Oregon
Schaffarzich, Nola	829 S. E. 15th Avenue	Portland, Oregon
Valdemar, Lidell H.	427 S. W. Broadway	Portland, Oregon

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CHANGE OF ADDRESSES

Meierjurgen, Herman	815 East 4th Street	Tillamook, Oregon
Compton, Louise H.	New Heathman Hotel	Portland, Oregon
Rydell, L. E.	1060 Olive Street	Eugene, Oregon
Barnes, Dr. Farrel F.	U. S. Soil Conservation Service	Campo, California

15 new members

LEFT OFF OF LAST LIST

Martin, Dr. Geo.	University Club	Portland, Oregon
St Arnauld, Mary	St Frances Hotel	Portland, Oregon

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NOTICE

Any member of the Geological Society whose mailing address has been changed or who is not now receiving the paper, please notify Raymond L. Baldwin, GA 6055, evenings. We want to correct our mailing list and this is the only way of our knowing whether you are receiving the bulletin or not.

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol. 2 - No. 6 Portland, Oregon March 9, 1936

LECTURES

The Geological Society of the Oregon Country will present five short reels of particular geologic interest Thursday evening, March 26th at 8 o'clock in Central Library Hall.

The films which have sound narrative accompaniment will picture natural geological features applicable to the following subjects:

The Earth's Rocky Crust
The Work of Rivers
Ground Water
Volcanoes in Action
Singing Waters

Animated diagrams and models are employed in the explanation of the laws governing the natural phenomena and to present the subject matter more clearly.

The films have been produced by Erpi Picture Consultants definitely for educational purposes under the sponsorship of leading educators and, with the exception of Singing Waters, in co-operation with the University of Chicago and Harvard.

Singing Waters is a showing of beautiful water falls with the accompanying sound narrative recorded by Oregon's own Frank Branch Riley.

In addition to above Mr. Harold B. Schminky will show some more of his interesting pictures taken on last summer's field trips.

The first four subjects have never been shown before in Portland, and an evening of excellent entertainment and rare educational value is assured.

The E. H. Rockwell collection of nodules will be presented beginning at 7:30 P.M. This showing is reported as even more spectacular than the wonderful display of geodes exhibited by Mr. Rockwell at the meeting of January 23rd.

May 14 - Dr. Ethel Sanborn will lecture on the Ancient Forests of Oregon.

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FIELD TRIP

April 12th - W. L. Powers, Professor of Soils, Oregon State College, will lead a trip to the type soil localities in the vicinity of Portland.

EXHIBITS OF THE MEETING OF FEBRUARY 13TH

The Society was treated to an exceptional exhibit of pottery and other artifacts of ancient peoples, many of whom were cave dwellers, at the meeting at which Dr. S. M. Mayfield gave his interesting talk on "Caves and Cave Dwellers".

Mr. Thomas A. Carney, in his own inimitable and pleasing style, presented an exhibit of Indian pottery of the Southwest consisting of a rare food container and ceremonial water jug, and a series of pieces of pottery running from the very early type of pottery down to the early Pueblo Indian types. Also, and an item that attracted considerable attention, was a piece of perfectly preserved cooked corn which had been removed from one of the pit fires of these ancient Indians. The rather quaintly made food container was an excellent example of the pottery made by the late Basket Makers, a people that lived in pit houses on the Mesa tops probably 2000 years before the time of the Cliff Dwellers, in what is now known as the Mesa Verde National Park in Colorado. As their name indicates, the Basket Maker people used baskets for domestic purposes, even for cooking, and only toward the latter part of their existence did they learn to make and use pottery. The food container was probably 3000 or more years old. The attractive and odd shaped water jug was the workmanship of the Cliff Dwellers and it was obvious that a great advancement had been made in the art of pottery making as this jug was better formed and considerably smoother. From the shape it is assumed that it was associated with ceremonial work and its probable age is about 900 years. Mr. Carney also painted the scene that served as a background to his exhibit and it portrayed in a colorfull manner a view from the Mesa Verde National Park.

The very interesting exhibit presented by Mr. F. R. Williamson consisted of the following; a flint axe from the Ohio Mound Builders; a discoidal stone from Washington; perforated and grooved sinkers from California; stone axes from New Mexico and Iowa; two paint pots, one of which was found near The Dalles and was of particular interest as it was carved in the form of a parrot-like bird; large spear points from Oregon, Iowa and Washington; a stone knife from North Carolina; a very ancient stone axe which was found near Albany, Oregon, and was made by chipping instead of the later used polishing methods. Last and very mystifying was the unusual hook-like stone implement that is yet to be identified, and the story behind the finding of this strange relic is equally as odd as the artifact itself. All of these items were perfectly preserved and presented a very fine exhibit.

The Society is deeply indebted to Messrs. Carney and Williamson for their efforts in furnishing us these very timely and appropriate exhibits.

EXCERPTS FROM MR. WIMMER'S REPORT TO PRESIDENT PHILLIPS ON OUR ANNUAL BANQUET

"The following committee members made the meeting a success:

Social Committee	Annual Meeting Committee
Mrs. G. M. Poppleton, Chairman	Mrs. N. Kurtichanoff
Miss I. L. Poppleton	Miss G. N. Teeters
Mrs. L. B. MacNab	Mr. R. J. Collins
Mr. L. Nowell	Mr. K. N. Phillips
Mr. F. Bigler	Mr. P. Randolph
	Mr. Tracy Wade

To the following credit is due for the items shown:

The music was furnished thru the courtesy of Mr. E. R. Corson of the Pacific Telephone & Telegraph Company (non-member).

The screen was loaned by Mr. Wm. Mackenzie, Jr.

The projection machine was loaned by Mr. H. B. Schminky.

Edwin T. Hodge, Editor
2915 N. W. Luray Terrace,
Portland, Oregon

Raymond L. Baldwin, Business Manager
2725 N. E. 50th Avenue,
Portland, Oregon

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Additional copies of this issue of bulletin containing "Bibleography of Oregon Geology, 1925 to 1936", may be purchased at $1.00 per copy.

All material for publication in bulletin should be sent to the Editor.

Address all other correspondence regarding bulletin and changes of address to the Business Manager.

The lantern was loaned by the Audubon Society thru the cooperation of Mr. Leo Simon.

The films were obtained thru the courtesy of Mr. J. L. Renton.

The mock geological pick was made and donated by Mr. R. J. Collins.

The place cards (18 polished geodes) were donated by Mr. E. H. Rockwell (non-member).

The letters and correspondence was prepared by Miss Lillian Neff.

The decorations were prepared and placed by the social committee, of which Mrs. G. M. Poppleton was chairman.

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CARAVAN AND TRAIL RULES

Our society is rounding its first milestone and, with better weather conditions, we may expect our exploration committee to plan more and longer trips than those we had during the short days of fall and winter. From the interest shown in our trips this past year, we have every reason to believe an increasing number of our members will desire to go on our field trips. As this will mean more cars in the caravans, we feel that a few words of advice to our new members, many of whom may not have traveled in a caravan, would not be out of place.

Be at the starting place as promptly as possible; some of our trips require considerable driving and we must move out promptly if we are to cover the territory scouted.

Our trip leader of the day will be in the first car. The driver of the next car not only follows the car ahead but is directly responsible for the car following. If for any reason the car behind stops, the car ahead is supposed to stop to render assistance, if necessary - thus, when one stops all stop.

Arriving at the point of interest, the lead car drives far enough past the place where the lecture will be given so that cars in the center of the caravan will be at about the point where the lecture will be given.

When the lead car drives off the pavement and stops, all succeeding cars do likewise and park as near as possible, bumper to bumper.

In order that as little time as possible will be lost between the time the cars stop and the lecture begins, members should assemble as soon as possible.

At each lecture the approximate time allowed to explore the region will be stated - also, where our next stop will be made.

A few brief rules of the trail - rules which are observed by all users of woodland trails - are given below in the order of their importance and should be followed as closely as possible.

1. Follow your leader; do not precede or abandon his guidance unless so instructed.
2. Follow the trail even though it is shorter to cut corners.
3. Do not drop refuse on or near trails.
4. Be careful of fires at all times.
5. Do not mar trees, pull up shrubs, flowers, etc.

If we keep to these simple rules for caravan and trails, we can look forward to some enjoyable and instructive trips this coming season.

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That marvelous geological hammer presented to Dr. Osgood for the best - ah hem - story of a geological experience was the clever handiwork of Russell Collins which only proves that members of the Geological Society of the Oregon Country are creative artists as well as scientists.

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BIBLIOGRAPHY OF OREGON GEOLOGY

By Edwin T. Hodge

The first and paramount need of one interested in the geology of the Oregon Country is a complete bibliography of all publications.

The first and best bibliography was prepared by Dorothy Dixon (now Mrs. W. A. Wall, a resident in Northern Rhodesia, Afria with her geologist husband), entitled Bibliography of the Geology of Oregon, University of Oregon publication Vol. 1, No. 1, Geology Series, June 1926. Unfortunately the edition has been completely exhausted, but a copy may be found in every important library.

Under the title, Progress in Oregon Geology since 1925, publication of the Northwest Scientific Association, December 1931, the author brought the Oregon bibliography up to the above date. This publication is also no longer available. For this reason, and also to take care of the intervening years, the writer and one of his advanced students, Mr. Torrence Galloway, have prepared another bibliography. The Dixon bibliography contained 1001 citations; the new one continues her serial numbers from 1002 to 1237, thus adding 236 publications for the nine past years.

Much effort has been given to attain completeness and accuracy. It is probable, however, that some errors and omissions will be found. If such proves to be the case, it is requested that the correction be sent to the editor of the Geological News Letter.

The Society plans to appoint a committee on bibliography, who will each year issue a bibliography for the past year on the Geology of the Oregon Country. This committee will correct all errors found in previous bibliographies.

Because important information contained in Progress in Oregon Geology is no longer conveniently available, it is quoted below. At a later date a continuation of the summary, below, will appear in the Geological News Letter.

"The year 1925 divides geological investigations in Oregon into two periods -- the historic, and the modern. In the historic period five great names stand for five epochs of progress in the investigation of Oregon geology.

"In the epoch of discovery, the name of Thomas Condon, father of Oregon geology, stands almost all alone. His geologic writings date from 1869 to 1906, and though his publications were few, his letters were numerous, and his activities enormous. He discovered most of the salient features of Oregon geology. Though only an amateur, he had a very keen insight and drew remarkably accurate conclusions.

"It was Condon who discovered, but Israel C. Russel who introduced the age of exploration in Oregon geology. For twenty-one years, from 1884-1905, he published voluminously on his reconnaissance investigations of the eastern slopes of the Cascade Mountains and eastern Oregon. The writings of no other geologist have left a deeper impression than the vivid descriptions of the geology of Oregon by Russell.

"Joseph Salas Diller also belonged to the age of exploration, but in contrast with Russell carried on detailed investigations west of the Cascade Mountains and particularly in southwestern Oregon. From 1884 to 1922 or a total period of 34 years, he made the geology of Oregon vivid, interesting, and known to the rest of the world. He had produced, by 1925, the only geological maps in the State of Oregon.

"Until the nineties continental deposits had not been properly correlated with marine deposits nor had those of eastern Oregon been properly correlated with continental deposits elsewhere. In 1897 John C. Merriam chose the John Day region of eastern Oregon for his important and brilliant work in vertebrate paleontology. He properly classified the old forms, discovered many new forms, and compared them both with the vertebrates of a section in California where both continental and marine types occur together. Thus he established for the first time, dependable data planes of the Tertiary formations of eastern Oregon. The horizons arenot, perhaps, permanently established. Following the lead of the American Museum of Natural History of New York City or of other workers, the horizons may change slightly, but will not affect fundamentally, the data established. Ralph Chaney is now correlating the paleobotanical data with the established vertebrate horizons. It is to be regretted that other duties have taken Merriam away from Oregon. From 1916 to the present time only one paper in 1920 dealing with Oregon geology has been offered.

"As early as the fifties the Blue Mountains of Eastern Oregon were overrun by gold prospectors, but it was not until 1900 that they were scientifically examined by Waldemar Lindgren. From 1900 to 1910 Lindgren offered several important contributions to geology of northeastern Oregon and in 1925 made a detailed examination of the Baker district, though the latter has not been published.

"From 1869 to 1925 Condon, Russell, Diller, Merriam and Lindgren discovered, explored, mapped, and established many of the essential facts of Oregon geology. These early reconnaissance investigations, made under difficult conditions, formed the foundation upon which all later geological investigations have been based. Let us now turn our attention to the discoveries of the last five years.

"The geological map of Oregon has undergone many changes. Instead of the great splash of red covering eastern Oregon, Washington, and Idaho indicating the presence of the Columbia River lava plateau, we now have many colors showing rocks dating from the Paleozoic down to Recent. No statement regarding Oregon geology was, perhaps, more erroneous than that Miocene olivine basalt covered all of eastern Oregon and that it lay horizontal. Eastern Oregon is neither an area of basalts nor of horizontal rocks. Each of the periods of the Tertiary have produced basaltic and other flows that make up the surface of eastern Oregon.

"The geological map of the state of Oregon prepared by the writer and to be published as a part of the map of North America by the United States Geological Survey for the International Geological Congress of 1933, will bear little or no resemblance to any previously published geological map of the State of Oregon.

"The progress of geological mapping in both Oregon and Washington has been lamentably slow. In fact, until 1925, the only areas mapped in detail were those by Diller in southwestern Oregon which covered less than one-thirtieth of the state. Since 1925, Hodge has mapped in north central Oregon and in the northern Cascade Mountains an additional one-tenth of the state. Recently the United States Geological Survey has published a small map of a narrow strip near the Deschutes River by Stearns. The detailed mapping of the Baker district by Lindgren and Gilluly has not been published. Thus, less than four-thirtieths of the state of Oregon has been mapped, and the scientific and economic progress of the state has correspondingly been retarded. In view of the progress made since 1925, it is evident that were funds and qualified assistance available, the balance of the state could be mapped within a period of twenty years.

"The progress of detailedreports on areas within the state is behind that of detailed mapping. Nevertheless, sufficient work has been done, so that we have a fairly accurate understanding of a cross section through the northern part of the state. The investigations of the United States Geological Survey in the Blue Mountains, the classical investigations in north central Oregon made by Merriam and his four students, Buwalda, Stock, Chaney, and Packard, and the detailed mapping of north central Oregon and the northern Cascades by Hodge carry the cross-section to the Willamette Valley. The writer hopes to carry his study westward across the Willamette Valley into the Coast Range and thus complete this cross section.

"Before 1925 the Cascade Mountains were considered to be formed of Miocene and early Pliocene lava flows that had been highly deformed and in late Pliocene time eroded to a peneplain. The Cascade peneplain was considered to have been elevated, eroded in the Pliocene, and glaciated. The Miocene rocks were considered to be olivine basalts and the Pliocene rocks to be hypersthene andesites.

"Later investigations have shown that the Oregon Cascade Mountains are divisable into two portions, the southern mountains are related to the Siskiyous of northern California, and the northern are related to the southern Cascade Mountains in Washington. No recent work has contributed any new facts to the southern Cascade Mountains. The northern Oregon Cascade Mountains are now known to date from Eocene to the Recent. Their older formations can be traced into eastern Oregon and into the Coast Range and only the Pliocene and later rocks are local. The Cascade Mountains, therefor, are a physiographic unit formed by a pile of lavas. The Deschutes River on the east and the Willamette River on the west subsequent to the later lavas have somewhat isolated the Cascade Mountain physiographic unit. The writer has found Eocene-Clarno forms of eastern Oregon in the Santiam Valley and Eocene Umpqua sandstones of the Coast Range in the Clackamas Valley, and these two occurrences are the oldest rocks to be found in the northern Cascades. Gently folded Oligocene pyroclastics lie unconformably on the Eocene and were little eroded before the outpouring of Miocene basalts On the Oligocene beds lie the folded and faulted Miocene olivene-free basalts The folds and faults differ in no way from those of eastern Oregon and were the later formations removed from the Cascade Mountains the "plateau" of Eastern Oregon would extend with no fundamental change to the Willamette Valley. These Miocene basalts were never peneplained and only near buried valleys were they even eroded to the stage of late maturity. The slightly eroded Miocene basalts were buried by pyroclastics and later by the lava flows of Pleistocene age and these, in turn, by lava flows and pyroclastics of Recent age. Over large areas the Pleistocene and Recent formations may have participated in a general tilting involving almost the entire state, but nowhere has evidence been found that they have suffered local folding. They consist of olivine basalts olivine andesites, sub-siliceous andesites, per-siliceous andesites, trachytes, and rhyolites. Hypersthene andesites are only locally developed, and not as wide spread as was formerly supposed.

"Condon and Diller developed the widely held down-warped trough theory of the Willamette Valley, supposedly similar to Puget Sound, Chehalis, and the Sacramento valleys. Willamette River was consequent in this trough. A Pleistocene depression of western Oregon let the ocean invade the Willamette Trough and Columbia River. Down-warping faulted, in places, the eastern side.

"Later investigations have shown Willamette Valley has no faulted areas and that the Eocene and Oligocene formations of the Coast Range dip eastward under the Miocene basalts of the Cascade Mountain area for ten to fifteen miles. This structure and erosional remnants of Columbia River basalts on the Coast Range show the Willamette Valley is a subsequent valley carved on the soft Oligocene beds; with a west wall formed by Oligocene and Eocene formations, and the eastern wall by the Miocene basalts.

"Perhaps the greatest addition has been to the knowledge of the structure of the state. In 1925 the only highly folded rocks known were in southwestern and northeastern Oregon. The Coast Range was a simple anticlinal fold, the Willamette Valley a simply warp, the Cascade Mountains were suspected of being formed of olded rocks, but no descriptions of any structures existed, and eastern Oregon, except for the faulted block mountains of southeastern Oregon, was a great simple plateau formed of horizontal rocks.

"Cross-sections drawn through the Coast Range by Callahan show it to be composed of a geo-anticline of gentle proportions with steep-dipping beds on the western side, some of which, according to Hodge, may be faulted. The eastern flank of this geo-anticline dips under the Cascade Mountains. Structurally, the Cascade Mountains are not independent of the Coast Range nor of eastern Oregon. The Eocene, Oligocene and Miocene beds of all three have undergone a common structural history.

"The great Columbia River lava plateau has been shown by Buwalda, Packard, and Hodge to be folded and faulted and Hodge has traced many of the structures of the "plateau" westward under the Cascade Mountains. Some of the folds of the "plateau" form mountain ranges and can be traced for long distances. Thus the Ochoco Mountains are an anticlinal uplift and Hodge has traced the Grizzly anticline northeastward across Oregon from the Cascade Mountains to the Columbia River or for a distance of nearly 100 miles. The plateau also has been faulted in many places, the largest fault being on the north side of the Columbia River extending from the Cascade Mountains nearly 60 miles eastward, almost to Umatilla, and is a fault of the first magnitude. Most of the folding and faulting took place in the early Pliocene and both were eroded during the late Pliocene. As aresult windows were opened up through which may be seen folded and metamorphosed rocks. In southeastern Oregon no rocks older than the Clarno-Eocene have been exposed, but in the .. Mutton Mountains near Ashwood, in the Ochocos, in the John Day Basin, near Canyon City, and elsewhere these windows expose rocks some of which are Palaeozoic in age. These new discoveries give us the first clew regarding the pre-lava structures and surfaces. The fault block mountains, as a result of the work of Russell, Fuller, Waters, and Smith, are now known not to be simple block faults of Miocene basalt, but expose much older rocks at their base, and are capped by formations much younger than the Miocene. In fact, the faulting seems to have been late Pliocene or early Pleistocene in age.

"The stratagraphic contributions of the last few years have been exceedingly valuable. Eastern Oregon is not covered by Miocene basalts. The Miocene lava plateau lies east of the Cascade Mountains and north of the Ochoco and Blue Mountains. Hodge has shown by detailed mapping that Pleistocene basic andesites and olivine basalts occupy the entire region of the upper Deschutes, and that larger areas of olivine basalts of Pleistocene age lie in southeastern Oregon. It is also strongly suspected that the basalts of the Snake River area are not Miocene in age. Many of the olivine basalts previously considered Miocene in age are of later age and the Miocene basalts are characteristically glassy, non-olivine basalts.

"Two new areas of highly fossiliferous Mississippian beds have been found in Oregon by Packard. The fauna is the second Baird fauna found in the North American continent. New large areas of Mesozoic rocks have been discovered and investigated. Schenck has proven that one of the new Triassic areas is composed of two horizons comparable to the California Triassic. The Jurassic has been thoroughly studied by Lupher, now of the Washington State College, with rather startling results. Not only has he developed a Jurassic column much fuller than that developed elsewhere in many parts of the United States, but he has found horizons not previously represented on the North American continent, but show a kinship with Himalayan faunas. This Jurassic contains the first Jurassic ichthyosaur found not only on the Pacific coast, but in North America. The western most area of Triassic found by Hodge shows evidence of having been peneplained before the deposition of the Cretaceous.

"Packard has discovered and collected an exceedingly rich fauna from the Cretaceous of eastern Oregon. The fauna is rich in new material and shows a marvelous distribution of types, all of which is being prepared for a thorough monographic publication. In it Packard has discovered the first Cretaceous ichthyosaur in North America as well as the first pterodactyl to be found outside of the Niobraran sea. The evidence so far points to the fact that Oregon was so delightful that Triassic ichthyosaurs lingered there throughout the Jurassic and Cretaceous.

"The Tertiary flora fascinated Condon and was made famous through the reseaches of Newberry, Lesquereux, and Knowlton, and lately has been subjected to scientific scrutiny and interpretation by Chaney. So far only the Eocene and Miocene have received detailed attention, but since this material is closely related to living material in varios parts of the world, it is evident that future work in the Pliocene Pleistocene will yield important results. Since the Tertiary of Oregon is largely volcanic, the establishment of stratigraphic horizons will depend largely upon paleobotanical researches. It is to be hoped that Chaney will continue his investigations and eventually establish a complete set of horizons determinable not only by leaves, but by wood as well, that will correlate with the vertebrate and invertebrate horizons of the Pacific Coast.

"The original area of Clarno-Eocene found near Bridge Creek close to Clarno Ferry has since been traced by Buwalda southward in the John Day country and by Hodge westward into the Deschutes canyon and into the deep canyons of several streams cutting in the Cascade Mountains. In addition, Hodge has found areas of Clarno in many parts of southeastern Oregon. The Eocene of western Oregon is now being investigated by Turner and in a few years we may expect it to be thoroughly defined, and the Eocene areas mapped.

"Since the time of Dall and Diller the Coast Range of Oregon has been neglected. Their conclusions were that the Coast Range consists mainly of a mass of Eocene sandstone on the flanks of which lie Miocene beds with some Pliocene and Pleistocene formations in small patches along the coast. Schenck has thoroughly definedthe marine Oligocene and shown that much of the Miocene of the Coast Range is Oligocene in age. It is to be hoped that Schenck will continue his investigations and present us with a map showing the detailed distribution of the Oligocene beds. The classical Oligocene of the John Day region described by Merriam has been traced by Hodge westward into the Cascade Mountains. Chaney has shown the Warrendale formation to be Oligocene in age, andHodge has been able to prove that is identical with the John Day formations of eastern Oregon and the Oligocene tuffs of the Coast Range. Perhaps the most important results of the detailed mapping of north central Oregon was the tracing westward from the John Day area of this formation into the Cascade Mountains and the discovery there of a rich upper John Day fauna which shows transition forms with the Miocene. We may now say that we have one fundamental datum plane in the State of Oregon, to wit, the John Day, which may be traced from

Eastern Oregon under the Cascade Mountains and over the Coast Range.

"The finished work of Turner and Schenck may make it possible to trace their horizons eastward and correlate them definitely with the continental Eocene and Oligocene of the Cascade Mountains and of eastern Oregon. Such a prospect is warranted since Hodge has shown that it is possible to trace both the marine and the continental formations into the Cascade Mountains. Were this done the leaf-bearing formations of the Cascade Mountains might be tied into a general correlation.

"Willis and Diller assumed that the Pliocene peneplain which the former found in Washington extended into the Cascade Mountainsof Oregon. No such peneplain, however, has as yet been found in the state of Oregon.

"The Pliocene folding probably resulted from a general subsidence of eastern Oregon as proven by the fact that the Miocene basalts which must have been formed above the sea level are now in part below sea level. This subsidence of central and eastern Oregon wasprobably associated with an uplift of western Oregon, as shown by the fact that the marine sandstones and tuffs now stand 1,500 to 2,000 feet above sea level. Hodge thinks this evidence, along with the almost straight coast line, points to a fault along the Oregon coast with a block fault-like uplift of the entire state accompanied by a tilt to the east. If this be true, then folding did not stimulate erosion, but rather reduced its intensity, especially in the central and eastern part of the state, where the general level was lower than previously. Certain it is that Pliocene erosion never reached beyond the stage of maturity. Pliocene, being a period of erosion, has left little paleontological evidence, but Stock has described a Pliocene bear.

"Reid and Sylvester have briefly described the existing glaciers in Oregon. Hodge, in the Mount Hood and Mount Jefferson regions, has found evidence of three different stages of glaciation of which existing glaciers are descendents of the last stage. Glaciation was purely local and these stages were probably contemporaneous with those in California and Washington. The stability of the Cascade Mountains during Pleistocene vulcanism points to the fact that climatic changes produced the different glacial epochs.

"During the Pleistocene period lava flows have dovered a large part of eastern Oregon and the entire Cascade Range has been piled up. The scenic features in Oregon are largely Pleistocene in age.

"The pyroclastics of the earlier part of the Pleistocene buried the Pliocene erosion surface in the Cascade Mountain region. One of the valleys so bured was old Columbia River. Dammed by lavas Columbia River produced Condon Lake, the old shore line of which is found in Oregon at an elevation of 1900 feet and, in places, has been seen in the state of Washington. This lake discharged westward in a consequent valley formed by the Pleistocene lavas along itspresent route where its course is superposed upon the older formations. The canyon of Columbia River is not an ancient antecedent course as described by LeConte, Bretz, and Williams, but has a Pleistocene and Recent consequent and superposed course. The rise of Condon Lake to an elevation of 1900 feet caused it to invade neighboring drainage systems and capture other rivers and produce and integrated river system. The full significance of this theory has not as yet been investigated, but gives promise of answering many of the contradictions to be found in geologic reports on eastern Oregon and Washington.

"Scientific investions have kept well in advance of the economic investigations in Oregon. In fact, it may be said that except for the work done in the Baker district of the Blue Mountains, no detailed investigation of any mining district in the state of Oregon has been undertaken since the early days. The gold mining which once promised so much has almost ceased to exist. The seconderily enriched outcrops of the lode gold veins have been mined, and no basic ores of high tenor have been found. Recent reports of the United States Geological Survey show that for at least 25 years none of the known copper prospects in Oregon can be mined at a profit. During the war manganese was boosted and before the war the nickel deposits at Riddle were considered a possible industry, but both lie neglected today. The former Oregon Bureau of Mines and Geology recommended the development of the lateritic iron ores of Columbia County, Oregon, but the lack of any suitable coke and coal, and competition of cheap pig iron from the Birmingham district make their development, even in a small way, impossible. About 1925 Hodge called attention, in a series of articles to the fact that Oregon provides a natural environment for cinnabar. Since that time a number of mineshave been developed, some of which are paying, at the present time, handsome dividends.

"Coal occurs in the Eocene of eastern and western Oregon and the Marshfield area may be developed to serve a local market. Over fifty holes have been sunk in Oregon in the exploration of oil and gas. Only three of these have been located as a result of previous geological investigations and as a result only three are located where there is even a remote possibility, either by reason of structure or formation, to justify the expectation of finding oil. Certain sedimentary marine beds in Oregon deserve prospecting, but up to date none of them have been drilled. Lenticular limestone beds in the Coast Range are quarried for cement and land plaster. The large deposits in eastern Oregon are not developed and are far from transportation.

"Waring's investigations of the ground water possibilities of southeastern Oregon are the only detailed investigations of our most important economic problem. Numerous important and succesful studies of dam sites have been made and since 1925 the record is clear of dam and irrigation failures due to neglect of geological conditions.

"The writer has attempted briefly to give an historic picture of theprogress of Oregon geology. The record up to 1925 is recorded in Dixon's thorough and reliable Bibliograph. Below the writer appends a bibliography complete up to date of the paper of all publications on Oregon geology since 1925."

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol. 2 - No. 7 Portland, Oregon April 10, 1936

CHANGE OF MEETING PLACE AND NIGHT

For the past month our meetings have been held at the Public Library, but restrictions at that place do not permit us to use that room after 9:00 P.M. As our scheduled programs would not permit us to comply with these restrictions, your officers have been able to secure the Auditorium in the Public Service Building for the second and fourth Friday of each month. Therefore our meetings beginning with our next meeting will be held on Friday evenings in the Auditorium of the Public Service Building.

NEXT MEETING

Our next meeting will be held on Friday Evening, April 10, 1936 at 7:30.

Exhibits are on display from 7:30 P.M. to 10:00 P.M.

Announcements and reports are given at 8:00 P.M. and the lecture of the evening begins at 8:15 P.M.

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LECTURE ANNOUNCEMENTS

April 10th - Is our climate changing? Mr. E. L. Wells, Meteorologist of the United States Weather Bureau, will lecture on "Oregon Climate".

May 15th - Dr. Ethel Sanborn will lecture on the "Ancient Forests of Oregon".

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FIELD TRIPS

April 26th - The geological trip will be in the vicinity of McMinnville. Dr. Mayfield will be the leader of the trip which promises to be one of the most interesting trips the Society has taken.

Further details will be announced in the papers and at the regular meeting of April 23rd.

May 17th - Forest Grove and vicinity.

Leader - Professor Watson.

May 30-31 - Madras and vicinity.

Leaders - Lewis H. Irving and Joseph Wimmer.

WATCH FOR INFORMATION ON THIS TRIP!

RESERVE THE DATES! PLAN TO ATTEND!

LECTURE OF MARCH 26TH

The first exhibit of speaking animated geological pictures shown in Portland under the auspices of the Geological Society of the Oregon Country was a grand success. Over 500 people were in attendance. The rapt attention and enthusiastic applause indicated the appreciation of our members. It may interest many to learn that our Society saw these pictures before they became available for the National Park Service for whom they were prepared.

Harold B. Schminky's pictures (in part colored) of last summer's exploration revived happy memories and we hope he will prepare for us another showing.

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Bulletin No. 6 "Bibliography of Oregon Country" is now on sale by the Business Manager at $1.00 per copy. This is the first of a series of reference and technical bulletins which will be issued throughout the year by the Society. Prices on these will be quoted at a later date.

All members whose dues are delinquent will not receive issues of bulletin after No. 5 until dues are paid.

The bulletins subsequent to and including No. 6 will be sent to all old and new members on receipt of dues.

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GUEST CARDS

Guest cards are available to members for friends who wish to attend our lectures and go on our trips.

The lectures and trips are provided for our members. All others who attend lectures and go on trips do so only as our guests.

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FOUND

A small 10 power prospector's glass. Left at lunch at Rathskeller.

Tracy Wade TRinity 6060

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EXPLORATION COMMITTEE PLANS TRIPS

The Exploration Committee is composed of J. R. Collins, Chairman, H. B. Schminky, Joseph Wimmer, J. R. Henshaw, Claire Holdredge, and Ray Treasher. They announce that field trips will be held on the following dates:

(1936) April 26
May 17
May 30-31
June 14
July 4-5
July 26
August 8-9

THE GEOLOGICAL NEWS LETTER

Edwin T. Hodge, Editor
2915 N. W. Luray Terrace,
Portland, Oregon

Raymond L. Baldwin, Business Manager
2725 N. E. 50th Avenue,
Portland, Oregon

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Address all other correspondence regarding the bulletin and changes of address to the Business Manager.

	August	23
	Sept.	5-6-7
	Sept.	27
	Oct.	10-11
	Oct.	25
	Nov.	15
	Dec.	13
(1937)	Jan.	10
	Feb.	14
	March	14

The routes and details of the trips will be announced later, but trip leaders are scouting and logging the various trips. The exploration will include the following: McMinnville and vicinity; Forest Grove and vicinity; Madras and vicinity (with fossil hunting); Copper City and Silverstar Mountain; Mt. St. Helens and Spirit Lake; Molalla and vicinity: Wheeler, Neakahnie Mountain and Arch Cape; Upper Clackamas River; Mt. Adams and vicinity; Mt. Hood buried forests and Little Crater Lake and vicinity; North and South sides of the Lower Columbia River; Columbia River Gorge; Scio and vicinity; Camas and vicinity; and other places of interest.

Any members having suggestions for exploration should submit the same to J. R. Collins, chairman of the Exploration Committee. If any member would like to scout and lead a field trip, communicate with J. R. Collins.

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Dr. Wilkinson of Oregon State College will lead a field trip for the college students, during the week of July 4 to July 11, 1936, covering various parts of Eastern Oregon, including the Wallowa country and Snake River valley. Members of the Society who desire to use part of their vacation for a Geology field trip should keep the above dates in mind and arrange vacation schedules accordingly. Members of the Society will be permitted to accompany the college students on this trip.

THE OREGON COUNTRY COAST LINE

The United States Coast and Geodetic Survey report February 29, 1936, states:

1. The ship Robert W. Knox was at Astoria, Oregon, engaged in completing field records of the survey of the lower reach of the Columbia River.

2. There are 33 primary tide stations in the United States. Of these 7 are on the Pacific Coast, 2 in Alaska, and 1 in Hawaii. The tide station at Fort Worden, Washington, which was maintained as a cooperative station with the United States engineers, was discontinued on the last day of the month, sufficient observations having been obtained.

3. New Nautical charts published are as follows:

   OREGON AND WASHINGTON.-No.6153. Columbia River-Crims Island to Saint Helens. February 1936. Scale, 1 : 40,000. Size 33 by 39 inches. Price, 75 cents.

   NEW SECTIONAL AERONAUTICAL CHARTS OF KLAMATH FALLS.-February 1936. Scale, 1 : 500,000. Size, 20 by 34 inches. Price, 40 cents; 25 cents in lots of 20.

4. The transport air liner of the Standard Oil Co. of California, which crashed in Great Salt Lake, Utah, on October 6, last, was located by the party of I. E. Rittenburg on February 27, after wire-dragging an area of 200 square miles in Great Salt Lake. The plane was found with a 23-foot drag in 25 feet of water, in almost the exact middle of the lake, partially salt covered.

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100 YEARS OF MINERALOGY

For more than one hundred years three men, grandfather, son and grandson, were leaders in American science, not only by their own contributions, but even more through their books and the Journal which they established and maintained.

BENJAMIN SILLIMAN

Born August 8, 1779.
Graduated from Yale in 1796.
Appointed Professor of Chemistry and Natural History at Yale in 1804.
Founded the American Journal of Science in 1818.
Died November 24, 1864, aged 85.

JAMES DWIGHT DANA

Born February 12, 1813.
Graduated from Yale in 1833.
Appointed Assistant in Chemistry at Yale in 1836.
Published System of Mineralogy in 1837.
Married Henrietta Frances Silliman, June 5, 1844.
Became Editor of American Journal of Science in 1846.
Died April 14, 1895, aged 82.

EDWARD SALISBURY DANA

Born November 16, 1849.
Graduated from Yale in 1870.
Became an Editor of American Journal of Science in 1875.
Published Textbook of Mineralogy in 1877.
Published Sixth Edition, System of Mineralogy in 1892.
Died June 16, 1935, aged 85.

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THE EXHIBIT AT THE FIRST ANNUAL BANQUET

Future annual banquets may be bigger and better, as the saying goes, but the exhibit that was presented on the speakers table no doubt will go down in the Society's history as the finest ever. Thanks to the originality, ingenuity and efforts of Mrs Nan Kurtichanof and Mrs. L. B. MacNab who made the clay models, and to Mrs. Irene L. Poppleton and her daughter Grace, who arranged the scenic effects for the animals, the Society was treated to a realistic and interesting scene that was a veritable geological Garden of Eden.

Amid cleverly reproduced trees, foliage and lakes of those ancient days were to be seen strikingly life-like models of several reptiles and amphibians among which was the huge fin-backed reptile of the Permian; a Diplodocus, one of the largest of the dinosaurs; a stegosaurus, the armored dinosaur of the Jurassic with its huge bony plates forming scallops up and down its spine. This latter was one of the best of the many models. Ready for battle was an Allosaurus, the wicked carnivorous dinosaur, with a red candy eye that added to its fierceness; and Tyrannosaurus, with its piano-sized head, was there too, the largest of the carnivorous dinosaurs; also the three horned dinosaur, the Triceratops, who had the smallest brain compared to the size of the head of any known animal. Last but not least was the very famous Ordovician trilobite.

The story of how this scene was created is equally as interesting as the scene itself. It will be recalled that on our Portland and Vicinity Trip of some months ago, we visited a brick and tile works out on Canyon Road and our genial host there had stated that his clay would serve quite well for modeling purposes. The members that arranged this exhibit din't forget those words and visited there again and were given sufficeint clay to take care of their needs but unfortunately, due to weather conditions at the time, the clay mass was frozen solid. However, after much effort Mrs. MacNab and Mrs. Kurtichanof carefully and accurately produced the nine realistic animal models of life as it existed many millions of years ago. An equal amount of thought and work also went into the arrangement of the scenic effects that served as a background for the animals and Mrs. Poppleton and her daughter Grace with the aid of others, searched out twigs, leaves and small branches of plants growing today that as closely as possible resembled the plants and trees of the Permian and Jurassic times. Their efforts were well rewarded as those authoritatively versed on the subject pronounced the effect quite perfect.

The Society is indebted to these members for their clever workmanship and we are indeed proud to have within our membership artists of such creative ability.

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EXHIBIT OF THE MEETING OF MARCH 12TH

It was the rare privilege of the Society to view a portion of the finest collection of Oregon agates in the world at our last meeting. This exhibit is owned by Messrs. Raymond and A. J. Schneider and was arranged and presented by them. In this group were approximately 120 pieces of cut and polished agate and yet this was but a very small part of the wonderful collection of these two brothers. All the agates exhibited were from the vicinity of Antelope and the Pony Ridge district, both of which are in central Oregon.

It was of interest to learn that the Schneider brothers have only been collecting for the past three years and that all of their great collection has been found by them personally. They have done all their own cutting and polishing and, in fact, they have also made their own cutting and polishing devices.

The arrangement and lighting effect of the exhibit was of particular interest. The presentation of the polished agates with a lighted background so that the lovely designs in the agates were clearly brought out was most effective. This method of displaying was originated by the Schneider brothers and is accomplished by cutting and polishing the agates to a thickness of only one eighth of an inch. They are then placed between pieces of glass and mounted and the spaces between the stones is painted black. These are then put in place of the glass on small electrical advertising signs and when the light is turned on the effect is quite beautiful.

The Society deeply appreciates efforts and workmanship of Messrs. Raymond and A. J. Schneider in furnishing us this interesting presentation of the agates of the Oregon Country.

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VANCOUVER TRIP MARCH 15, 1936

MESSRS. CLAIRE HOLDREDGE AND A. D. VANCE LEADERS

It appeared that the Gods of the Universe were attempting to make up for the atrocious weather they handed out on the Newberg trip by giving us the kind of a day of which geologists dream. The party met in Vancouver, and at 9:45, a caravan of 23 cars, containing 60 people, started forth under the direction of Claire Holdredge and A. D. Vance. Dr. Hodge was not with us, illness confining him to his home. He was missed and we all hope for his early recovery.

We went in a northerly direction, climbed to the top of a gravel terrace back of Vancouver, where the first stop was made. Holdredge explained the general situation; that the waters of the Spokane flood, in pouring out of the narrow chute of the Columbia Gorge, found their first opportunity to spread out and deposit a large share of the suspended material which had been carried for some time. The terrace contained fine basaltic pea gravels and coarse sands. There were occasional boulders, very poorly rounded, mainly basalt, but some foreign. These larger, poorly rounded boulders, stated Holdredge, must have been ice rafted into the area because most of the material in the bar is of a fine nature, fairly well sorted. He also exhibited a foreign pebble, about 4" in diameter, which had one flat, rather well polished surface. These peculiar pebbles were discovered by Vance and have since been intensively studied by him and holdredge over the entire area. They presented an unique problem. Of the three possibilities, glacial plowing, stream erosion, sand blasting, the latter seemed best to fill the bill.

This terrace has an elevation around 300' and is continuous to the vicinity of Camas. We crossed over it and down into the valley of Burnt Bridge Creek, which has an enormously wide valley, occupied by a small stream which never could have done the erosive work required. At a point 7.5 miles out of Vancouver, we stopped to note some of the features of this wide valley, that it was a broad plain, undulating and hummocky, indicating strong water action. A number of these faceted pebbles were found here.

The third stop was 10 miles out of Vancouver, on the divide between Burnt Bridge Creek and LaCamas Creek. The latter creek comes from the north over the west flank of the Green Mt. volcanic cone, then turns sharply eastward where it flows through an old drainage channel and eventually to the Columbia, at Camas. At this point the boulders were large, as much as 3 and 4 feet in diameter, composed mainly of andesite, but a few of foreign origin, and there were some indications of scoracious lava. Indications are that this spot was part of a channel through which the Spokane flood poured as strongly suggested on the quadrangle map, that the area at this point is underlaid by Troutdale formation. It was also noted that the Green Mt. volcanic cone, Rocky Butte and Mt. Tabor form a ride line.

The natives for miles around came rushing to the scene, evidently under the impression we were about to bury a number of corpses, or at least with the hope of seeing considerable blood and gore. We were sorry to disappoint them, but no one seemed willing to offer himself as a willing victim.

We ate lunch on the Troutdale formation east of here. We noted that the surface was litterly covered with quartzite pebbles. Holdredge explained that this hill was composed of Troutdale. The soil had the reddish color commonly associated with the breaking down of basic lavas, and he said that it seemed reasonable that the softer and more easily weathered materials of the Troutdale were decomposed to form soil and that the resistant quartzite pebbles remain.

After we had succeeded in devouring all of our food, we started for a "happy hunting ground" of faceted pebbles. This was nearly 25 miles on our itinerary at an elevation of about 500' and with a geologic setting very similar to the locality where we ate luncheon. We scattered over some plowed ground, searching for faceted pebbles, this time unbothered by curious inhabitants, who, undoubtedly, would have thought we were crazy or, at least, slightly unbalanced if they could have seen 60 people dashing hither and yon, picking up boulders, throwing them down, and carting others to form a huge pile. A seminar was then held to discuss the faceted pebbles and while many theories were advanced, we were always confronted by the fact that the smooth surfaces were slightly curved and highly polished, which seemed to preclude any other conclusion than wind action.

Our next stop was at Morgan Creek, where we hunted for agates and faceted pebbles, much to the enjoyment of the local people, who were convinced that we were starting a gold rush. From here we went westward to the Pacific Highway, over the wide flood plane established by the Spokane flood. We noted the persistence of the quartzite pebbles, the characteristic flood plane topography. The surface of the flood must have had an elevation of at least 400' over this area making the water at least 100' deep. We continued along the Pacific Highway to the Pioneer corner, where we turned down toward Ridgefield. As we approached the Columbia, the rounded, mature topography gave away to deeply eroded canyons and an excellent exposure of Troutdale formation was manifest. Here A. M. Piper discovered a small faceted quartzite pebble in place in this formation. By easy stages we returned to the Pacific Highway where the party broke up.

M C M I N N V I L L E   T R I P

April 26, 1936

Caravan will meet at Linfield College in McMinnville at 9:15 A. M. Those wishing to carry extra passengers and those desiring transportation meet at SW Sixth avenue and SW Yamhill street not later than 8:00 A.M.

Mrs. Lewellen will conduct the party through the college museum. Inasmuch as fossils of the Ordovician period are not found in Oregon, the type collection of this period should be of considerable interest. The college also owns a very complete collection of minerals.

* Leaving the college about 10:15, the party will go to Lafayette where a visit will be made to the old government locks on the Yamhill River. These locks are the relic of the hey-day of river transportation in the Willamette Valley. They should be of interest as we are hearing so much of channel improvements today.

The next stop will be on Bishop Mountain. Here a wonderful view of the Willamette and Yamhill river valleys will serve as a stage setting for Dr. Hodge to give us the general geological story of the points we will visit later in the date. We should have a very interesting discussion on the problems of ground water while here.

The Red Hills of Dundee, of which Bishop Mountain is a part, cover only eight or ten square miles. yet year round springs exist to within 150 to 200 feet of their summit. Dayton gets its entire water supply from such springs.

* The party will then go to the park in Dayton for lunch. One of the towns-people will tell us the history of the old Sheridan Blockhouse which now stands in this park. The blockhouse will be open for inspection. Luncheon may be purchased in Dayton.

* The next stop will be at the Morgan ranch near the south edge of Dayton. Mastodon bones and the place they were found will be seen here. A section of the old Salem road of pioneer days may also be seen on this ranch. Glacial erratics are found throughout the area.

We will next visit a rock quarry in the foothills west of McMinnville. This place is interesting because of a gold mining venture. Two shafts, now filled with water, remain. Some gold is supposed to have been taken out.

Those who made the soil trip will have a chance to review their knowledge of type soils.

Points marked with a star (*) are places where late sleepers may join the caravan.

The round trip will cover about 130 miles.

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol. 2 - No. 8 Portland, Oregon April 25, 1936

NEXT MEETING

Our next meeting will be held on Friday Evening, April 24, 1936 at 7:30 in the auditorium of the Public Service Building.

Exhibits are on display from 7:30 P.M. to 10:00 P.M.

Announcements and reports are given at 8:00 P.M. and the lecture of the evening begins at 8:15 P.M.

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LECTURE ANNOUNCEMENTS

April 24, 1936 (Friday) - Dr. Thomas Thayer spent several years in detailed exploration of the Cascade mountains. He has had splendid training at the universities of Oregon, Cincinnati, Northwestern and California Tech. At present he is one of the geologists at Bonneville Dam. He has lots of enthusiasm, a sense of humor and, of course, (or we would not have him on our program) is an authority on the subject of his lecture - "The Central and Northern Cascades".

This lecture should attract all our membership.

May 15, 1936 (Friday) - Dr. Ethel Sanborn will lecture on the "Fossil Forests of Oregon".

May 29, 1936 (Friday) - No meeting, in order to permit members who desire to leave early on field trip to Madras and vicinity.

June 12, 1936 (Friday) - Dr. E. W. Lazelle will speak on "Gems".

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FIELD TRIPS

April 26, 1936 (Sunday) - McMinnville, the town that spells its name with the capital in the middle lies in an area of great geological interest. However, very few people of our state know much about this attractive area. After long, insistent requests, a trip is planned for April 26, 1936. The leaders will be Dr. Sam N. Mayfield and Joseph Wimmer. Party leaves from Old Postoffice Building at 8:30 A.M. Spring will be in the air and orchids in bloom.

May 17, 1936 (Sunday) - Forest Grove and vicinity - Leader - Professor Watson.

May 30-31, 1936 (Saturday and Sunday) - Fossil hunting in Madras and vicinity. - Leaders: Lewis H. Irving and Joseph Wimmer.

June 14, 1936 (Sunday) - Copper City, Silverstar Mountain and vicinity. - Leaders: Joseph Wimmer and Claire Holdredge.

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Any members having suggestions for exploration should submit the same to J. R. Collins, chairman of the Exploration Committee. If any member would like to scout and lead a field trip, communicate with J. R. Collins.

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AN UNUSUAL OPPORTUNITY

The beautiful Wallowa Mountain, the Alps of America and the Snake river canyon - the deepest gorge in the United States - will be visited July 4 - 11 under the leadership of Dr. Don Wilkinson. Many are planning to work this into their vacation. Our president will announce a manager for our party so as to reduce food and transportation costs and to save labor and time.

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PURPOSES OF SOCIETY

(1) To provide facilities for members of the Society to study geology, particularly the geology of the Oregon Country.

(2) The establishment and maintenance of a library and museum of geological works, maps and specimens.

(3) The encouragement of geological study among amateurs.

(4) The support and promotion of geologic investigation in the Oregon Country.

(5) The designation, preservation and interpretation of important geologic features of the Oregon Country.

(6) The development of the mental capacities of its members in the study of geology and the promotion of better acquaintance and closer association between those engaged in the above objects.

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SPECIAL NOTICE

During the first year the Bulletin, under the able editorship of Mrs. Gladys Randolph, was so good that many remarked "The Bulletin, alone, is worth the price of the membership".

This year with much improved facilities, we intend to enlarge and widen the scope of the Bulletin.

In the Oregon country there are thousands of people deeply interested in the geological features of their homeland. These people have no reliable and dependable source of current information. The professional journals are too technical; the newspapers are unreliable. Hence these people hunger for geological pabulum and thirst for dependable knowledge. It is our intention to supply that need. The Bulletin will be enlarged. As in the past the material published will be new and authentic.

It will contain reports on our lectures and field trips, announcements and geological news.

It will contain a review and digest from all journals and articles dealing with the Oregon country.

Frequently special bulletins will be issued which will be textbooks on topics for which there is now no source material. Some of these planned are soils, minerals, rocks, ores, fossils, etc. These, when combined, will form a handbook on field and practical geology. Below is the first chapter:

INTRODUCTION TO MINERALS

A mineral may be defined as a natural inorganic substance that has distinctive physical properties and characteristic chemical composition. It is customary to limit the designation mineral to inorganic substances; the pearl of an oyster, truly a mineral-like substance, is formed by an organism and is not a mineral. Almost all minerals are solid at the temperature ordinarily found at the surface of the earth; the only ordinary liquids considered as minerals are water and mercury. Petroleum, or mineral oil, now legally recognized as a mineral resource of the country, is not recognized by mineralogists as a mineral species; it is a complicated mixture of several organic compounds.

In the solid state nearly all minerals possess crystalline structure. Crystalline structure refers to the special arrangement of the molicules which comprise the mineral. The molecules assume this orderly relation to each other during the formation of the solid, as a result of the action of the forces exerted between them. The crystalline structure possessed by minerals gives them certain physical properties, among which are elasticity, cohesion, effect upon light, and crystal form. The few minerals that have no crystalline structure are said to be amorphous (without form).

If the crystallization of matter takes place under conditions sufficiently free from outside influences, the internal arrangement of the molecules may be expressed in the external form of the mass. The result is a crystal, a solid body bounded by plane surfaces intersecting in straight edges, the directions of which bear an intimate relation to the internal structure. The study of crystals is the province of the science of crystallography, the importance of which is now recognized by chemists and physicists as well as by geologists and mineralogists.

Because of the fundamental laws governing the form of crystals, the angles between corresponding faces of all crystals, of the same chemical substance are always the same and are characteristic of the substance. Such angles may therefore be of great assistance in the identification of minerals. Furthermore, crystals may be symmetrical with respect to a point, a line or axis, and a plane; indeed, certain crystals such as a regular octahedron may possess as many as thirteen axes of symmetry and nine planes of symmetry, as well as a center of symmetry.

Crystals are grouped into six systems and thirty-two classes, depending upon their degree of symmetry and the number and relation of their crystallographic axes. This classification is not, however, of much assistance in an elementary study of geology, because most of the minerals of which the common rocks are composed were crystallized under conditions which did not permit the formation of large and perfect crystals. Physical properties other than crystal form will therefore be used more frequently in the identification of minerals.

Minerals which do not show external crystal form may be described as follows: Massive, if the specimen appears to be homogeneous and is not bounded by plane surfaces. (Such specimens may be irregular portions of a large crystal.) Granular, if the specimen appears to be made up of irregular grains. A crystalline aggregate, if, by means of cleavage or other physical properties, it may be ascertained that the specimen is a moss of interlocking crystals. Fibrous, if the specimen appears to be composed of slender fibers. Platy, if the specimen is made up of thin plates. Obviously, these terms are descriptive; others may be used if necessary.

Physical Properties of Minerals

It is possible to identify a great many of the various minerals by observing their physical properties. The more important of these properties are streak, hardness, color, luster, cleavage, fracture, specific gravity, diaphaneity; the less important are odor, taste, feel and magnetism. It is necessary to ascertain the nature of these properties by examining a fresh specimen of the mineral, since alteration of the mineral causes its physical properties to vary.

The streak of a mineral is the color of its powder. This may be determined by rubbing the mineral on a streak plate(a small piece of unglazed porcelain), by scratching the specimen to produce a powder, or by pulverizing a small bit of the mineral and noting the color of the powder.

The color of some minerals is constant, but that of many minerals may range through various shades. Consequently different specimens of the same mineral may show different colors, and in such cases the color of the specimen may be misleading.

Hardness is the resistance a mineral offers to scratching. Hardness can be determined by attempting to scratch the specimen with another mineral or with some common object of known hardness. The following table gives the minerals of the standard hardness scale, other minerals which may be used for comparison, and, in the third column, objects which may be used to test hardness. The hardness scale is an arbitrary division of all minerals into ten groups on the basis of hardness and does not indicate the actual ratio of hardness of one mineral to another.

SCALE OF MINERAL HARDNESS

Grade	Standard Mineral	Other Minerals	Useful Objects
1	Talc	Graphite	
2	Gypsum	Sulphur Halite	

SCALE OF MINERAL HARDNESS (Continued)

Grade	Standard Mineral	Other minerals	Useful Objects
2.5			Finger nail
3	Calcite	Galena Barite	
3.5		Sphalerite	Copper coin
4	Fluorite	Pyrrhotite Chalcopyrite	
5	Apatite		Iron nail
6	Orthoclase	Magnetite	Glass Knife blade
7	Quartz	Garnet	File
8	Topaz		
9	Corundum		
10	Diamond		

Cleavage is the tendency of minerals to break or split in certain, parallel directions, forming smooth planes. These planes are parallel to some crystal face or some possible crystal face. Minerals may have 1,2,3,4 or 6 cleavage directions. If a mineral has three or more directions, the cleavage fragments may be bounded on all sides by fairly smooth, plane faces and may resemble a complete crystal.

Fracture is the term used to define the character of the surface obtained when a mineral is broken in any direction other than one of its cleavage directions. There are several terms used to describe the fracture of minerals, such as: conchoidal (a surface resembling the inner surface of a shell), uneven, splintery, hackly, smooth and earthy.

Note: Cleavage and fracture in minerals may be compared with the tendency of a piece of wood to split with fairly smooth faces in a direction parallel to the grain and to fracture with a splintery surface in any direction across the grain.

Luster is defined as the appearance of the surface of a mineral in reflected light. Minerals are divided into two large groups on the basis of their luster: first, those with a metallic luster (reflecting light like a piece of polished metal) and second, those with non-metallic luster. In the non-metallic group there are several subdivisions; vitreous (reflecting light like glass), greasy (reflecting light like a piece of greasy glass), adamantine (reflecting light like a diamond), earthy, waxy, resinous, etc.

Diaphaneity is the term applied to the degree of transparency. This property depends on the amount of light that will pass through a mineral. A mineral is described as transparent if the outline of an object seen through the mineral is distinct, as translucent if light is transmitted through the specimen but objects cannot be seen and opaque if no light passes through the specimen even on very thin edges (most of the minerals with metallic luster are opaque).

Specific gravity is the weight of the mineral as compared to the weight of an equal volume of water. Accurate determinations of specific gravity require special apparatus which is not readily available in field work, so for our purpose we shall classify minerals as light weight, medium weight, or heavy.

Some minerals have a distinct odor after they have been rubbed, moistened or struck a blow.

Minerals which are soluble in water can be tasted. Common salt (the mineral halite) is a good example of this.

Certain minerals feel smooth, soapy, clayey or rough when touched.

A few minerals are attracted by a magnet and are termed magnetic. One variety of magnetite (lodestone) acts as a magnet and will attract small tacks or iron filings.

Chemical Properties of Minerals

The chemical composition of minerals can be determined only by chemical analysis which is quite outside the province of an introductory course in geology. It is necessary, however, in order to understand geologic processes, to have at least an elementary knowledge of the chemistry of minerals and rocks.

The following table gives the twenty-five chemical elements which are most common in the earth's crust and the percentage of the crust formed by each element.

ELEMENT	SYMBOL	PERCENTAGE OF THE CRUST
Oxygen	O	49.52
Silicon	Si	25.75
Aluminum	Al	7.51
Iron	Fe	4.70
Calcium	Ca	3.39
Sodium	Na	2.64
Potassium	K	2.40
Magnesium	Mg	1.94
Total percentage of first eight		97.85
Hydrogen	H	0.88
Titanium	Ti	0.58
Chlorine	Cl	0.188
Phosphorus	P	0.12
Carbon	C	0.087
Manganese	Mn	0.08
Sulphur	S	0.048
Barium	Ba	0.047
Chromium	Cr	0.033
Nitrogen	N	0.030
Fluorine	F	0.027
Zirconium	Zr	0.023
Nickel	Ni	0.018
Strontium	Sr	0.017
Vanadium	Va	0.016
Cerium, Yttrium	Ce, Y	0.014
Copper	Cu	0.010
All others		0.032
		100.000

Several familiar elements are found in the all inclusive group at the end of the table. They are: Gold (Au), Silver (Ag), Platinum (Pt), Tin (Sn), Lead (Pb), Zinc (Zn), Mercury (Hg), Tungsten (Wo), etc.

As indicated in the table, almost 98 per cent of the earth's crust is composed of eight elements. These eight elements are therefore the ones most commonly found as constituents of minerals and rocks.

Of these eight elements, oxygen combines with the other seven to form the following oxides: silica (SiO_2), alumina (Al_2O_3), iron oxides (FeO, Fe_2O_3 and Fe_3O_4), lime (CaO), magnesia (MgO), soda (Na_2O) and potash (K_2O). The chemical formulae, stated here in parentheses, indicate the relative proportions of each element in each compound. Thus in a molecule of silica (SiO_2), two atoms of oxygen (O) are combined with each atom of silicon (Si).

The union of silica (SiO_2) with one or more of the other oxides forms a silicate, and the silicates are the most important group of rock-forming minerals. One molecule of lime (CaO) combined with one molecule of alumina (Al_2O_3) and two molecules of silica (SiO_2) forms one molecule of the mineral anorthite ($CaAl_2Si_2O_8$) which might be called a calcium aluminum silicate. Some of the oxides, such as silica and the iron oxides, may exist uncombined in the earth's crust as minerals.

In addition to the oxides and silicates there are many other combinations of elements which are found as minerals. Many of the metals, iron, lead, zinc, etc., combine with sulphur (S) to form sulfides such as pyrite (FeS_2), galena (PbS) and sphalerite (ZnS). Other common groups of minerals are the carbonates, sulfates and chlorides. The carbonates are formed by the combination of one of the oxides with carbon dioxide (CO_2); thus lime (CaO) combines with CO_2 to form calcium carbonate ($CaCO_3$). The sulfates are formed by the conbination of an oxide with sulphur trioxide (SO_3); thus lime (CaO) combines with SO_3 to form calcium sulfate ($CaSO_4$), or magnesia (MgO) combined with SO_3 forms magnesium sulfate ($MgSO_4$), known commercially as epsom salts. The chlorides result from the combination of some element with chlorine (Cl); the most common chloride is ordinary salt, sodium chloride ($NaCl$).

Notes on the Common Igneous Minerals

The following notes give the chemical composition, use and other desirable information concerning the common igneous minerals.

Feldspars (orthoclase and plagioclase) are perhaps the most common of all minerals; they comprise about 50 per cent of the rocks of the earth's crust.

Chemical composition:

Orthoclase: $K_2O \cdot Al_2O_3 \cdot 6SiO_2 = KAlSi_3O_8$ (potassium aluminum silicate).

Plagioclase: Albite - $Na_2O \cdot Al_2O_3 \cdot 6SiO_2 = NaAlSi_3O_8$ (sodium aluminum silicate).

Anorthite - $CaO \cdot Al_2O_3 \cdot 2SiO_2 = CaAl_2Si_2O_8$ (calcium aluminum silicate).

The plagioclase feldspars form a series of mineral species which contain varying amounts of the two molecules given above. Labradorite, one of the common members of this series, contains about 50 per cent sodium aluminum silicate (albite molecule), and 50 per cent calcium aluminum silicate (anorthite molecule).

Use: The feldspars are used chiefly in the manufacture of porcelain, both in the body of the ware and in the glaze. Some varieties of feldspar may be used for interior decorating and occasionally for gem stones (amazon stone and sun stone).

Quartz is second only to feldspars in abundance.

Chemical composition: SiO_2 = silicon dioxide = silica.

Use: Quartz is used mainly in the manufacture of glass. It is used in minor amounts as an abrasive on sand paper and in certain scouring soaps. Quartz, as sand and sandstone, is used as material for construction. Some of the colored varieties are used for ornamental purposes and as gem stones.

Hornblende is a member of a large group of rather closely related mineral species known as the amphiboles.

Chemical composition: Calcium, magnesium, iron and aluminum silicates, usually having a very complex formula.

Augite is a member of another large group of closely related mineral species known as the pyroxenes.

Chemical composition: Calcium, magnesium and iron silicates, usually with a very complicated formula.

Mica. The most common of the micas are muscovite, the white mica, and biotite, the black mica

Chemical composition: Muscovite is a hydrous, potassium aluminum silicate; biotite is essentially the same except that it contains, in addition, iron or magnesium or both.

Use: Micas are used as insulating materials in electrical apparatus. Pulverized micas are used as fireproofing material, for heat insulation and, when mixed with oil or grease, as lubricants. Thin sheets of some of the transparent varieties are used as non-inflammable material to cover the openings in stove and furnace doors.

Olivine is a common mineral in certain igneous rocks.

Chemical composition: Olivine may be either a magnesium silicate or a magnesium iron silicate $[2MgO \cdot SiO_2 = Mg_2SiO_4$ or $2MgFeO \cdot SiO_2 = (Mg,Fe)_2SiO_4]$.

Use: The clear green variety, called peridote is used as a gem stone.

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A VALUABLE CONTRIBUTION

The society has been very fortunate in having speakers who were not only authorative but leaders in their field of study. The lecture by Mr. Piper is a splendid illustration. The Bulletin takes pride in publishing the first detailed geological report on the previously little known but a very important part of Oregon.

RESUME OF THE GEOLOGIC HISTORY OF THE HARNEY BASIN, OREGON

BY

ARTHUR M. PIPER

The Harney Basin covers about 5,300 square miles on the relatively high and semiarid plateau of southeastern Oregon, in Harney and Grant Counties. It constitutes the drainage area of the Malheur and Harney Lakes which have no outlet to the sea. The average yearly rainfall is about 7.80 inches; the yearly mean temperature 44.6° F.

The Basin may be divided into (1) a low central district which comprises playas and lake beds, extensive alluvial plains, cinder cones, and lava fields;

also, (2) a higher marginal district which comprises erosion plains of intermediate altitude and a youthful to mature dissected upland, the latter having been eroded from a fault-block terrane. The Harney, Malheur, and Mud Playas occupy the lowest part of the central district; together they cover about 125 square miles and range in altitude from 4,080 to 4,095 feet above sea level. Alluvial plains cover fully 800 square miles in addition to the playas. These plains are underlain by the shallowest water-bearing beds and include the arable land that can be irrigated economically by pumping from wells. The dissected upland attains a height of 9,600 feet above sea level at Strawberry Mountain to the north, of 9,400 feet at Steens Mountain to the southeast.

The greater part of the Basin is drained by the Silvies River and the Donner und Blitzen River, these streams rising on the highest parts of the dissected upland to the north and south, respectively. Each ranges widely in discharge between a spring freshet of several thousand second-feet and an autumn ground-water run-off which may fail altogether; also, each discharges onto the Malheur Playa, which in turn drains westward to the Harney Playa. Since 1895, the aggregate area of the lakes on these playas has ranged repeatedly from about 125 square miles to about 2 square miles.

In the Harney Basin non-marine strata of the Tertiary and Quaternary systems rest upon a basement of crystalline and metamorphic rocks, part of which belong to the Lower Jurassic series. The Tertiary rocks include extrusive basalt, andesite, and rhyolite; ejectamenta which range from coarse scoria to compact massive tuff or breccia; also detrital sediments of alluvial and lacustrine origin.

Five distinct stratigraphic units span the Miocene and Pliocene epochs. The oldest is composed of siliceous extrusives which are Miocene (?) in age and about 1,000 feet thick. These extrusives form a few scattered masses in the eastern half of the Basin; generally, they are loosely crumpled and faulted and have little water-yielding capacity. The Steems basalt, of Miocene age, rests uncomformably on the older siliceous extrusives in the marginal upland along the eastern half of the Basin. Its maximum known thickness, about 3,000 feet, is exposed in the east-facing escarpment of Steens Mountain. The component layers average 10 feet thick; scoriaceous and fragmental zones are common at the top of each and afford considerable water-yielding capacity. The Steens basalt is overlain non-comformably by the Danforth formation of Pliocene age, which crops out extensively over the whole dissected upland and which ranges in thickness between 20 feet and about 800 feet. In the northwestern part of the Basin, the upper part of the Danforth formation comprises stratified siltstone, sandstone, tuff, and volcanic ash with a few intercalated layers of glassy perlitic rhyolite and one distinctive rhyolitic tuff-breccia member. Its lower part is massive rhyolite, commonly spherulitic. In that district the stratified beds of the upper part yield considerable water at some places; the lower part yields thermal water from fault conduits. In the southern part of the Basin the Danforth formation comprises four local facies, as follows: (1) the distinctive tuff-breccia member and associated stratified rocks; (2) an equally distinctive basaltic-breccia member and associated siltstone, sandstone, conglomerate, and two intercalated sheets of basalt; (3) stratified siltstone, sandstone, and ash; also, (4) spherulitic rhyolite. In that district the formation supplies several large thermal springs from fault conduits but generally is not water-bearing extensively. The succeeding stratigraphic unit, the Harney formation, is Pliocene (?) in age, about 750 feet thick, and rests on the Danforth formation with angular and erosional nonconformity. The Harney formation underlies an extensive plain of intermediate altitude in the west central part of the Basin and outliers occur along all margins of the central district except the northern. The formation includes massive basaltic tuff and breccia, sandstone and siltstone, some incoherent gravel, and a few layers of scorisceous and massive basalt. The incoherent gravel members yield water freely. A fanglomerate or a conglomerate that accumulates at the foot of a talus slope, also Pliocene (?) in age, occurs locally along the north margin of the central district but lies above regional ground-water level.

The Quaternary formations are both volcanic and detrital. In the southeastern part of the Basin basaltic lava fields cover approximately 150 square miles. These disclose compact, scoriaceous, and fragmental extrusives; also lava domes, cinder cones, and cinder plains. The scoriaceous and fragmental facies are pervious; they supply one moderately large perennial spring and several flowing wells along the south margin of the Malheur Playa. The youngest of these lava fields constitutes the so-called Diamond Craters, which are post-Pleistocene in age. The Quaternary valley fill comprises alluvium, lake and playa deposits, and eolian sediments; all these are derived largely from the volcanic rocks of the upland. Along the principal streams at the outer margin of the central district the valley fill is largely clean sand and gravel but toward the center of the Basin these beds grade laterally and finger featherwise into silt and clay. At least one thin layer of volcanic ash is intercalated from 3 feet to 6 feet below the land surface. It is inferred that the valley fill is thickest, about 300 feet, along the northern edge of the Malheur Playa. In the valley fill the members, lentils, and tongues of gravel and sand are pervious. Those which are shallow hold unconfined water; near the center of the Basin this shallow water contains considerable alkali. The deep permeable beds in the valley fill hold confined water and supply several irrigation wells on the northwestern part of the central alluvial plain.

The Tertiary rocks of the upland are inclined toward the center of the Basin from the north, east, and south, the dip ranging from 2° to 14°. In the main these rocks are not folded but are cut by faults that strike about N. 10° E. or N. 30° to 60° W. The displacement along the principal fractures is about 1,000 feet. It is inferred that most of the faults were established at the close of the Steens epoch but were reopened and acquired their greatest displacement after the Danforth epoch. Some fault displacements occurred after the Harney epoch.

The history of the Harney Basin seems to include the following stages: (1) Approximately in late Miocene time the site of the basin was a district of moderate or strong relief whose rocks included: (a) metamorphosed sedimentary strata and crystalline plutonic rocks of several kinds, in part of Lower Jurrassic age, which had been faulted and compressed; and (b) siliceous extrusives of Miocene (?) age which had been faulted and loosely crumpled. (2) In Miocene time the Steens basalt was extruded in a series of thin but extensive sheets that buried the older rocks along the eastern margin of the basin with the exception of a few scattered peaks. North of Burns the whole series wedged out by overlap against the crystalline rocks. (3) The present structural basin was outlined in general form by faulting and by tilting of blocks. At that time certain of the present fault scarps were perhaps initiated and the major subdivisions of the present upland were outlined. The basaltic plain was incised locally with stream canyons. (4) In Pliocene time, the Danforth formation was deposited over most of the area; this formation comprised detrital sediments of lacustrine and alluvial origin, coarse and fine ejectamenta, massive spherulitic rhyolite and perlite, and thin discontinuous sheets of rhyolite and basalt. Only the highest members lapped eastward upon the flank of the Steens Mountain. (5) The major faults of the pre-Danforth epoch were rejuvenated, the major fault scarps of the present land surface were formed or heightened, and, by further block tilting, the central part of the basin was depressed still more with reference to the bordering upland. (6) For a relatively long period the region was subject to erosion and exterior drainage was established along the general course of the present South Fork of the Malheur River, drainage leaving the Harney Basin through one or both of two gaps that pierce the upland to the east. These inferred outlets are now wind gaps: Crane Gap, which is near the town of that name, and Malheur Gap, which is due east of the Malheur Playa. By the end of the epoch, the central part of the Basin had acquired considerable relief. (7) In late Pliocene (?) time the Harney formation was deposited throughout the central part of the basin and over an extensive district to the west; this formation comprised basalt scoria, pumice, detrital sediments, and some extensive but relatively thin layers of basalt. (8) Through a long fraction of the Pleistocene epoch erosion was again dominant so that exterior drainage was again established through Malheur Gap and perhaps briefly through Crane Gap. By stream planation the upper part of the Harney formation was stripped from the central district; it is inferred that ultimately the central district was reduced to a submature land surface which was adjusted to an outlet about 300 feet below the present alluvial tongue in the Malheur Gap. (9) Immediately prior to the epoch just described, or during the early part of that epoch, a few of the faults were reopened and some blocks were tilted further, particularly along the eastern margin of the basin near the two gaps; however, the major features of the structure are believed to have remained stable. (10) In late Pleistocene time basalt was extruded from vents about 5 miles southwest of Burns, near Hines townsite; also from vents along the southeast margin of the central alluvial plain - specifically, east and south of Voltage. From the latter a relatively extensive lava field spread northward and eastward, entered the Malheur Gap, filled that drain up to the level of the present divide near the Gap School, and separated the present Harney Basin from the drainage area of the Malheur River. The lava dam has not been breached to this day. (11) The central basin was filled by lake and playa deposits, by alluvium, and by minor quantities of volcanic ash, peat, and wind-borne sand. It is not unlikely that some of the valley fill was deposited contemporaneously with the basalt. In the final stage of this epoch the central alluvial plain was aggraded to its present altitude and the lower reaches of the stream valleys were drowned by alluvium for several miles upstream from the central plain. (12) At some relatively late time in the epoch of valley filling the late basalt of the Diamond Craters was extruded near the southwest margin of the Voltage lava field. Today these "craters" are virtually unscarred by erosion and disclose minor initial forms such as fragile spatter cones. With the exception of dunes and certain features of the Malheur and Harnery Playas, that epoch of volcanism molded the youngest component of the present land surface in the Harney Basin.

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LIST OF NEW MEMBERS

Walgrave, Edna	3315 N. E. 18th Avenue
Cimino, Elsie	Hillsboro, Oregon.
Stockwell, H. Mildred	1015 S. E. 26th Avenue
Jones, Doris Wolcott	2640 S. W. Patton Road
Kurath, Carl	2914 S. E. 53rd Avenue
Rockwell, E. H.	2503 N. E. 41st Avenue
Schumacher, Roy A.	3609 N. E. 76th Avenue
Holbrook, D. C.	3245 N. E. 55th Avenue
Byron, H. F.	375 Edgecliff Road
Cooper, H. C. Dr.	533 N. E. Multnomah Street
Jennings, Rose H.	206 N. E. 31st Avenue

Nelson, Clara	9529 N. Edison Street
Tomlinson, Paul C.	2847 N. E. 31st Avenue
Wheeler, Chester A.	2944 N. E. 47th Avenue

CHANGE OR CORRECTION OF ADDRESS

Gekler, Ruth S.	3219 N. E. 67th Avenue
Maxwell, J. I.	1542 W. Burnside Street
Hurst, Jane	615 N. W. 20th Avenue
Kaufman, Chas. R.	4304 S. E. 44th Avenue
Vance, A. D.	5516 N. E. Rodney Avenue

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MEMBERSHIP APPLICATION

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Date______________________

I, ____________________________________(print), do hereby apply for membership in the Geological Society of the Oregon Country, subject to the Provisions of the By-Laws.

______________________________________ Telephone No.______________
Address

______________________________________ ___________________________
Business Address Occupation

I am particularly interested in the following branch of Geology:

____

Sponsored by: ____________________
(Member)

I inclose $_____ for first year's dues.
(make checks payable to the Society)

____
Signature

THE GEOLOGICAL NEWS LETTER

OFFICIAL BULLETIN
OF THE

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

VOL. 2 - NO. 9 PORTLAND, OREGON MAY 10, 1936

PLACE OF MEETING

THE PUBLIC SERVICE BUILDING HAS GENEROUSLY GRANTED THE SOCIETY THE USE OF THEIR SPLENDID LECTURE HALL ON THE SECOND AND FOURTH FRIDAY EVENINGS OF EACH MONTH. THIS HALL COULD NOT BE SECURED FOR THURSDAY EVENINGS AND BECAUSE OF THE EXCELLENCE OF THIS LECTURE HALL, THE EXECUTIVE COMMITTEE DECIDED TO CHANGE THE DAY OF MEETING FROM THURSDAY TO FRIDAY. IT IS HOPED THAT FRIDAY WILL BE A CONVENIENT TIME FOR OUR MEMBERS. THE LECTURE HALL HAS COMFORTABLE SEATS, IMPROVED VENTILATION AND ADMIRABLY SUITED TO OUR USE.

NEXT MEETING

MAY 15, 1936 (FRIDAY) - DR. ETHEL SANBORN IS A SPECIALIST ON PALEOBOTONY. SHE HAS SPENT MANY YEARS IN DETAILED STUDY OF THE FOSSIL PLANTS OF OREGON AND OF THE OREGON COUNTRY. THE LECTURE WILL BE ILLUSTRATED BY ORIGINAL PICTURES OF THE FOSSIL PLANTS YOU ARE APT TO FIND ON YOUR EXPLORATIONS. THE LECTURE WILL DEAL WITH THE HISTORY OF PLANTS FROM THE BEGINNING OF THEIR APPEARANCE IN THE OREGON COUNTRY DOWN TO THE PRESENT TIME. THIS IS AN OPPORTUNITY TO LEARN SOMETHING OF A SUBJECT OF SUCH GREAT INTEREST TO MANY PEOPLE. HER SUBJECT IS "FOSSIL FORESTS OF OREGON".

OTHER LECTURES

MAY 29, 1936 (FRIDAY) - NO MEETING IN ORDER TO PERMIT MEMBERS WHO DESIRE TO LEAVE EARLY ON FIELD TRIP TO MADRAS AND VICINITY.

JUNE 12, 1936 (FRIDAY) - DR. E. W. LAZELL WILL SPEAK ON "GEMS".

FIELD TRIPS

MAY 17, 1936 (SUNDAY) - FOREST GROVE AND VICINITY. PROFESSORS JESSE WATSON AND DR. FRANCIS T. JONES HAVE EXPLORED THE FOREST GROVE REGION AND FOUND SEVERAL MYSTERIES AND SOME EXCITING DISCOVERIES. DO YOU KNOW YOUR FOREST GROVE COUNTRY? IF NOT, HERE WILL PROBABLY BE YOUR ONLY CHANCE FOR SEVERAL YEARS. PROFESSOR WATSON WILL LEAD THE TRIP.

OTHER FIELD TRIPS

MOST OF THE FOLLOWING FIELD TRIPS ARE DEFINITELY PLANNED BUT SOME ARE TENTATIVE. IF YOU HAVE SUGGESTIONS OF THINGS THAT SHOULD BE VISITED ON THIS EXPLORATION TRIP OR IDEAS OF BETTER TRIPS, COMMUNICATE WITH RUSSELL COLLINS (3310 S. E. CARUTHER ST., PORTLAND) CHAIRMAN OF THE EXPLORATION COMMITTEE.

MAY 30-31, 1936 (SATURDAY AND SUNDAY) - FOSSIL HUNTING IN MADRAS AND VICINITY. - LEADERS: LEWIS H. IRVING AND JOSEPH WIMMER.

JUNE 14, 1936 (SUNDAY) - COPPER CITY, SIVERSTAR MOUNTAIN AND VICINITY. - LEADERS: JOSEPH WIMMER AND CLAIRE HOLDREDGE.

JULY 4-5, 1936 (SUNDAY AND MONDAY) - MT. ST. HELENS AND SPIRIT LAKE. - LEADER: RAY TREASHER.

JULY 26, 1936 (SUNDAY) - MOLALLA AND VICINITY. - LEADER: HARRY CLARK.

AUGUST 8-9, 1936 (SATURDAY AND SUNDAY) — WHEELER, NEAKAHNIE MOUNTAIN AND ARCH CAPE. LEADER: HARRY JENNISON.

AUGUST 23, 1936 (SUNDAY) — UPPER CLACKAMAS RIVER. LEADER: CLARENCE PHILLIPS.

SEPT. 5-6-7, 1936 (SATURDAY, SUNDAY AND MONDAY) — MT. ADAMS AND VICINITY. LEADER: RAY TREASHER.

SEPT. 27, 1936 (SUNDAY) — MT. HOOD BURIED FORESTS AND LITTLE CRATER LAKE, ETC. LEADER: J. R. COLLINS.

OCT. 10-11, 1936 (SATURDAY AND SUNDAY) — NORTH AND SOUTH SIDES OF LOWER COLUMBIA RIVER. LEADER: CLAIRE HOLDREDGE.

OCT. 25, 1936 (SUNDAY) — COLUMBIA RIVER GORGE. LEADER: JOSEPH WIMMER.

NOV. 15, 1936 (SUNDAY) — SCIO AND VICINITY. LEADER: WAYNE FELTS.

DEC. 13, 1936 (SUNDAY) — CAMAS AND VICINITY. LEADER: A. D. VANCE.

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NOTICE OF THURSDAY NOONDAY LUNCHEON

IT HAS BECOME QUITE THE HABIT FOR CERTAIN MEMBERS OF OUR SOCIETY TO GATHER ON THURSDAYS AT THE RATHSKELLER, 722 S. W. TAYLOR STREET, FOR NOONDAY LUNCHEON.

WE HAVE NO SET PROGRAMS AND ONE CAN LEAVE AT ANY TIME. IT IS A GET-TOGETHER WHERE THINGS OF GEOLOGIC INTEREST ARE DISCUSSED.

IT IS SUGGESTED THAT ANY OF OUR MEMBERS WHO ARE DOWNTOWN AND IN THE VICINITY, ON THURSDAYS, DROP IN AND JOIN OUR GROUP.

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ACTIVITIES OF OUR MEMBERS

DR. HODGE WAS SPEAKER OF THE EVENING APRIL 2ND, AT THE MEETING OF THE PORTLAND CHAPTER OF BUSINESS AND PROFESSIONAL WOMEN'S CLUB. HIS SUBJECT WAS "GEOLOGY OF THE MT. HOOD REGION".

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MR. LEO SIMONS HAS BECOME A FAMOUS LECTURER. HE SPOKE APRIL 3 BEFORE A LARGE AUDIENCE OF P. E. O. (YOU FIGURE IT OUT) GROUP ON THE GEOLOGY OF OREGON. HIS REMARKS WERE ENTHUSIASTICALLY RECEIVED.

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MR. CLAIR HOLDREDGE AND DR. THOMAS THAYER HAVE BEEN SELECTED TO CONDUCT A CLASS ON GEOLOGY FOR THE BONNEVILLE EMPLOYEES.

BRADFORD ISLAND WHICH SPLITS THE COLUMBIA RIVER CHANNEL AT THE DAM SITE IS RICH IN GEOLOGICAL MATERIAL AS WELL AS RELICS OF EARLY INDIAN SETTLEMENTS, IT BEING FOR CENTURIES, A FISHING GROUND OF INDIAN TRIBES.

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THE LAST FIELD TRIP LED BY DR. POWERS VISITED MANY SOIL AREAS AROUND PORTLAND AND WAS VOTED AS ONE OF THE MOST INTERESTING AND ECONOMICALLY VALUABLE TRIPS EVER SPONSORED BY THE SOCIETY.

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THE ANCIENT EASTERN SHORE OF THE LAND, WHICH IS NOW THE OREGON COUNTRY, LEFT THE FINEST REMAINS OF WORMS AND OF THE ANCESTORS OF CRABS AND INSECTS THAT HAVE EVER BEEN FOUND. HERE WALCOTT FOUND THOUSANDS OF COMPLETE TRILOBITES, THE FIRST OF THE ARTHROPODS.

THE GEOLOGICAL NEWS LETTER

EDWIN T. HODGE, EDITOR
2915 N. W. LURAY TERRACE,
PORTLAND, OREGON

RAYMOND L. BALDWIN, BUSINESS MANAGER
2725 N. E. 50TH AVENUE,
PORTLAND, OREGON

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YEARLY SUBSCRIPTION..$ 2.00

ALL MATERIAL FOR PUBLICATION IN BULLETIN SHOULD BE SENT TO THE EDITOR.

ADDRESS ALL OTHER CORRESPONDENCE REGARDING THE BULLETIN AND CHANGES OF ADDRESS, DURING THE MONTH OF MAY, TO MR. C. J. BORUM, 305 U. S. COURTHOUSE BUILDING.

BY-LAWS
OF
GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

A CORPORATION

ARTICLE I

NAME, LOCATION AND OBJECT

SECTION 1. THE NAME OF THIS CORPORATION SHALL BE THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY.

SECTION 2. THE OFFICES OF THE SOCIETY SHALL BE LOCATED IN THE CITY OF PORTLAND, OREGON.

SECTION 3. THE OBJECTS OF THE SOCIETY SHALL BE:

(1) TO PROVIDE FACILITIES FOR MEMBERS OF THE SOCIETY TO STUDY GEOLOGY, PARTICULARLY THE GEOLOGY OF THE OREGON COUNTRY.

(2) THE ESTABLISHMENT AND MAINTENANCE OF A LIBRARY AND MUSEUM OF GEOLOGICAL WORKS, MAPS AND SPECIMENS.

(3) THE ENCOURAGEMENT OF GEOLOGICAL STUDY AMONG AMATEURS.

(4) THE SUPPORT AND PROMOTION OF GEOLOGIC INVESTIGATION IN THE OREGON COUNTRY.

(5) THE DESIGNATION, PRESERVATION AND INTERPRETATION OF IMPORTANT GEOLOGIC FEATURES OF THE OREGON COUNTRY.

(6) THE DEVELOPMENT OF THE MENTAL CAPACITIES OF ITS MEMBERS IN THE STUDY OF GEOLOGY AND THE PROMOTION OF BETTER ACQUAINTACE AND CLOSER ASSOCIATION BETWEEN THOSE ENGAGED IN THE ABOVE OBJECTS.

ARTICLE II

MEMBERSHIP

SECTION 1. THE SOCIETY SHALL BE COMPOSED OF MEMBERS WHO, BY KNOWLEDGE, EXPERIENCE AND HONORABLE STANDING ARE QUALIFIED TO ADVANCE THE OBJECTS OF THE SOCIETY, AND WHO SHALL BE ELECTED TO MEMBERSHIP AS HEREINAFTER PROVIDED, AND SHALL

BE DIVIDED INTO FOUR CLASSES OF MEMBERSHIP, AS FOLLOWS: JUNIOR, MEMBER, FELLOW AND HONORARY LIFE FELLOW.

SECTION 2. THE EXECUTIVE COMMITTEE, IN ITS DISCRETION, MAY ISSUE MEMBERSHIP CARDS IN SUCH FORM AS THEY MAY DETERMINE.

SECTION 3. QUALIFICATION FOR MEMBERSHIP:

(1) A JUNIOR SHALL BE A PERSON OVER EIGHTEEN AND UNDER TWENTY-ONE YEARS OF AGE WHO IS INTERESTED IN AND SUPPORTS THE AIMS AND OBJECTS OF THE SOCIETY, AND WHO HAS BEEN RECOMMENDED BY THE MEMBERSHIP COMMITTEE.

(2) A MEMBER SHALL BE A PERSON AT LEAST TWENTY-ONE YEARS OF AGE, WHO IS INTERESTED IN AND SUPPORTS THE AIMS AND OBJECTS OF THE SOCIETY AND WHO HAS BEEN RECOMMENDED BY THE MEMBERSHIP COMMITTEE.

(3) A FELLOW MUST BE ELECTED BY TWO-THIRDS OF THE EXECUTIVE COMMITTEE FOR SOME DEFINITED CONTRIBUTION TO THE WELFARE AND OBJECTIVES OF THE SOCIETY.

(4) AN HONORARY LIFE FELLOW MUST BE ELECTED UNANIMOUSLY BY THE EXECUTIVE COMMITTEE FOR OUTSTANDING CONTRIBUTION TO OR ATTAINMENT IN THE STUDY OF GEOLOGY.

ARTICLE III

DUES

SECTION 1. THE ANNUAL DUES FOR A JUNIOR SHALL BE $1.00, AND ALL OTHER MEMBERS SHALL PAY ANNUAL DUES OF $3.50; PROVIDED HOWEVER, THAT THERE SHALL BE EXTENDED TO THE WIFE OR HUSBAND OF A MEMBER, AS THE CASE MAY BE, ALL PRIVILEGES OF THE SOCIETY, EXCEPT THE RIGHT TO RECEIVE THE PUBLICATION OF THE SOCIETY. HONORARY LIFE FELLOWS SHALL NOT BE REQUIRED TO PAY DUES.

SECTION 2. DUES SHALL BE PAYABLE ANNUALLY IN ADVANCE ON OR BEFORE MARCH FIRST OF EACH YEAR. ALL APPLICATIONS FOR MEMBERSHIP SHALL BE ACCOMPANIED BY THE FIRST YEAR'S DUES. THE EXECUTIVE COMMITTEE, BY RESOLUTION, MAY FIX PART YEAR DUES FOR APPLICANTS FOR MEMBERSHIP, WHICH SHALL ONLY BE EFFECTIVE FOR THE BALANCE OF THE YEAR IN WHICH SUCH APPLICATION BE RECEIVED.

SECTION 3. ANY MEMBER WHOSE DUES ARE MORE THAN TWO MONTHS IN ARREARS SHALL BE NOTIFIED BY THE SECRETARY, OF HIS DELINQUENCY. SHOULD SAID DELINQUENT DUES BE NOT PAID WHEN THEY ARE FOUR MONTHS IN ARREARS, THE DELINQUENT MEMBER SHALL LOSE THE RIGHT TO VOTE; IF SUCH DUES BECOME SIX MONTHS IN ARREARS, THE DELINQUENT MEMBER SHALL FORFEIT HIS CONNECTION WITH THE SOCIETY. ANY MEMBER DELINQUENT IN HIS DUES SHALL NOT RECEIVE THE PUBLICATIONS OF THE SOCIETY.

ARTICLE IV

OFFICERS AND DIRECTORS

SECTION 1. THE OFFICERS OF THE SOCIETY SHALL BE A PRESIDENT, A VICE-PRESIDENT, A SECRETARY AND A TREASURER, AND SAID OFFICERS SHALL ACT AS MEMBERS OF THE BOARD OF DIRECTORS, AND IN ADDITION THERETO THREE DIRECTORS AT LARGE SHALL BE ELECTED AS HEREINAFTER PROVIDED.

SECTION 2. THE BOARD OF DIRECTORS SHALL BE KNOWN AS THE EXECUTIVE COMMITTEE, AND SHALL BE COMPOSED OF NINE MEMBERS, AS FOLLOWS: THE TWO LATEST LIVING PAST PRESIDENTS CONTINUING TO BE MEMBERS, THE PRESIDENT, VICE-PRESIDENT, SECRETARY, TREASURER AND THE THE THREE DIRECTORS AT LARGE PROVIDED FOR IN SECTION I OF THIS ARTICLE IV.

SECTION 3. THE TERMS OF OFFICE OF ALL OFFICERS SHALL BE ONE YEAR WITH THE EXCEPTION OF THE DIRECTORS WHO SHALL SERVE FOR THREE YEARS, PROVIDED THAT AT THE FIRST ELECTION THE NOMINEE FOR DIRECTOR RECEIVING THE HIGHEST NUMBER OF VOTES SHALL SERVE FOR THREE YEARS, THE NOMINEE RECEIVING THE NEXT HIGHEST NUMBER OF VOTES SHALL SERVE FOR TWO YEARS, AND THE NOMINEE RECEIVING THE THIRD HIGHEST NUMBER OF VOTES SHALL SERVE FOR ONE YEAR. THEREAFTER ONE DIRECTOR SHALL BE ELECTED EACH YEAR. UNTIL SUCH TIME AS THE SOCIETY HAS EXISTING LIVING PAST PRESIDENTS, THE POSITIONS PROVIDED FOR THEM ON THE EXECUTIVE COMMITTEE SHALL BE FILLED BY APPOINTMENT BY THE ELECTED MEMBERS OF THE EXECUTIVE COMMITTEE.

SECTION 4. THE EXECUTIVE COMMITTEE SHALL APPOINT OFFICERS TO ALL VACANCIES EXCEPT THAT THE VICE-PRESIDENT SHALL COMPLETE THE TERM OF THE PRESIDENT IN CASE OF A VACANCY.

Section 5. The President shall be ineligible for re-election to succeed himself.

ARTICLE V

Management and Duties of Officers

Section 1. All the powers of the Society shall be vested in the Executive Committee, who shall manage the affairs of the Society in accordance with the Articles of Incorporation, By-Laws and such statutes as may apply to this Corporation.

Section 2. All expenditures of money shall be authorized by the Executive Committee, and warrants for the payment of such expenditures shall be drawn on the Treasurer, and shall be signed by the President and Secretary, and checks shall be signed by such persons as may be authorized by the Executive Committee.

Section 3. The President shall serve as the executive head of the Executive Committee. The President shall have general supervision of the affairs of the Society. He shall preside at the meetings of the Society and of the Executive Committee and shall be ex-officio member of all committees.

Section 4. The Vice-President shall preside at meetings when required to do so by the President or in the absence of the President he shall exercise the duties of that office.

Section 5. The Secretary shall be under the direction of the President and the Executive Committee. He shall be expected to attend all meetings of the Society and of the Executive Committee and prepare the business therefor and record the proceedings thereof. He shall see that all monies due the Society are collected. He shall scrutinize all expenditures and use his best endeavour to secure economy in operation of the Society. He shall personally certify to the correctness of all bills and vouchers on which money is to be paid, to the best of his ability and belief. He shall perform all duties which may be assigned to him from time to time by the President or the Executive Committee.

Section 6. The treasurer shall receive all monies and deposit the same to the name of the Society. He shall pay all bills when certified and audited by the Secretary, and warrants for the payment of the same have been drawn on him by the President and Secretary.

Section 7. At the expense of the Society, the Treasurer may be required to give bond in such amount and form and with such sureties as the Executive Committee may determine.

ARTICLE VI

Fiscal Year

Section 1. The fiscal year of this Society shall begin with the first day of March of each year and end with the first day of march of the succeeding year.

ARTICLE VII

Meetings

Section 1. Meetings of the Society shall be held at such times and places as fixed by the Executive Committee.

Section 2. The annual meeting of this Society shall be held at some time during February, at such time and place as may be fixed by the Executive Committee, at which time the officers of the Society for the ensuing year shall be elected. Twenty members shall constitute a quorum at any meeting of the Society.

Section 3. Regular meetings of the Executive Committee shall be held immediately following the annual meeting, and special meetings of the Executive Committee may be held at such times and places as the President shall designate. At all meetings of the Executive Committee five or more members shall constitute a quorum for the transaction of business.

Section 4. Notice of the annual meeting of the Society shall be sufficient if the time and place thereof be designated in the official publication of the Society. At least 24 hours notice shall be required of meetings of the Executive Committee.

ARTICLE VIII

Nomination and Election of Officers

Section 1. A Nominating Committee shall be appointed consisting of five members, none of whom shall be officers or Directors of the Society. Not later than the 15th Day of December, prior to the time of the annual meeting of the Society, the nominating committee shall file with the Secretary its nominations, containing the name of one nominee for each office to be balloted on. On or before the first day of January of each year, the Secretary shall notify the members in writing, or by a publication in the official publication of the Society, the names of nominees for each office. Other nominations may be made by members of the Society by filing with the Secretary, on or before the 15th day of January of each year, a list of such nominations, which shall be signed by at least ten members of the Society. The names of the additional nominees shall be communicated by the Secretary to each member, either by writing or by publication in the official publication of the Society, which communication shall be made not less than fifteen days prior to the annual meeting.

Section 2. A letter ballot containing the nominees of the regular and special tickets shall be enclosed and mailed to each member. All ballots must be returned and in the hands of the Secretary prior to the annual meeting at which meeting the Secretary shall announce the result thereof. In case a majority of all the ballots shall not have been cast for any candidate for any office, the Society shall proceed to make an election, in open meeting, for such office from the two candidates having the highest number of votes.

Section 3. All officers elected shall take office as of the first of March following the annual meeting.

ARTICLE IX

Order of Business

Section 1. The order of business at the regular annual meeting and all business meetings shall be in conformance with Roberts' Rules of Order, or any other rules of order adopted by the Executive Committee.

ARTICLE X

Seal

Section 1. This Society, as a corporation, shall have a seal, the impression of which shall be as follows:

ARTICLE XI

Committees

Section 1. The Executive Committee may create such committees as it may deem advisable, and appoint the members thereof.

Section 2. All committees shall be appointed by the Executive Committee not later than thirty (30) days after the regular annual business meeting. All committee members shall perform the duties of the respective committees until their successors are duly appointed. The number of members on the various committees shall be left to the discretion of the Executive Committee.

ARTICLE XII.

Amendments.

Section 1. Proposed amendments to these By-Laws must be reduced to writing and signed by not less than ten members in good standing, except such amendments as made by the Executive Committee, and amendments shall be submitted and acted upon as follows:

Section 2. Proposed amendments shall be filed with the Secretary who shall submit same to the Executive Committee at its first regular or called meeting thereafter for its approval or disapproval. At least fifteen days prior to the date of the regular annual meeting the proposed amendment, accompanied by the action of the Executive Committee, shall be mailed to each member of the Society. If the proposed amendment is filed with the Secretary more than ninety days prior to the regular annual meeting a letter ballot may be enclosed with said proposed amendment, which ballot shall be returned to the Secretary within fifteen days from the date of mailing by the Secretary. No proposed amendment shall be considered at the regular annual meeting unless filed with the Secretary at least thirty days prior thereto.

Section 3. If the proposed amendment has been approved by the Executive Committee, then an affirmative vote of a majority of all ballots cast shall be necessary to the adoption of the amendment.

If the proposed amendment has not been approved by the Executive Committee, then an affirmative vote of two-thirds of all ballots cast shall be necessary to the adoption of the amendment.

Any amendment defeated by letter ballot shall not be re-submitted for adoption except at a regular annual meeting or until one year has elapsed.

Amendments shall become effective immediately, provided that the officers of the Society, at the time any amendment may be adopted shall continue in office until the expiration of the time for which they were elected.

Section 4. Notwithstanding the foregoing provisions in this Article XII, the Executive Committee may by a two-thirds vote of those present at a meeting duly called, amend the By-Laws provided that the Secretary shall have given written notice of such amendment to each member of the committee at least seven days before the meeting at which action thereon is to be taken. Such amendments shall become effective immediately, but shall be submitted for ratification at the next succeeding annual meeting.

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THE SOILS TRIP

April 5, 1936, Dr. W. L. Powers, Professor of Soils at Oregon State College, led an intensely interested and enthusiastic group of geologists on a trip to the type soil areas in the vicinity of Portland.

This subject has great economic interest for anyone who owns or hopes to own land in the lower Willamette or Columbia Valleys; also, soils are the climatic and biologic expression of the rocks that occur at the earth's surface. For these reasons the members of our Society gained a large reward for the day spent under Dr. Power's instruction.

Our diligent keen reporter, Miss Eva Catlin, noted the following items of Human Interest on the trip:

"The first stop was made at Mr. Hall's farm on the Sandy Road in the main valley floor. Here, the first hole was dug and we were initiated to the mysteries of soil profiles, soils, subsoils, and zones of accumulation. We were to hear these terms over and over during the day. Mr. Arthur Piper acted as official "Hole Filler". Dr. Hodge suggested that he call on others for assistance. "All right, will you be first?" piped Mr. Piper. Both the Hillsboro and Sauvie soil series were studied on this farm. We learned of drainage, of mellowness, and of soil mottling. But to the novices, in spite of this new dignity, the Sauvie of that old river bottom was just -- mud!

In the gravel pit about one half mile from Gresham the Willamette and Salem soil series were observed. A little farther on toward Gresham in the Amity series

Dr. Powers used the "borer" to illustrate the type of drainage and soil mottling of this series. It was here the lowly earth worm received his share of glory. Even his gizzard has played its part in this great story of erosion. Mr. A. B. Schminky was unwilling that his pet white crawfish should not share in this glory, and told of their appearance every morning in the first bucket of water drawn from an old farmer's well. Dr. Hodge thought the old man was seeing things the morning after.

Several roadcuts were examined where we observed the residual soil types of the hill lands. The Olympic, Akin, and Powell series were thus studied. While studying the roadcut in which the Akin series was exposed Dr. Powers brought out his little green kit filled with its miscellaneous collection of testtubes, filter papers, chemicals, and other field equipment for soil analysis. He tested some of this soil for its phosphate and lime content. At this point Dr. Hodge noticed how well Mr. Piper was learning his lesson and became fretful lest he not do as well and asked the mentor if he couldn't have some kind of a handbill; or must he remember all these facts.

At last the cries for lunch became so clamorous Dr. Powers was forced to call a halt. During lunch, while scouting around for a good story the writer was asked if she had noticed those excellent signs of erosion down the road. Dr. Powers said he had read this one recently in the "March of Deserts":

Wind 40 miles per
Hot as hell
Two Kansas farms go by every minute.

While investigating the Sifton series across the Clackamas River from Baker Bridge a young farmer came up and wanted to know "Is this a good soil for potatoes? As he happened to be interested". Dr. Powers thought, and sagely replied, "Why, potato soil?" But Dr. Hodge thought dead Irishmen make the best potato soil, or so he had always heard. When we got down on the Chehalis and Newberg soils of the river and stream bottom lands we learned where potatoes grow, and – where spinach grows. That's where Dr. Hodge lost interest! Mrs. Hodge was heard speaking confidentially, "He just won't eat his spinach".

In Oregon City while observing the Holcomb series it became evident that the soil man and the G man weren't seeing the same things in some of these soils. One saw little sparkling things, and they bothered him. The other saw compactness and mellowness, and what that soil was adapted to bothered him. Later, near Tigard in the Melbourne series the G man kept persistently bringing up those little "sparkling" things. Were they a clue? The G man was on the hunt.

The grand finale of the day was the tramp out over the peat muck in the Tualatin Flats. With the aid of his valuable assistants, Piper and Philips, Dr. Powers drilled twenty-one feet through the peat muck to the old lake bottom. Comparing the samples from the drill at regular intervals was fascinating. It seemed to expose the secrets of thousands of years. While the drillers labored Dr. Hodge played with his dog and made merry jests. Not once did he offer his services, though once he was heard to say something about "all for the good of science". Someone thinking to get even said something about "spinach". The hated word recalled the following with which Dr. Hodge testily responded, "During the depression it was suggested to a group of unemployed that they plant spinach. They refused saying, 'What's money to an injured conscience?'". Soon after this the party disbanded after extending to Dr. Powers a most heartfelt appreciation for all that he had opened our eyes to. It was one of the finest trips of the year."

Mr. A. D. Vance has furnished the Bulletin some notes additional to those contained in the material above. These notes were obtained from Dr. Power's lecture.

Professor Powers bombarded the members of the Society, who followed his leadership on the April 5th field trip, with so much interesting information about soil surveys that it was impossible for your reporter to retain all of it.

The first stop was made at a prosperous dairy and bulb farm on Sandy Boulevard between Park Rose and Fairview where the Hillsboro type of soil was examined.

At this place Professor Powers exploded a bomb in the midst of the party by stating that the modern view of soil formation as developed by Russian soil scientists, and generally accepted as correct, divided mature soils according to climate regardless of the type of parent rock from which they came. A mature soil, he said, "in a given climate will be the same wherever that climate is found regardless of the source rock." You geologists who have learned to swear by the chemical formulae of your rock forming minerals, think that over.

THE WILLAMETTE VALLEY SOIL SURVEY RECOGNIZED THREE GENERAL TYPES OF SOILS CLASSED AS RECENT SOILS, OLD VALLEY FILLING SOILS AND RESIDUAL SOILS.

IN EXPLAINING THE SOIL TYPES PROFESSOR POWERS DUG PITS ABOUT THREE FEET DEEP AND EXPLAINED THE A, B AND C LAYERS ALWAYS CONSIDERED IN CLASSIFYING A SOIL. THE SURFACE OR A LAYER IS SHALLOW AND REPRESENTS THE ZONE FROM WHICH THE SALTS AND PLANT FOODS ARE LEACHED OUT BY THE WEATHER AND FROM WHICH THE PLANTS RECEIVE MOST OF THEIR FOODS. THE B ZONE IS THE ZONE OF ACCUMULATION. IT IS HERE THAT THE IRON, POTASSIUM AND CHEMICALS LEACHED FROM THE A LAYER ACCUMULATE. THE C ZONE IS THE RAW EARTH ONLY SLIGHTLY AFFECTED BY ANY SURFACE TREATMENTS.

THE HILLSBORO TYPE FIRST EXAMINED IS FROM THE OLD VALLEY FILLING SOILS. IT IS A BROWN LOOSE SURFACE SOIL WITH A LIGHTER BROWN, SANDY, B LAYER AND WITH EXCELLENT DRAINAGE. IT IS ONE OF THEBEST SOILS BUT ONLY ABOUT 12,000 ACRES ARE SO CLASSED. IT IS DERIVED FROM BASALTIC AND SEDIMENTARY ROCKS. CLOSELY ALLIED TO IT IN THE SAME SERIES IS THE WILLAMETTE TYPE EXAMINED AT A STOP NEAR GRESHAM. IT DIFFERS FROM THE HILLSBORO TYPE ONLY IN HAVING A FIRMER LESS SANDY SUB-SOIL. ITS DRAINAGE IS GOOD AND IT IS CONSIDERED A GOOD SOIL. OVER 350,000 ACRES ARE CLASSED AS WILLAMETTE BY THE SURVEY.

THE AMITY TYPE WAS NEXT EXAMINED ON THE LOW LAND ADJOINING THE GRESHAM CITY LIMITS ON THE NORTH. THIS SOIL HAS A GRAY BROWN SURFACE SOIL. ITS DRAINAGE IS IMPEDED AND FOR THIS REASON ITS B LAYER IS MOTTLED IN APPEARANCE.

WE WERE NEXT LEAD TO THE SOUTHEAST OF GRESHAM WHERE PROFESSOR POWERS INTRODUCED US TO THE OLYMPIC TYPE. THIS SOIL BELONGS AMONG THE RESIDUAL SOIL. IT IS A RUSTY BROWN COLOR IN THE SURFACE LAYER, IS LOOSE, CONTAINS CONCRETIONARY PELLETS, HAS A REDISH BROWN SUBSOIL AND GOOD DRAINAGE. NEARLY 700,000 ACRES HAVE BEEN PLACED IN THIS TYPE. IT IS DERIVED FROM IGNEOUS ROCK. THE AIKEN TYPE IS THE BRIGHT COLORED PHASE OF THE OLYMPIC. IT IS A REDDISH BROWN SOIL ON A RED SUBSOIL, RICH IN IRON AND HAS GOOD DRAINAGE. IT IS CLASSED AS EXCELLENT SOIL FOR NUTS AND STONE FRUIT ORCHARDS.

ALONG THE CLACKAMAS RIVER THE CHEHALIS AND NEWBERG TYPES WERE EXAMINED. THIS SERIES IS DERIVED FROM BASALTIC AND SEDIMENTARY ROCKS. THE CHEHALIS IS THE SECOND BOTTOM LAND, CHOCOLATE BROWN ON BROWN SUBSOIL AND WITH GOOD DRAINAGE. THE NEWBERG HAS COARSER SUBSOIL AND MORE RAPID DRAINAGE. THESE ARE GOOD SOILS FOR EARLY CROPS.

IN OREGON CITY THE OLDEST VALLEY FILLING TERRACE WAS EXAMINED. IT IS CALLED THE HOLCOMB TYPE. IT IS A GRAY BROWN ON A DRAB MOTTLED SUBSOIL, VERY COMPACT AND WITH POOR DRAINAGE.

IN THE TUALATIN VALLEY THE MELBOURNE TYPE, A SOIL RESIDUAL FROM SEDIMENTARY ROCK, WAS EXAMINED. IT IS A BROWN TO LIGHT BROWN IN COLOR ON A MOTTLED YELLOW BROWN SUBSOIL. 377,000 ACRES HAVE BEEN PLACED IN THIS CLASS.

AS A FITTING CLIMAX TO THE EVENTFUL DAY, THE PARTY TOOK ITS LAST SAMPLES IN THE OLD LAKE BED SOUTH OF THE WEST SIDE PACIFIC HIGHWAY BEYOND TIGARD. THIS INTERESTING PEAT MUCK SOIL, BLACK ON TOP AND BROWN BELOW, WAS SAMPLED BY PROFESSOR POWERS TO A DEPTH OF 21 FEET AND FROM THE THIRD OR FOURTH FOOT ON DOWN IT WAS PEAT WHICH PROFESSOR POWERS SAID WOULD RUN LESS THAN 10 PER CENT ASH. IN THE DEEP SAMPLES WERE SMART WEED SEEDS PERFECTLY PRESERVED.

PROFESSOR POWERS EXPLAINED AT LENGTH THE MEANING OF THE CAPACITY OF A SOIL FOR "BASE EXCHANGE" AND THE TREATMENT NECESSARY TO INCREASE THIS CAPACITY BUT YOUR REPORTER CONFESSES IT WAS OVER HIS HEAD.

CHEMICAL TESTS WERE MADE IN THE AIKEN TYPE SOIL TO DETERMINE THE LIME REQUIREMENT AND ALSO A TEST TO DETERMINE THE FREE OR USABLE POTASSIUM.

IN CONCLUSION IF PROFESSOR POWERS CAN BE PERSUADED TO LEAD ANOTHER CARAVAN AT SOME FUTURE TIME, THE WRITER PROMISES HE WILL BE ONE OF THOSE PRESENT.

A HANDBOOK ON SOILS

FOLLOWING THE POLICY OF THE BULLETIN, WE PRESENT TO OUR READERS A BRIEF HANDBOOK ON WILLAMETTE SOILS. THE MATERIAL HAS BEEN OBTAINED ENTIRELY FROM PROFESSORS W. T. POWERS, E. F. TORGERSON AND OTHERS OF THE OREGON STATE COLLEGE STAFF.

DIRECTIONS FOR SOIL SAMPLING

1. Take samples from an open field and avoid paths, gopher holes, etc. from which modified andnot typical samples are likely to be obtained.

2. Select an average spot, pull up growing plants on it, brush aside half decayed vegetable matter and bore or dig a vertical hole to a depth of eight inches. Get samples to this depth from several places in the field, mix these samples well on a piece of cloth or stout paper (avoid jute bagging), dry this mixed sample, put a quart in a clean canvas bag or box and label carefully. This sample represents the SURFACE SOIL.

3. In the same manner get an average of the SUBSOIL, taken below the surface sample, to the depth of approximately three feet. Place in separate bag and label.

4. Dig or bore to the depth of six feet, and if hard pan or other peculiarity in structure is noted, send sample properly labeled. If solid rock is found, state at what average depth.

5. Send "Description of Land" giving as complete a history of the field as possible, name of nearest town, probable selling price of land, elevation above nearest river, directions and grade of slopes, drainage, how long cropped, by what crops or fruits, what yields, whether fertilizers have been applied, and any peculiarities which may have a bearing on the agricultoral qualities of the soil.

6. State the Township, Range and Section Number of the land from which these samples are taken.

7. Do not fail to label samples carefully, placing name of sender on each sample wrapper.

8. Send samples to:

SOILS DEPARTMENT,
O. S. C. EXPERIMENT STATION,
CORVALLIS, OREGON.

SOIL SURVEYS AND THEIR USES

The soil work deals whith the development, use and maintenance of our soil and water resources. These studies include the Soil Survey, irrigation, drainage, dry farming, soil fertility, and soil management.

1. The soil survey gives a scientific basis for land use
2. Serves as an invoice
3. Gives the farmer information on soil management
4. Aids new settlers in selecting land and crops
5. Forms a basis for introduction of new crops
6. Is a guide to reclamation requirements or feasibility
7. Guides the county agent in advising settlers
8. Is useful in locating highways
9. Lays the foundation for a permanent system of agriculture for each soil type
10. Furnishes a basis for study of fertilizer needs and rationalization of assessments

Detailed soil surveys, in cooperation with the U. S. Bureau of Soils, have been made of all the Willamette Valley counties and Josephine, Columbia, and Grand Ronde Valley. The survey of Umatilla County is under way. Feasibility soil and economic surveys or land classifications have been made of many reclamation projects of the State.

These surveys give an invoice of soil resources; are helpful in advising farmers and settlers, or in locating highways, reclamation projects or experiment fields or collecting representative soils for analysis or plant-house fertilizer work, calculated to develop permanent systems of agriculture for each soil type. When maps are published, the farmer may learn which type or types of soil cover his farm, what his general composition is, crops adapted, and methods of improvement. The detailed soil survey gives a scientific basis for land use.

IN RECENT YEARS THE STUDY OF SOILS HAS COME TO BE A DISTINCT SCIENCE. THIS NEW SOIL SCIENCE PERMITS SOIL CLASSIFICATION IN A PERMANENT WAY. IT MAKES AVAILABLE TO THE LANDOWNER OR FARMER SOIL MAPS, REPORTS, AND BULLETINS, BY WHICH GOOD, MEDIUM, AND POOR SOIL AREAS CAN BE RECOGNIZED. IN THE PAST, GREAT ECONOMIC WASTE HAS RESULTED FROM MISPLACING ORCHARDS OR OTHER PLANTINGS ON SOILS UNSUITED TO THE PURPOSE. THE SOIL SURVEY HELPS IN "TAKING THE GUESS WORK OUT OF AGRICULTURE."

A MODERN VIEW OF SOIL IS TO REGARD IT AS A NATURAL REACTIVE BODY WITH DEFINITE CHARACTERISTICS DEVELOPED UNDER THE INFLUENCE OF CLIMATIC AND RELATED BIOLOGICAL ACTIVITIES. THE AMOUNT OF NATURAL LEACHING ORGANIC MATTER ACCUMULATION, AND RELATIVE NUMBERS AND ACTIVITIES OF MICRO-ORGANISMS OF THE SOIL ARE DETERMINED PRIMARILY BY THE MOISTURE SUPPLY, TEMPERATURE, AND OTHER CLIMATIC CONDITIONS UNDER WHICH THE SOIL MATERIAL HAS WEATHERED INTO SOIL.

SOIL MAY BE REGARDED AS HAVING YOUTH, MATURITY, OR AGE. A YOUTHFUL SOIL MAY HAVE A FLESHY CLAY COVERING ON A SKELETON OF MINERAL PARTICLES. WITH MATURITY IT LOSES THE CHARACTERISTICS OF THE PARENT MATERIAL AND ACQUIRES THOSE IMPARTED BY THE FINE JELLY-LIKE WEATHERED PARTICLES, THE NATURE OF WHICH VARIES ACCORDING TO THE CLIMATIC ZONE UNDER WHICH DEVELOPED. WE ARE LARGELY INDEBTED TO RUSSIAN SOIL SCIENTISTS FOR LAYING THE BASIS OF A NATURAL LOGICAL CLASSIFICATION OF SOILS OF THE WORLD INTO CLIMATIC GROUPS. MODERN SOIL SCIENCE IS THE STUDY OF THE ORIGIN, DEVELOPMENT, CLASSIFICATION, CHARACTERISTICS, AND UTILIZATION OF SOILS.

SOIL SCIENCE IS DIFFERENT FROM GEOLOGY OR CHEMISTRY, JUST AS SOILS ARE DIFFERENT FROM ROCKS OF THE EARTH'S CRUST, FOR THE FOLLOWING REASONS:

1. SOILS ARE MORE REGULARLY DISTRIBUTED OVER CLIMATIC ZONES OF THE EARTH'S SURFACE THAN ARE THE KINDS OF ROCK. THE SAME SOIL MAY COVER SEVERAL KINDS OF ROCK AND SOIL MATERIAL.

2. SOILS HAVE CHARACTERISTIC COLLOIDAL, OR JELLY-LIKE CONSTITUENTS CAPABLE OF ABSORBING AND RETAINING LIME (CALCIUM) AND OTHER BASES.

3. MATURE SOIL MAY HAVE A CHARACTERISTIC LAYERED ARRANGEMENT OF ITS PROFILE AS EXPOSED BY FRESH VERTICAL CUTS, SOMETHING LIKE A LAYER CAKE. IN THE SOIL PROFILE THERE IS AN A LAYER, OR SURFACE SOIL; THE B LAYER, OR SUBSOIL; AND THE C LAYER, OR RAW SOIL MATERIAL.

4. SOILS HAVE A CLOSE ASSOCIATION WITH THE BIOLOGICAL LIFE OF THIS CRUST.

5. THE METHODS BY WHICH SOILS ARE STUDIED ARE NECESSARILY DIFFERENT FROM THOSE OF CHEMISTRY OR GEOLOGY.

THE <u>PROFILE</u> OF A MATURE SOIL, WHICH HAS COME ABOUT AS THE RESULT OF CLIMATIC CONDITIONS, INCLUDES ALL THAT MAY BE SEEN IN A FRESH VERTICAL CUT THROUGH THE SOIL AND INTO THE UNDERLYING MATERIALS. FIELD STUDY MAY WELL INCLUDE THE STRUCTURE PROFILE, TEXTURE PROFILE, COLOR PROFILE, REACTION PROFILE, AND ORGANIC MATTER PROFILE. MODERN SOIL CLASSIFICATION IS BASED UPON THE CHARACTERISTICS OF THE SOIL ITSELF, AND NOT UPON THE FORCES OR CONDITIONS PRODUCING THEM.

PROOF OF THE RELATION OF SOIL CHARACTERISTICS TO CLIMATE IS AFFORDED IN THE GREAT SOIL ZONES OF RUSSIA AND THE WORLD.

1. THE BLACK (TSCHERNOSEM) AREAS OCCUPY REGIONS OF SIMILAR MOISTURE CONDITIONS AS DETERMINED BY PRECIPITATION AND TEMPERATURE AND COVER DIFFERENT KINDS OF ROCK.

2. THE "FAT" OR THICK BLACK EARTH IS IN THE CENTRAL PART OF THIS BROAD NORTHEAST SOUTHWEST REGION AND HAS A MAXIMUM OF ORGANIC MATTER.

3 INDIVIDUAL AREAS OF BLACK EARTH MAY BE FOUND ON MOUNTAIN SLOPES AT ELEVATIONS THAT HAVE A CLIMATE SIMILAR TO THE MAIN BLACK EARTH AREA.

4. VEGETATION TENDS TO CHANGE THE DISAPPEARANCE OF THE BLACK EARTH.

5. SIMILAR BLACK EARTH IS FOUND IN VARIOUS CONTINENTAL AREAS THROUGHOUT THE WORLD. THE BLACK "PARKLAND" OF SASKATCHEWAN AND THE NORTH PRAIRIE REGION OF THE UNITED STATES ARE OF THIS KIND. IN SOUTH AMERICA BLACK EARTH OCCURS IN ARGENTINE UNDER SIMILAR CLIMATIC CONDITIONS.

THE DEVELOPMENT OF GRAY, ASHY, OR SO-CALLED PODSOL SOIL MAY SERVE TO ILLUSTRATE THE PROCESSES THAT GIVE EXPRESSION TO CHARACTERISTICS OF SOIL AS A NATURAL BODY. SUCH SOIL DEVELOPS UNDER COOL MOISTURE CONDITIONS AND CONIFER VEGETATION

AND OCCURS ALONG THE NORTHEASTERN BOUNDARY OF THE UNITED STATES FROM MINNESOTA TO MAINE AND IN NORTHERN EUROPE. A YOUNG SOIL OF THIS KIND DEVELOPED FROM A MATERIAL WELL SUPPLIED WITH LIME WILL HAVE A DEEP HUMUS LAYER. AFTER THE LIME IS LEACHED FROM THE SURFACE UNDER THE INFLUENCE OF ORGANIC ACIDS FROM THE CONIFER LITTER, THE PHYSICAL PROPERTIES OF THE SOIL ALTER AND DETERIORATE. WHEN THE LIME CONTENT OF THE SURFACE BECOMES LOW, THEN THE HUMUS LAYER BECOMES SHALLOWER FROM BELOW AND A LIGHT GRAY, ASHY LAYER IS FORMED WHICH IS HIGH IN SILICATE. IRON AND ALUMINUM ARE LEACHED DOWNWARD AND THE IRON PERCIPITATED IN THE SUBSOIL. WHERE LIME IS STILL PRESENT, THE SOIL IS NEUTRAL IN REACTION, GIVING RISE TO AN IMPERVIOUS HARD-PAN WITH IMPEDED DRAINAGE, FOLLOWED BY THE DEVELOPMENT OF A SWAMPY CONDITION. THE HUMUS IS PARTLY LEACHED OUT BUT MAY ACCUMULATE TO SOME EXTENT BY PRECIPITATION IN THE SUBSOIL. THE PINE-COVERED SOIL ALONG THE ROOSEVELT HIGHWAY SOUTH FROM BANDON, CLASSED AS BLACKLOCK LOAM, SHOWS THE CHARACTERISTICS OF THIS GROUP OF SOILS, AND THE LAYER OF IRON ACCUMULATION CAN BE DISTINCTLY SEEN IN THE FRESH ROADSIDE CUTS ALONG THE NEW HIGHWAY. LIMING SHOULD IMPROVE SUCH LAND.

DEVELOPMENT OF OUR RED, OR, LATERITIC SOILS UNDER WARM HUMID CONDITIONS IS ACCOMPANIED BY LOSS OF SILICA, THE MAIN CONSTITUENT OF GLASSY SAND AND THE IRON AND ALUMINUM RESIDUES REMAIN AND MAY FORM IRON PELLETS OR IRON CRUSTS. THESE RED SOILS ARE FRIABLE, ABSORB MOISTURE READILY, ARE CAPABLE OF BEING WORKED WHEN WET, AND RESIST EROSIVE FORCES.

SOIL MATURITY AND EVEN DEGENERATION MAY FOLLOW DEVELOPMENT OF HIGH ACIDITY OR HIGH ALKALINITY. AN ACID-CLAY OR AN ALKALINE "SODIUM-CLAY" MAY DEGENERATE INTO ITS CONSTITUENT OXIDES AND THE SOIL LOSE ITS BASE ABSORBING CAPACITY. LIMING MAY BE FUNDAMENTAL TO CONSERVE THE PRODUCTIVENESS OF THE SOIL AND TO PREVENT MARKED DIFFERENTIATION OF THE SOIL BODY INTO LAYERS OF WIDELY CONTRASTING PROPERTIES, ABNORMAL IN CHARACTER AND SUBNORMAL IN PRODUCTIVENESS. SUCH ARE THE MODERN FOUNDATIONS UPON WHICH SOIL IS CLASSIFIED.

THE GREAT SOIL PROVINCES OF THE WORLD CORRESPOND TO THE ORDERS IN CLASSIFYING PLANTS. THE SOIL GROUPS CORRESPOND TO PLANT FAMILIES. THE SOIL SERIES IS THE GENUS, AND THE SOIL TYPES CORRESPOND TO THE PLANT SPECIES.

THE SOIL TYPE IS THE UNIT OF SOIL CLASSIFICATION. IT HAS A COMPOUND NAME; THE FIRST PART INDICATES THE SERIES OR PROFILE CHARACTERISTICS, THE LATTER THE DEGREE OF FINENESS OR TEXTURE. FOR EXAMPLE; DAYTON SILTY CLAY LOAM INDICATES THAT THE SOIL BELONGS TO THE WET GRAY DAYTON SERIES, COMMONLY KNOWN AS WHITE LAND, AND THAT THE TEXTURAL TYPE IS SILTY CLAY LOAM. SOIL STUDIES AND SOIL MANAGEMENT TO IMPROVE AND CONSERVE PRODUCTIVENESS SHOULD BE BASED ON THE SOIL TYPE. RESULTS SECURED WITH ONE SOIL TYPE OR THE TYPE OF ONE SERIES MAY PROVE A MISFIT WHEN ATTEMPT IS MADE TO APPLY THEM TO OTHER SOIL TYPES QUITE DIFFERENT IN CHARACTER. THE MODERN SOIL SURVEY AND CLASSIFICATION LAYS THE FOUNDATION FOR INTELLIGENT DEVELOPMENT, USE, AND CONSERVATION OF OUR SOIL RESOURCES.

THE INDIANS MADE RELATIVELY SMALL USE OF THE SOIL. AS YET THE SUCCESSORS HAVE ONLY SCRATCHED PART OF THE SURFACE. IT IS ESTIMATED THAT THE SOILS OF THE WILLAMETTE VALLEY ARE CAPABLE OF SUPPORTING TWO MILLION PEOPLE ACCORDING TO AMERICAN STANDARDS OF LIVING. HIGH PRODUCTIVE VALUE CAN ONLY BE REALIZED NOW WHERE THE SOIL IS PROPERLY MANAGED AND IN SUITABLE CROPS AND IS PROPERLY FERTILIZED TO PERMIT ECONOMIC PRODUCTION OF WUALITY PRODUCTS.

EXPERIENCED GROWERS WILL RECOGNIZE FROM THE SOIL MAP THAT THE BRIGHT RED HILL SOILS OF THE AIKEN AND OLYMPIC SOIL SERIES AFFORDING GOOD DEPTH AND A PROPER SITE ARE BEST ADAPTED TO NUTS AND STONE FRUITS; THAT THE BROWN WILLAMETTE SERIES OF THE MAIN VALLEY FLOOR IS A GOOD GENERAL PURPOSE SOIL, WHILE THE CHOCOLATE BROWN CHEHALIS SOILS OF THE SECOND BOTTOMS ARE WELL SUITED TO PRODUCTION OF ALFALFA, CORN, HOPS, INTENSIVE SMALL FRUITS AND VEGETABLES WHEN SUPPLIED WITH SUPPLEMENTAL IRRIGATION.

THE SOIL SURVEY OF WILLAMETTE VALLEY, COVERING NEARLY 7,000,000 ACRES GIVES AN INVOICE OF ITS SOIL RESOURCES. FROM IT WE LEARN THAT OVER HALF A MILLION ACRES IS SO SITUATED AND OF SUCH A CHARACTER THAT IT COULD BE GREATLY IMPROVED BY SUPPLEMENTAL IRRIGATION. THREE-FOURTHS OF A MILLION ACRES COULD BE RECLAIMED OR DOUBLED IN PRODUCTIVENESS BY DRAINAGE IN THIS VALLEY, AND FOR THESE WET SOILS DRAINAGE IS THE FIRST ESSENTIAL IN IMPROVEMENT. ABOUT 1,000,00 ACRES NEED LIMING. THERE IS, OUTSIDE OF THE NATIONAL FORESTS, OVER 3,000,000 ACRES OF FOOTHILL LANDS; 1,100,000 OF VALLEY FLOOR AND 650,000 OF STREAMBOTTOM SOILS. SOME 2,000 ACRES IS PRIMARILY GRAZING LAND BEST UTILIZED BY SHEEP, FOR THE MOST PART. WE HAVE A LARGE PROBLEM IN IMPROVEMENT OF GRAZING LAND. IT IS BELIEVED BEST TO DEVELOP OUR GOOD LANDS FIRST FOR AGRICULTURAL USE. IT IS CERTAINLY BETTER AND CHEAPER TO MAINTAIN THE FERTILITY OF GOOD SOILS THAN TO RESTOREPRODUCTIVENESS IN EXHAUSTED LAND.

In one of our experiment fields on a representative valley floor soil type after fifteen years of continuous cropping, the yield has fallen below that required to pay production cost, leaving nothing for taxes or interest on investment. On adjacent plats where a three-year rotation with legumes and manuring, each rotation has been practiced, the fifteenth crop was worth $120 an acre and left a net profit over production costs, representing good interest on a productive value of a few hundred dollars an acre. Crop rotation has been 85 per cent, has effect as complete fertilizer in fifteen year yield trials with representative Willamette Valley floor soils.

PROGRESS OF SOIL SURVEY IN OREGON DECEMBER, 1935, BY

W. L. POWERS

TABLE 1. DETAILED SOIL SURVEYS MADE PRIOR TO 1917

Location	Date Made	Area Surveyed (Acres)
Baker City Area	1903	101,120
Coos-Marshfield Area	1909	627,200
Hood River-White Salmon River	1912	72,000
Jackson-Medford Area	1911	343,160
Klamath Reclamation Project Area	1909	159,360
Salem Area	1903	181,624
SIX STUDIES		1,489,664

TABLE 2. DETAILED COOPERATIVE SOIL SURVEYS MADE SINCE 1917

Location	Date Made	Area Surveyed (Acres)
Benton County	1920	414,720
Clackamas County	1921	623,360
Columbia County	1929	421,120
Linn County	1924	977,920
Marion County	1927	542,060
Multnomah County	1919	209,920
Polk County	1922	476,160
Josephine County	1919	429,600
The Eugene Area	1925	630,720
The Grand Ronde Valley Area	1926	134,960
Washington County	1919	467,840
Yamhill County	1917	445,440
Umatilla area (125,000 Ac. yet to map)	1931-5	1,000,000
TWELVE STUDIES		7,088,640

KEY TO WILLAMETTE VALLEY SOILS

DEFINITIONS:

THE SOIL PROFILE - INCLUDES ALL THAT MAY BEE SEEN IN A FRESH VERTICAL CUT THROUGH THE SOIL LAYERS AND INTO THE UNDERLYING SOIL MATERIAL.

SOIL HORIZONS - ARE LAYERS OR SECTIONS OF THE SOIL PROFILE, MORE OR LESS WELL DEFINED AND LYING PARALLEL TO THE SURFACE, LIKE THE LAYERS IN A CAKE.

SOIL GROUPS - WILLAMETTE VALLEY SOILS HAVING MOST IN COMMON FALL INTO THREE DISTINCT GROUPS AS FOLLOWS:

A. RECENT ALLUVIAL SOILS, OR YOUNG SOILS OF THE RIVER AND STREAM BOTTOMS WITH RATHER UNIFORM PROFILES AND FRIABLE SUBSOILS
B. OLD VALLEY FILLING SOILS OF THE MAIN VALLEY FLOOR, INCLUDING FAIRLY MATURE SOILS WITH MODERATELY COMPACT SUBSOILS.
C. RESIDUAL HILL LANDS COMPOSED OF RESIDUES OF ROCK MATERIALS WHICH HAVE WEATHERED IN PLACE, AND OF VARIABLE DEPTH TO PARENT ROCK.

SOIL SERIES - INCLUDE DIFFERENT MEMBERS OF ABOVE GROUPS HAVING SIMILAR (1) RANGE OF COLOR, (2) SUBSOIL, (3) TOPOGRAPHY, (4) DRAINAGE, (5) ORIGIN, AND (6) AGRICULTURAL VALUE. EXAMPLE: WILLAMETTE SERIES - IS THE BROWN, GENTLY UNDULATING, NATURALLY DRAINED SOIL IN THE OLD VALLEY FILLING GROUP.

SOIL CLASS - SOILS OF SIMILAR DEGREE OF FINENESS OR TEXTURE MAY BE GROUPED IN A CLASS, AS CLAY LOAMS. SOILS ARE MIXTURES OF PARTICLES VARYING IN SIZE AND SHAPE. SOIL PARTICLES INCLUDE (1) INORGANIC MATTER AND (2) ORGANIC MATTER. THE PRINCIPAL CLASSES OF SOILS ARE:

SANDS - LESS THAN 20 PER CENT CLAY
SANDY LOAMS - 20 TO 50 PER CENT SILT AND CLAY
SILT LOAMS - 50 PER CENT OR MORE SILT, 20 PER CENT OR LESS CLAY
CLAY LOAMS - 20 TO 30 PER CENT CLAY
CLAY - 30 PER CENT OR MORE OF CLAY
PEAT - 50 PER CENT OR MORE OF ORGANIC MATTER
MUCK - 15 TO 50 PER CENT ORGANIC MATTER PLUS MUCH SILT AND CLAY

CLAY PROPERTIES PREDOMINATE OVER THOSE OF OTHER CONSTITUENTS AND CLAY TENDS TO COAT THE MINERAL PARTICLES OR FORM A FLESHY COVERING FOR THE RELATIVELY INERT MINERAL SKELETON OF THE SOIL. IT IS VERY FINE, POROUS, PLASTIC, STICKY, HAS GREAT SURFACE AREA AND ABSORPTIVENESS.

SILT PARTICLES ARE LARGER THAN THOSE OF CLAY YET TOO FINE TO DETECT WITH THE FINGERS. IT FORMS THE GREAT BULK OF AGRICULTURAL SOILS.

SANDS ARE DIVIDED BY SIEVES INTO COARSE, MEDIUM, FINE AND VERY FINE GRADES.

SOIL STRUCTURE REFERS TO THE ARRANGEMENT OF SOIL PARTICLES: CRUMB STRUCTURE OR GOOD TILTH OCCURS WHERE PARTICLES ARE STUCK TOGETHER LIKE POPCORN GRAINS WHEN SYRUP IS USED TO HOLD THEM IN BALLS.

PUDDLED STRUCTURE OR "RUN TOGETHER" CONDITION IS MORE LIKE CONCRETE.

THE SOIL TYPE IS THE UNIT OF CLASSIFICATION BASED ON (1) ORIGIN, (2) TOPOGRAPHY, (3) VEGETATION, (4) STRUCTURE, (5) PHYSICAL COMPOSITION, (6) COLOR, (7) NATURAL DRAINAGE, (8) AGRICULTURAL VALUE (9) CHEMICAL REACTION AND COMPOSITION AND (10) ORGANIC CONTENT.

NAMING OF SOILS - THE NAME OF A SOIL TYPE CONSISTS OF TWO PARTS
(A) THE NAME OF THE SERIES, AND
(B) THE TEXTURE OF THE PARTICULAR MEMBERS OF THE SERIES

SOIL TYPE
(SERIES - ALL OTHER PROPERTIES
(CLASS - THE TEXTURE OF SURFACE SOIL

EXAMPLE: (A) DAYTON + (B) SILT LOAM, MAKES DAYTON SILT LOAM SOIL TYPE (A) SERIES NAMES ARE TAKEN FROM THE LOCALITY WHERE THE SERIES IS FIRST MAPPED AND DESCRIBED. THE "WHITE LAND" WAS FIRST MAPPED IN DAYTON PRAIRIE. (B) SEVERAL TEXTURAL CLASSES MIGHT OCCUR AS DAYTON SILT LOAM OR DAYTON CLAY, ETC.

Group Series	Soil	Subsoil	Drainage	Actual A. shown in Soil Surveys
A. Residual soils (hill lands)				
I. Derived from igneous rocks				
Aiken	Reddish-brown	On red	Good	283,264
Olympic	Rusty-brown	Reddish-brown	Good	698,304
Polk	Rich reddish-brown	Dull red	Good	30,912
Cascade (Olympic sur. Melbourne sub.)	Brown	Yellowish-brown	Good	85,760
Viola	Grayish-brown	Yellowish-brown, drab mottled	Poor	26,428
II. Derived from sedimentary rocks				
Sites	Reddish-brown	Yellowish-red	Good	39,680
Melbourne	Brown to light brown	Yellowish-brown, mottled	Good	377,856
Carlton	Light grayish-brown	Light gray-brown mottled	Fair	76,608
III. Miscellaneous group				
Rough stony land				5,440
Rough broken and stony land				140,032
Rough mountainous land				1,455,680
		Total		3,219,964
B. Recent alluvial soils (river and stream bottom lands):				
I. Derived from basaltic and sedimentary rocks				
Chehalis (2nd bottom)	Chocolate-brown	Brown, finer sub	Good	218,715
Newberg (1st bottom)	Brown	Brown, coarser sub	Rapid	99,008
Wapato	Dark Brown	Drab to brown, mottled	Poor	202,752
Cove (black sticky)	Black	Dark, drab mottled	Poor	29,440
Whiteson (bottomland, white land	Gray	Drab, mottled compact	Restricted	8,960
Sauvie	Dark-brownish	Gray-brown, mottled	Poor	24,192
Columbia	Brown	Brown	Good	10,816
II. Derived from basaltic rocks				
Camas	Brown	Brown, gravelly sub	Good	36,736
Toutle	Slate-gray	Gray	Rapid	3,840
Peat and muck (beaver-dam)	Black	Brown		5,888
Riverwash				14,080
		Total		654,427
C. Old Valley filling soils (main valley floor)				
I. Derived from basaltic and sedimentary rocks				
Willamette	Brown	Light brown, firm	Good	351,680
Salem	Brown	Light brown, gravelly	Good	59,584
Hillsboro	Brown	Light brown, sandy	Good	12,224
Salkum	Reddish-brown	Dull reddish-brown, compact with soft gravel	Good	25,792
Powell	Reddish-brown	Yellowish-brown, friable	Good	46,912
Clackamas	Dark (grayish)	Dark grayish-brown, gravelly	Restricted	31,232
Sifton (looseland)	Dark brown, sooty	Brown, gravelly	Rapid	10,496
Veneta	Yellowish-brown	Pale, mottle yellow-gray, compact weathered gravels	Fair	18,368

Group Series	Soil	Subsoil	Drainage	Actual A. shown in soil surveys
Amity (half-white land)	Gray-brown	Yellowish-gray, mottled	Restricted	277,568
Dayton (white land)	Gray	Drab, mottled compact	Poor	183,296
Concord (Dayton surf. on Amity sub.)	Brownish-gray	Yellowish-gray mottled	Poor	29,148
Holcomb	Brown to grayish brown	Gray drab, mottled compact	Poor	52,032
Courtney	Dark brown	Grayish-brown, bluish-gray mottled, on gravelly subsoil	Poor	13,504
Waldo	Dull-dark	Light reddish-brown, mottled, very compact	Poor	1,280
II. Derived from sedimentary rock				
Grand Ronde	Yellowish-brown	Pale, mottled, compact	Poor	5,760
		Total		1,118,876

Total acreage of soils mapped and surveyed in the Willamette Valley

Recent soils	654,427
Old valley filling soils	1,118,876
Residual soils	3,219,964

GRAND TOTAL 4,993,267

It is with much regret that we announce the death of Mr. N. M. Sloan, a charter member of the Society. He passed away on April 16th. He was extremely interested in the Society, and those of us who knew him realize that we have lost a real friend.

FOREST GROVE TRIP

MAY 17, 1936

THE CARAVAN WILL ASSEMBLE AT SYLVAN AT 8:30 A.M. THOSE DESIRING TRANSPORTATION AND THOSE WHISHING TO CARRY EXTRA PASSENGERS MEET AT S. W. SIXTH AND S. W. YAMHILL ST. NOT LATER THAN 8:00 A.M.

THE FIRST STOP WILL BE AT A ROCK QUARRY JUST EAST OF BEAVERTON WHERE A FAULT AND SLICKENSIDES CAN BE OBSERVED.

THE CARAVAN WILL NEXT PROCEED N. W. ON THE WALKER ROAD TO THE CORNELIUS PASS ROAD, THENCE NORTH TO WEST UNION AND WEST TO MOUNTAINDALE. WHILE ON THE VALLEY FLAT A STOP WILL BE MADE TO OBSERVE THE EVEN-CRESTED HILLS MAKING UP THE HORIZON. ARE THESE HILLS REMNANTS OF A PENEPLANE?

FROM MOUNTAINDALE WE GO NORTH TO SHERMAN'S MILL AND ABOUT A HALF MILE EAST TO A BASALT CASCADE. JUST A LITTLE UP STREAM ABOVE THE BRIDGE THE STREAM IS SEEN TO BE CUTTING DOWN BETWEEN TWO DIFFERENT KINDS OF ROCK.

FROM SHERMAN'S MILL THE TRIP CONTINUES UP THE STEEP HILLS TO THE ELEVATION OF OVER 3000 FEET NEAR BACONA WHERE A VIEW OF COLUMBIA COUNTY TO THE NORTH CAN BE HAD FROM AN EXCARPMENT. FURTHER DISCUSSION OF THE PENEPLANE.

GOING WEST THE CARAVAN WILL GRADUALLY DESCEND TO THE VALLEY LEVEL AT BUXTON VIA THE GREEN MOUNTAIN ROAD. ABOUT 3 MILES NORTH OF BUXTON AT AN ELEVATION OF 1100 FEET LAVA CAN BE SEEN OVERLYING COARSE CONGLOMERATE.

THE PARTY WILL STOP FOR LUNCH IN BUXTON.

FROM BUXTON WE WILL GO A FEW MILES UP THE STRASSEL ROAD TO WHERE THE ROAD PASSES UNDER THE TRESTLE. HERE CONCRETIONS AND FOSSILS ARE QUITE EASILY OBTAINED.

RETURNING THROUGH BUXTON WE PROCEED A FEW MILES WEST TO A CAVE WHERE CHALCEDONY ABOUNDS.

AFTER PASSING THROUGH BANKS WE TURN WEST CROSSING THE RIDGE INTO THE GALES CREEK VALLEY AND THEN UP THIS VALLEY TO THE GLENWOOD BRIDGE WHERE WORK IS BEING DONE ON THE NEW WILSON RIVER ROAD PROJECT. THE CREEK HERE HAD CUT THROUGH COARSE GRAVELS AND OLD SHALES WHICH ARE FAULTED.

RETURNING DOWN THE GALES CREEK VALLEY WE CAN SEE ANOTHER OUTCROP OF THE SHALE AT RIPPLING WATERS.

THE NEXT STOP IS JUST OUTSIDE FOREST GROVE WHERE A PUMACEOUS ERATIC CAN BE SEEN. THE GENERAL LAY OF THE LAND AROUND FOREST GROVE WILL BE STUDIED AND THEN WE WILL DISBAND.

THE TOTAL MILAGE WILL BE AROUND 85 MILES.

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THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol. 2 - 10 Portland, Oregon May 25, 1936

MEETINGS

May 29, 1936 (Friday) - No meeting in order to permit members who desire to leave early on field trip to Madras and vicinity.

June 12, 1936 (Friday) - Dr. E. W. Lazell will speak on "GEMS".

June 26, 1936 (Friday) - Mr. Lewis McArthur, of the Pacific Power & Light Company, will address the Geological Society upon the subject of "Topographic Maps", including explanation of how they are made, their uses, and the necessity for further work im this field in Oregon.

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FIELD TRIPS

May 30-31, 1936 (Saturday and Sunday) - Fossil hunting in Madras and vicinity. - Leaders: Lewis H. Irving and Joseph Wimmer.

June 14, 1936 (Sunday) - Copper City, Silverstar Mountain and vicinity. - Leaders: Joseph Wimmer and Claire Holdredge.

July 4-11 - The trip to the Alps of America under the leadership of Dr. Donald Wilkinson promises to attract many of our members. Dr. Wilkinson announces that his party will furnish meals for $1.25 a day but that the members will be expected to assist in dish washing

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NEWS FOR THE BULLETIN

The Publication Committee in addition to the editor and manager is composed of the following members: Francis S. Olaine, Eva Catlin and Ray Treasher. It is hoped that short notes of general interest, reviews of important articles and original paper will be turned in to one of the above persons. Lets make our Bulletin bigger and better with each issue.

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NEW MEMBERS AND CHANGES OF ADDRESS

MacTarnaghan, J. Telfer - 4406 Blackwater Street, Fort Peck, Montana

Samuelson, Arthur - Building Department, City Hall, Portland, Oregon.

Watson, Josephine C. - Brown Apartments, Portland, Oregon. (New member)

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THE OBJECTS OF THE SOCIETY

(1) To provide facilities for members of the Society to study geology, particularly the geology of the Oregon Country.

(2) The establishment and maintenance of a library and museum of geological works, maps and specimens.

(3) The encouragement of geological study among amateurs.

(4) The support and promotion of geologic investigation in the Oregon Country.

(5) The designation, preservation and interpretation of important geologic features of the Oregon Country.

(6) The development of the mental capacities of its members in the study of geology and the promotion of better acquaintance and closer association between those engaged in the above objects.

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THE CLIMATE OF OREGON

By

E. L. WELLS
U. S. Meteorologist, Portland, Oregon

The term "Climate of Oregon" is perhaps a misnomer, for Oregon has many climates..

Climate in Oregon is affected by latitude, a wide range in elevation, nearness to the ocean, and the fact that the mountain ranges run parallel to the coast and athwart the prevailing winds blowing from the ocean.

The word climate comes from a word meaning "to incline", and at first referred to the difference in the angle of the sun's rays, or differences in latitude. In Oregon, however, other influences are more pronounced than latitude. The region lying west of the Coast Range has a marine climate; the region east of the Cascade Mountains has a continental climate.

The normal annual temperature ranges from about 56° in the Snake River Canyon in the northeastern portion, to about 39° near the summit of the Cascade Mountains. This does not tell all the story; Pendleton, toward the northeast corner, and Brookings, at the southwest corner, have about the same normal annual temperature, but the weather at the two places is almost never the same. Some interior places may have as great a range of temperature in a single summer day as is experienced during an entire year on the immediate coast. The greatest extremes of temperature in winter are not on the high mountains but in places on the elevated Plateau east of the Cascade Mountains.

There is relatively little change in temperature from day to day.

Warm weather in Oregon is always dry weather, and therefore such high temperature as is experienced is less oppressive than similar temperatures in other sections. Cold weather in winter in western Oregon is also dry, because it comes with winds from the interior, but otherwise humidity in winter is rather high.

THE GEOLOGICAL NEWS LETTER

Edwin T. Hodge, Editor
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Portland, Oregon

Raymond L. Baldwin, Business Manager
2725 N. E. 50th Avenue,
Portland, Oregon

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Precipitation in Oregon ranges from about 6 inches annually over parts of the Plateau to more than 130 inches in places on the west slope of the Coast Range. Stream measurements in some regions where no weather records are available indicate some spots with more than 200 inches annually. There is everywhere a distinct dry period in summer. The heaviest rains are generally in November, December, or January, but some eastern localities have the most rainfall in May.

So far as records have been kept there is nothing to indicate a progressive change in temperature. For quite an extended period precipitation has apparently been growing less, but recent trends are upward. It is believed that other periods as dry as the recent one occurred prior to the time records were begun. The fundamental climatic controls have not changed in historic times.

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OUR EXHIBITS

The Exhibition Committee is to be congratulated on the consistently high standard of the presentations made before the Society, and as said Committee is composed of only Mr. Hancock, we have him to thank for making the necessary arrangements to obtain these exhibits which greatly increase the interest at our meetings and also very substancially enlarges our knowledge of geology.

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GEODE EXHIBIT OF APRIL 10TH

Messrs. Raymond and A. J. Schneider, who recently exhibited their fine collection of agates for the Society, again presented for our enjoyment and education a part of their interesting collection of geodes. There were 39 in all ranging in size from the huge 185 pound quartz crystal specimen down to the tiny one that was smaller than the top of a pencil. All of them were found in the central Oregon district. The 185 pound geode is said to be the largest ever found and it was discovered near Antelope. When located only a very small portion of it was visible above the ground and a considerable amount of effort was required to dislodge it from the earth. Incidently, the half we saw displayed was the smaller half as the other portion of it was entirely too bulky to exhibit. Of particular interest to the amateurs was the geode in the rough. The two geodes of amethyst crystal were particularly beautiful.

The Society is very appreciative of the interest taken by the Schneider brothers in furnishing us this truly fine exhibit which, in this case, also required no small amount of manual labor to prepare it for us.

THE EXHIBIT OF APRIL 24TH

The exhibit of April 24th was of a miscellaneous nature and was prepared by two of our members. Mr. Vance presented eleven fine examples of fossil leaves of the John Day county; two parts of that well known fossil whale, a section of the jaw and a lumbar vertebra; eight fossil clams that were obtained near Newport; and a particularly fine sample of Oregon fossil coral.

Mr. H. F. Byram exhibited some eighteen mineral specimens which included gold and copper ore; numerous interesting samples of cinnabar; a piece of lignite coal which was actually a fossil tree limb of Eocene age; and come pyrite crystals. Also, included in this group was a rock specimen of unusual interest which contained numerous marine fossils and was found personally by Mr. Byram some 200 miles north of the Arctic Circle.

Francis S. Olaine.

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MEMBERSHIP APPLICATION

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Date ____________________

I, ______________________________ (print), do hereby apply for

membership in the Geological Society of the Oregon Country, subject to the

Provisions of the By-Laws.

______________________________________ Telephone No. ______________

______________________________________ ______________________________

Business Address Occupation

I am particularly interested in the following branch of Geology:

____

Sponsored by: ______________________
(Member)

I inclose $ ________ for first year's dues.
(make checks payable to the Society)

____
Signature

MCMINNVILLE TRIP - APRIL 26, 1936

The trip to McMinnville, Sunday, April 26, was enjoyed by 117 members of the Geological Society of the Oregon Country. Joe Wimmer, leading the caravan of 39 cars should be congratulated on his excellent arrangements and close adherence to schedule.

First stop was made at the Linfield College museum where an hour was spent viewing the many interesting specimens. Dr. Samuel Mayfield told of some of the erratics of the region and a study was made of a large granitic erratic on the Linfield campus.

The second stop was at Yamhill Locks Park where Mr. Johnson who was in charge, gave a few facts about the Locks. They were constructed by the U. S. Corps of Engineers in 1900 at a cost of $75,000, to serve McMinnville. Gates are hand operated with a 16.2 foot lift. They are kept in perfect condition but used now only occasionally. Ray Mackenzie made some comparisons between these old locks and the modern electrically operated ones now being completed at Bonneville. The 1922 and 1934 flood levels were noted on the tower. During these floods, as Dr. Hodge suggested, there was reproduced temporarily a condition not unlike the normal conditions of the past when a large volume of water occupied this wide valley and carved out the upper terraces.

The third stop was on the flank of the Dundee Red hills, or Bishop Mountain, which is a S.W.-N.E. trending ridge. There are numerous springs, 9 of them, coming out of the side of the Mountain. The one which is the source of Dayton's water supply was visited and explained. Dr. Hodge led the group in a discussion of the probable source of the water. The mathematicians present computed the approximate volume of the hill above the springs and the appoximate output of the springs, allowing a 20% porosity it was determined that the absorbent power of the rocks could account for much more water than is released by the several springs. It was pointed out that this frequently is the case, and instead of looking for some sort of artesian basin, that the pore space in the overlying rocks is adequate to make the springs function. Leo Simon identified several of the flowers blossoming; miner's lettuce or Montia siberica; Yellow violet or viola glabella; geranium or erodium ? ; trillium or trillium chloropetalum, iris tenax, and bed straw or galium.

We drove on up the Mountain and hiked to the top. A beautiful view of the Willamette and Yamhill valleys was obtained from this point and Dr. Hodge again led us into the mysteries of the history of these valleys. The hills have a gentle eastward slope and a steep westward slope, indicative of a monoclinal dip to the east. He suggested faulting to produce these ridges, which are rudely parallel, set in eschelon. Erosion has removed the softer materials, forming the valleys. We observed the ridge which swings toward the eastward at Salem, where the Willamette cuts through the hills instead of going around. Also at the end of Parrott Mountain, the river cuts off a small hill called Butte hill instead of continuing around. This all appears that the stream channels are superposed, that the valley was once filled with silt, and the streams intrenched themselves into the silt and later into the harder underlying rocks, irrespective of the topography before the valley was filled.

The gang was crying for food so we hurried to Dayton where we spread our picnic lunch in the city park. Before we ate, Professor Willard of the Dayton High School gave us an interesting talk on the historic significance of the Dayton blockhouse. It originally stood some distance out of town but in 1911 was moved to this park and re-erected. It is preserved as a museum and many interesting relics are on display. The blockhouse is open at all times.

After several demonstrations of the capacities of various "rock hounds" we went southward and stopped at the ranch of Mr. E. A. Morgan, who possesses many vertebrate fossils dug from the blue clay of the small stream running back of their place. Most of the bones were elephant remains, teeth, tusk, scapula, ulna, humeras, vertebra. They were described and discussed by Dr. Hodge, Dr. Adams, and Dr. Jones. Consideration was given to the means of their burial, whether ice rafted or residual. The large mammals require a luxuriant vegetation, or tropical or sub-tropical nature, and as they travel in herds, they consume enormous quantities of food. Thus we were able to reconstruct the climate of the region as being sub-tropical. The great Ice-Sheet need not alter these conditions as a lowing of the average annual temperature just 3° would probably bring on a recurrance of the ice age, at the present. Mr. Morgan took us down to the creek where the fossils were found. The old pioneer road from Portland to Salem went nearby. The ranch was exceedingly interesting to Oregon historians, the barn being built in 1860, and still has the original hand hewn timbers, pins and board, sawed at Oregon City.

Our itinerary took us back to McMinnville and out the Coast highway toward Bellview. At mile 34 on our trip we climbed a small hill and here was an enormous argillite erratic on top of the knoll. Dr. Mayfield discussed the site and the probable origin of the argillite as Belt (Algonkian) series of northern Idaho. It was about 27' long, 12' wide and 6' thick. The berg which carried it must have been 18-20 times as large to have been able to transport it and would have required at least 200 feet of water over the hill. This would make the depth of the water above the valley floor, 350'. Dr. Mayfield displayed a specimen of Whitleyite, a "wanderer", a meteorite from the Blue Grass of Kentucky and told us of its history. Dr. Hodge used this hilltop as another viewpoint of the ancient Willamette Valley and discussed the old valley fill and subsequent erosion.

Our last stop was northeast of McMinnville at a basalt quarry. Here we saw a beautiful example of a vertical fault plane with the attendant slickensides, gouge, curved fault plane. Dr. Mayfield pointed out that there are 2 abandoned shafts just around the corner where someone has propected for gold, and claimed to have taken out nuggets. The authenticity of this find was questioned. A good spring issues in the quarry floor, evidently from along a joint plane.

The trip to McMinnville ties in with the Newberg trip and a few words of summation might not be out of place. Under Dr. Hodge's guidance, we have seen that the Willamette River does peculiar things. It cuts directly through a ridge of basalt at Salem, when it could have gone around. Near Newberg it goes around Parrott Mountain, But cuts off Butte Hill. At Oregon City, it cuts across another basalt ridge. The valley itself is mainly wide and flat. The tributary streams in wide valleys, entirely too large for the size of the streams, and they enter the Willamette at all sorts of unconventional angles. The whole story is "cock-eyed" to what normal stream development should be. Evidently, after the valley was originally formed, it was choked for some reason with sediment and filled to a considerable depth, Subsequent stream erosion started cutting new channels, the rivers first trying one, then another course, developing valleys. As they cut through the soft valley fill, they became entrenched and were unable to change their courses when they struck the tops of some of the old, underlying ridges and have cut their channels across them. Such a valley fill would have to be several hundred feet deep, but at present there seems to be no other explanation. Subsequently, the water from the melting glaciers were backed up into the Willamette area and ice bergs floated in, depositing their erratics, wanderers from the Interior Plateau. Much work is necessary to figure out in detail all the true relationships. However, we have seen the conditions on the ground. We have had a possible hypothesis submitted which we can consider and attempt to find evidence to prove or disprove. We see that our Willamette Valley presents many interesting and fascinating problems.

Ray C. Treasher.

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LINFIELD COLLEGE MUSEUM

Linfield College is proud of its museum. As yet no money has been allotted for its development. The entire collection is the result of the work of interested and enthusiastic students, professors, and friends. Hope is high that when the new library is completed new and suitable quarters for the museum will be provided.

The museum collection while small and incomplete contains valuable specimens of interest to students in all the major fields of science. The fine mineral collection was donated by Mr. Myron W. Haines, former field representative of the college. Mrs. Lewellen, an advanced student, has done some splendid work in arranging and identifying many of the fossil specimens. Dr. Mayfield brought to the school a "geological consciousness", and is doing some excellent work in this field.

The college is proudest of its collection of Ordovician fossils. There were brachiopods, trilobites, cup corals, and cephalopods, many of which came from the region of the Cincinnati Arch, near Richmond, Indiana. A part of a giant Orthoceras, or straight cephalopod, with simple sutures showed the high development of the cephalopods at this early time. The giant ammonites from the Jurassic and Triassic of eastern Oregon held the place of honor. In these great coiled "devilfish" the sutures were extensively crenulated. One particular fossil showed the last great struggle of these creatures to adapt themselves to their ever changing environment. This creature had the extensively crenulated sutures, but was no longer coiled.

The collection contained an interesting group of Mississippian crinoids and nodules. A comparison of the crinoids with their modern descendants, the starfish, easily proves their relationship. In some places crinoids were so common that vast beds of limestone were formed. In other places protozoa, having a calcareous shell, were so numerous great beds of oolitic limeston were formed. Some of the best known of the latter are those found near Bedford, Illinois. Dr. Mayfield called the attention of the group to the material of the columns and trimmings of the main building of the college, which was this oolitic Bedford Limestone.

Some fine fossil leaves of ferns, neuropterus, annularia, and sigillaria of the Carboniferous were obtained from the Mason Creek area of Illinois. There were also some fossil leaves and nuts from the John Day region. These were Oligocene in age. Other Oligocene specimens have been obtained from the Bethel locality. The Miocene was represented with Oregon Coast fossils from the Coos Bay region. There were mastodon bones and elephant teeth from the Pleistocene of Oregon.

A very interesting spherulite of tridymite quartz gave us much concern. "Surely that is a coral," most of us remarked, "But look at the underneath side!" Smooth varicolored undersurfaces showing evidence of having been molten conflicted with the upper surface which appeared so much like coral. "Spherulites!" said Dr. Hodge, and the mystery was solved.

Eva Catlin

SILVER REPORTED NEAR PORTLAND !!

Silver had been discovered in the Portland hills area and great excitement reigns. The upper lava flows of this locality contain amounts ranging from 1/10-$\frac{1}{4}$ oz. per ton. The lava is scoraceous micro-basalt, very much decomposed in the exposed portions, but becoming sound and hard a few feet down. Specimens of volcanic tufa from Clackamas River yields a "trace" up to 6 oz. per ton. This is an account by Herbert Lang, in Science, v. 10, no. 245, p. 192, October 14th, 1887.

NEW ARTICLE ON NATURAL GAS IN OREGON

Kirkham, Virgil R. D.

Natural Gas in Washington, Idaho, Eastern Oregon, and Northern Utah: American Association of Petroleum Geologists, Geology of Natural Gas, pp. 221-242, 1 fig. 2 tables (correlation) bibliography, June 1935.

Most gas is discovered in the Miocene, Pliocene and Pleistocene rocks of terrestrial or lake-bed origin. They are associated with igneous intrusions or lava flows, as a rule. The gases are high in methane and ethane and also nitrogen. It is similar to a gas which would be distilled from oil shale rather than a natural gas coming from petroleum. The gas probably was derived from algal and sapropelic deposits in the lake beds. When released, the gases usually have a strong odor of hydrogen sulfide and when heated, a strong odor or ammonia is given off. Gases occuring in isolated patches of Cretaceous and Tertiary sediments are limited and none have attained considerable commercial importance. In Oregon, the Vale-Ontario area is discussed as to structure and the composition of the gas. It is similar to the Weiser-Payette and Marsing-Grandview areas of Idaho. The Willamette Valley is mentioned briefly.

Ray Treasher.

ALONG OUR COAST

The Surveyor, A. M. Sobieraiski commanding; The Discoverer, J. M. Smook temporarily in command; the Explorer, L. C. Wilder commanding; and the Westdahl, H. Arnold Karo commanding, were at Seattle, Washington, overhauling equipment and completing field records.

Robert W. Knox was at Astoria, Oregon, engaged in completing field records of the survey of the lower reach of the Columbia River.

NEW NAUTICAL CHARTS OF:

Washington.--No. 6195. Grays Harbor and continuation of Chehalis River. March 1936. Scale, 1:40,000. Size, 25 by 39 inches. Price, 50 cents.

No. 6403. Port Discovery and Washington Harbor. January 1936. Scale, 1:40,000. Size, 19 by 22 inches. Price, 25 cents

NEED OF STANDARD MAP

It would be difficult to exaggerate the importance of providing for the entire country at the earliest possible date a standard topographic map adapted to the most urgent needs of the people. If such maps served no other purpose than to make possible the most economical location of the country's vast system of national, state, county and other highways, they would more than repay their cost. Approximately half a billion dollars are spent annually on highway construction, much of it after local surveys have failed to discover the most economical route (in respect to length, amount of grading required, best bridge locations, cost of maintenance, et cetera), which would immediately show on a good topographic map.

Demonstrated savings in actual cases reported by highway engineers are very large.

But it is not in respect to highways alone that the need is urgent. All drainage, flood control, and irrigation projects, water supply and power developments, mining operations, land classification, soil studies, location of railways, canals, sewers, transmission line, parks, and recreation centers, and an endless variety of other engineering, industrial, and civic developments are peculiarly dependent on good topographic maps. Intelligent national, state, and municipal planning is impossible without adequate maps, and the large programs recently undertaken have resulted in an unprecedented volume of requests for these indispensable tools of ordered progress.

Executive agencies of the Federal Government are handicapped at every turn by lack of adequate topographic maps such as: The Bureau of Air Commerce, The Bureau of Chemistry and Soils, The Federal Power Commission, The Corps of Engineers, The Mississippi River Commission, The Division of Topography of the Post Office, The Forest Service and The Bureau of Census. The list could be lengthened but the foregoing are typical of a general situation which confronts the country.

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CLASSIFICATION OF THE SEDIMENTARY ROCKS

A. CLASTIC SEDIMENTARY ROCKS.

These are composed of fragments of previously existing solid materials (igneous or metamorphic rocks or sedimentary rocks) cemented or compacted into more or less firm strata.

1. BRECCIA: angular blocks in a matrix of finer material.
2. CONGLOMERATE: rounded or subangular boulders, cobblestones, or pebbles, generally mixed with sand, the whole cemented by finer material. Varieties are named from the most abundant material of the rounded fragments, as
   (a) quartz conglomerate,
   (b) limestone conglomerate,
   (c) gneiss conglomerate.

If feldspar is a fairly abundant constituent of a conglomerate, it is known as

   (d) arkose conglomerate.

3. SANDSTONE: any sort of sand cemented by any cement. Quartz grains are by far the most common kind of sand, and calcareous or iron oxide cements are customary. Varieties are named from the cements, the texture or the composition.
   (a) Siliceous sandstone is cemented with silica; generally very hard; white, light gray or cream tints.

(b) Calcareous sandstone is cemented with lime; generally soft and crumbly; colors similar to preceding.
(c) Ferruginous sandstone is cemented with iron oxide; hard or soft; red, brown or yellow tints.
(d) Carbonaceous sandstone contains a high proportion of carbonaceous material; gray or black.
(e) Argillaceous sandstone is held together with clay or mud particles; generally soft; varying shades of gray.
(f) Arkose is a sandstone containing a considerable amount of undecomposed feldspar.

4. SHALE: a compacted clay rock or mudstone which generally displays closely spaced bedding planes.
   (a) Arenaceous shale contains a considerable proportion of sand.
   (b) Calcareous shale has much lime as an impurity.
   (c) Ferruginous shale is expecially rich in iron oxides.
   (d) Bituminous shale contains enough organic matter to give it a black color and may have an odor like crude petroleum when freshly broken.

5. ROCKS OF GLACIAL ORIGIN consist of debris transported by moving ice and later cemented or compacted into a firm mass.
   (a) Tillite: consolidated glacial till; unsorted angular and subangular rock fragments, some which may show glacial markings, embedded in a matrix of pulverized rock.

B. ORGANIC AND BIOCHEMICAL SEDIMENTARY ROCKS.

Organic and biochemical sedimentary rocks are formed primarily through the agency of plants and animals.

1. CALCAREOUS rocks of this class consist chiefly of the carbonates of lime and magnesia-lime, the shells or other hard parts of aquatic animals, or the precipitates resulting from the presence of living creatures in the water.
   (a) Limestone: a general name for solid rocks composed mainly of calcium carbonate; effervesces readily when tested with cold dilute HCl or vinegar; may or may not display its organic origin by visible fossils; of widely differing purity, texture, hardness and color.
      (i) Argillaceous limestone contains a considerable amount of mud or clay as an impurity.
      (ii) Arenaceous limestone contains sand grains in sufficient amount to make it gritty.
      (iii) Lithographic stone is a very fine-grained, pure limestone.
      (iv) Bituminous limestone contains enough organic matter to yield an odor like crude petroleum.
      (v) Carbonaceous limestone is generally dark and contains much carbonized tissue of plants or animals.
      (vi) Fossiliferous and dolomitic are among the other qualifying terms which may be used.
      (vii) Oolite is a limestone containing tiny spheroidal masses which cause it to resemble the roe of fishes.
      (viii) Coquina consists of loosely consolidated shells and shell fragments.
   (b) Chalk: a very soft, easily crumbled, calcareous rock of light color, composed of very fine particles, which under the microscope are seen to be largely the skeletons of tiny single-celled animals known as Foraminifera.
   (c) Dolomite: a rock composed largely of the mineral of the same name; harder, coarser and darker than the average limestone; does not efferesce readily with cold dilute HCl.

2. SILICEOUS rocks are composed mainly of silica derived directly from plants and animals, deposited by their aid, or chemically precipitated, often in a colloidal state.
   (a) Flint: generally occurs as nodules or lenticular masses in limestone or shale; many pieces contain organic remains which acted as nuclei around which the flint was deposited.
   (b) Chert: similar to flint, but not so dense; lighter shades of gray, pink, yellow, etc.
3. CARBONACEOUS rocks are composed in large part of carbon derived from various types of plant tissues.
   (a) Peat: More or less carbonized vegetable material; porous and very soft; dark brown; earthy luster; light weight.
   (b) Lignite: more compact, slightly harder than peat; dark brown to brownish-black; luster sometimes dull, but more commonly silky to brilliant.
   (c) Bituminous coal.
   (d) Anthracite coal.
4. FERRUGINOUS rocks are composed chiefly of iron oxides precipitated from solution through the agency of plants.
   (a) Bog iron ore: a variety of limonite.

C. CHEMICAL PRECIPITATES.

Chemical precipitates result from the evaporation or mingling of solutions containing considerable mineral matter, or from changes in the amount or nature of the gases held in sea or lake water.

1. LIMESTONE: some limestones are in whole or in part the result of chemical precipitation uninfluenced by organic activity.
2. GYPSUM: layers or lenses of the mineral gypsum.
3. ROCK SALT: layers or lenses of the mineral halite.

FORMATION OF SEDIMENTARY ROCKS

From the weathering of igneous, metamorphic or other sedimentary rocks				
FRAGMENTAL OR CLASTIC MATERIALS (Transported mechanically and deposited)		DISSOLVED MATERIAL (Transported in solution)		
			Precipitated Chemically	Percipitated by Organisms
MATERIAL	ROCK	MATERIAL	ROCK	ROCK
Angular blocks	Breccia	$CaCO_3$	Limestone, chalk	Limestone, chalk, coquina
Boulders Cobbles Gravel	Conglomerate Tillite (glacial)	(Ca, Mg)CO_3	Dolomite	
		$CaSO_4$	Gypsum	
Sand	Sandstone	Colloidal silica	Chert(light colored) Flint(dark colored)	Chert(light colored) Flint(dark colored)
Clay	Shale	NaCl	Halite (salt)	
These materials are consolidated by pressure or cementation or both		These materials are consolidated by crystallization		

NOTE: Many limestones are composed of fragments of organic remains, shells, etc., which have been transported mechanically by waves and currents and deposited. They are cemented by precipitated material and form fossiliferous limestones, coquina or "shell rock." Limestone may become dolomitic after its deposition as a result of the chemical activity of water which permeates it or percolates through it.

From the Products of plant life	
Accumulated in Place or Transported Mechanically	Compressed and Chemically Altered
MATERIAL	ROCK
Peat or other vegetal debris	Lignite Bituminous coal Anthracite coal

MORE ON SOILS

Soils are sedimentary rocks and as such are of great interest to geologists. The Handbook of Soils published in our last issue has aroused much interest. In response to inquiries for additional sources of information we publish a selected soils text reference as prepared by Dr. W. L. Powers:

Lyon and Buckman - The Nature and Properties of Soils, 1929, MacMillan, New York

Emerson, Paul - Principles of Soil Technology, 1930, MacMillan

Robinson, G. W. - Soils, their Origin, Constitution and Classification, 1932, D. Van Norstrand, New York

Wolfanger, L. S. - The Major Soil Divisions of the U. S., 1930, J. Wiley & Sons

Comber, N. M. - An Introduction to the Scientific Study of the Soil, Ed Arnold Co., 1929, London

Moser, J. G. and Gustafson, A. F. - Soil Physics and Management, 1917, Lippincott

Kean, B. A. - The Physical Properties of Soil (very technical), 1931, Longmans, Green and Co.

Powers and Teeter - Land Drainage, 1932, J. Wiley & Sons

Israelson, O. W. - Irrigation Principles and Practices, 1932, J. Wiley & Sons

Bear, T. E. - Theory and Practice in the Use of Fertilizers, 1929, J. Wiley & Sons

Bear, T. E. - Soil Management, 1924, J. Wiley & Sons

Van Slyke - Fertilizers and Crops, 1932 ed., Orange Judd Co.

Russell, E. J. - Soil Conditions and Plant Growth (technical), 1932 ed.-Longmans, Green and Co.

Greaves, J. E. and E. O. - Bacteria in Relation to Soil Fertility, 1925, D. Van Norstrand Co.

Waksman, S. A. and Starkey, R. L. - The Soil and the Microbe, 1931, J. Wiley & Sons

Fisher, E. - Principles of Real Estate Practice, 1924, MacMillan

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THE ASCENT OF MOUNT ST. HELENS, 1894

The American Naturalist, Vol. 26, pp. 46-48

The following abstract of an account of the ascent of Mount St. Helens by Mr. Fred G. Plummer, prefaced by a brief history of its recent eruptions, appeared in the December number of Scientific American,

"St. Helens has shown considerable activity in recent times. In August, 1831, there was an uncommonly dark day, which was thought to have been caused by an eruption of a volcano. The whole day was nearly as dark as night, except for a slight red, lurid appearance, which was perceptable until near night. Lighted candles were necessary during the day. The atmosphere was filled with very light ashes, like the white ashes of wood. The day was perfectly calm. There were no earthquakes or rumblings. After the ash clouds had cleared away it was seen that the pure white snow upon St. Helens was browned by the fall of ashes. It is also said that lava flows took place at that time."

"In October, 1842, St. Helens was discovered all at once to be covered with a dense cloud of smoke, which continued to enlarge and move off in dense masses to the east, filling the heavens in that direction. When the first volume of smoke had cleared away it could be seen distintly from various parts of the country that an eruption had taken place on the north side of St. Helens, a little below the summit, and from the smoke that continued to rise from the crater it was pronounced to be a volcano in active operation. When the explosion took place the wind was northwest, and on the same day, extending from thirty to fifty miles to the southwest, there fell showers of dust or ashes, which covered the ground in some places so as to admit of its being gathered in quantities."

"On November 23, 1843, St. Helens scattered ashes over the Dalles of the Columbia River, fifty miles away, and burned continuously until February 16, 1844. Dense masses of smoke rose from the craters in immense columns, and in the evenings the fires'lit up the mountain side with a flood of soft yet brilliant radiance'."

"Having determined to investigate the most active volcano of Washington, we left Tacoma by the midnight train, August 10, 1893, with packs containing necessities for the trip and the instruments for observing and recording all we were to see."

"When we reached the mountains with the aid of a glass I was able to map out a route to the larger of the craters which would not cross any of the great crevasses in the ice slopes. Our ascent began immediately, and in less than an hour became very steep and in places dangerous. Our progress was checked by an enormous canon several hundred feet deep, which appeared a counterpart of the great canon of the Yellowstone. Its formation showed several lava flows, which being firmer than the cinders and broken rock in most places overhung the walls of the canon and made descent out of the question. The great glacier at its head was fully 100 feet deep at the foot, and was ploughing its way into a huge terminal moraine of small rocks. We could plainly hear the rocks grinding together as the great body of ice slowly formed them down the canon. This great glacier headed in the ice cap at the summit of the mountain, and, although it looked steep and slippery, we decided to try the route."

"It was then 10 o'clock in the morning - a bad time to climb ice slopes and snow fields - but we had been gone from Tacoma nearly a week and had only provisions for two more days. We had proceeded but a short distance cutting steps in the steep ice slope, when a bombardment of rocks warned us that our route was to be a dangerous one. The surface of the glacier seemed a sheet of ice clear to the summit, and down its slippery surface came rocks large and small as fast as the noonday sun melted the ice and snow which held them near the top."

"Imagine a toboggan slide about three miles long, starting nearly 10,000 feet above the sea with an initial grade of forty-five degrees. The speed of the rocks as they passed us was terrific. They whirled at such a rate that they seemed spherical in form, and as they flew down the slope seemed only to touch the high places in the lightly wavy surface of the glacier, making a metallic sound as they clipped the ice into a cloud which trailed them like a comet's tail. Here and there great rocks lay upon the surface of the glacier, probably having been held by a fall of new snow, and now and then one of these flying rocks would strike those which were held by the ice, and, amid a shower of sparks and chips, would bound into the air fifty feet or more, still whirling like a buzz saw and giving out a sound which I cannot describe. All this would have been very entertaining if so many of the flying rocks had not passed near us."

"We were exposed to this danger for over an hour while climbing a quarter of a mile, and to say that we were all thoroughly frightened would not do the rocks justice. When at last we reached a place of comparative safety, we were too much awed to speak."

SPECIAL MEETING

A special meeting of the Society has been arranged for Thursday noon, June 4, 1936, to view geological moving pictures by Mr. Hugh A. Matier, Public Relations Representative of the Union Oil Company of California.

Luncheon at Ratnskeller at 12:00 noon.

We will then go to the auditorium of the Y. M. C. A., 6th and Taylor Streets, where the pictures will be shown. Come if you can and bring your friends.

LATE NOTICE

The emblem chosen by the Executive Committee is in the form of a Geological Pick. Pins of this design in either of two sizes are made, with fasteners, either for ladies or gentlemen. Members desiring pins may procure the same from the following persons who are jewelers and members of the Society:

Karl J. Klein, Jeweler,
Maegley-Tichner Building,
610 S. W. Broadway
At. 3718

James C. Olson,
2700 S. W. Patton Road,
Be. 8463

DETAILS OF MAY 30 AND 31 TRIP

Leave Portland Friday evening for Madras via Wapinitia (be sure you have a full tank of gas when you leave Sandy as gas stations between Sandy and Maupin may be closed at night.)

SATURDAY MAY 30, 1936.

Leave Madras 7:00 A. M. Sharp. Take along lunch for Saturday noon meal-be sure you have a full tank of gas - Mr. Irving's Texaco Station will be open early to accomodate all.

Drive north 8 miles to head of grade on Warm Springs Highway view basaltic pillows, tree casts, etc. Return to Madras 8 A.M. and drive to Cove on the Crooked River. From the top of the grade we will walk two miles to view the Kettle, arriving about 10:00 A.M. Returning from Kettle, we will view Crooked River Gorge and then drive into the gorge and have lunch at Crooked River.

Leave Crooked River at 12:45 P.M. and drive to Gray Butte Hills arriving about 2:30 P.M. Leave Gray Butte hills and drive to Diatomite Mines west of Terrebone, arriving about 3:30 P. M. Leave mines about 4:30 P.M. return to Madras 6:00 P.M.

SUNDAY MAY 31, 1936.

Leave Madras 7:00 A.M. Sharp. Be sure you have a full tank of gas and a lunch. Drive to Richard's Hill - geodes will be found here, also shale with leaf imprints. Arrive about 7:45 A.M. Leave Richard's Hill 8:15 A.M. drive to top of Ashwood grade, view deposits of chalcedony and large pieces of petrified wood.

Leave Ashwood grade about 9:00 A.M. drive via Ashwood up Trout Creek view tree casts and petrified wood on the H. L. Priday Ranch (Jones Ranch).

Lunch near Jones Ranch 12:00 to 1:00 P.M.

Leave Jones Ranch drive to top of Ashwood grade and visit Polka-Dot chalcedony deposit arriving here about 2:00 P.M.

Leave Polka-Dot at 2:20 P.M. and drive to Opal Mines reaching there about 3:00 P.M.

Leave Opal Mines about 3:30 P.M. proceed to California-The Dalles Highway by 4:00 P.M. at a point 17 miles north of Madras - and on to Portland.

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ACCOMODATIONS:

Hotel at Madras per night

1 person	single room	$1.00
2 persons	double room	1.50
4 persons	two double beds	2.50

Cabins per night

single without bedding	1.25
double without bedding	1.50
single with bedding	1.50
double with bedding	2.00

Those contemplating leaving Portland Saturday A.M., may meet the caravan at Cove, on the Crooked River about 5 miles from the California-The Dalles Highway or wait at Culver on the highway. We should be at Culver about 1:15 P.M.

Wear Warm outdoor clothing.

Mr. T. A. Carney has prepared a suprise for us Saturday night. Time and place to be announced Saturday evening at Madras.

Driving Distance - - Portland to Maupin - - -	102	Miles
Driving Distance - - Maupin to Madras - - - -	52	Miles
	154	Miles

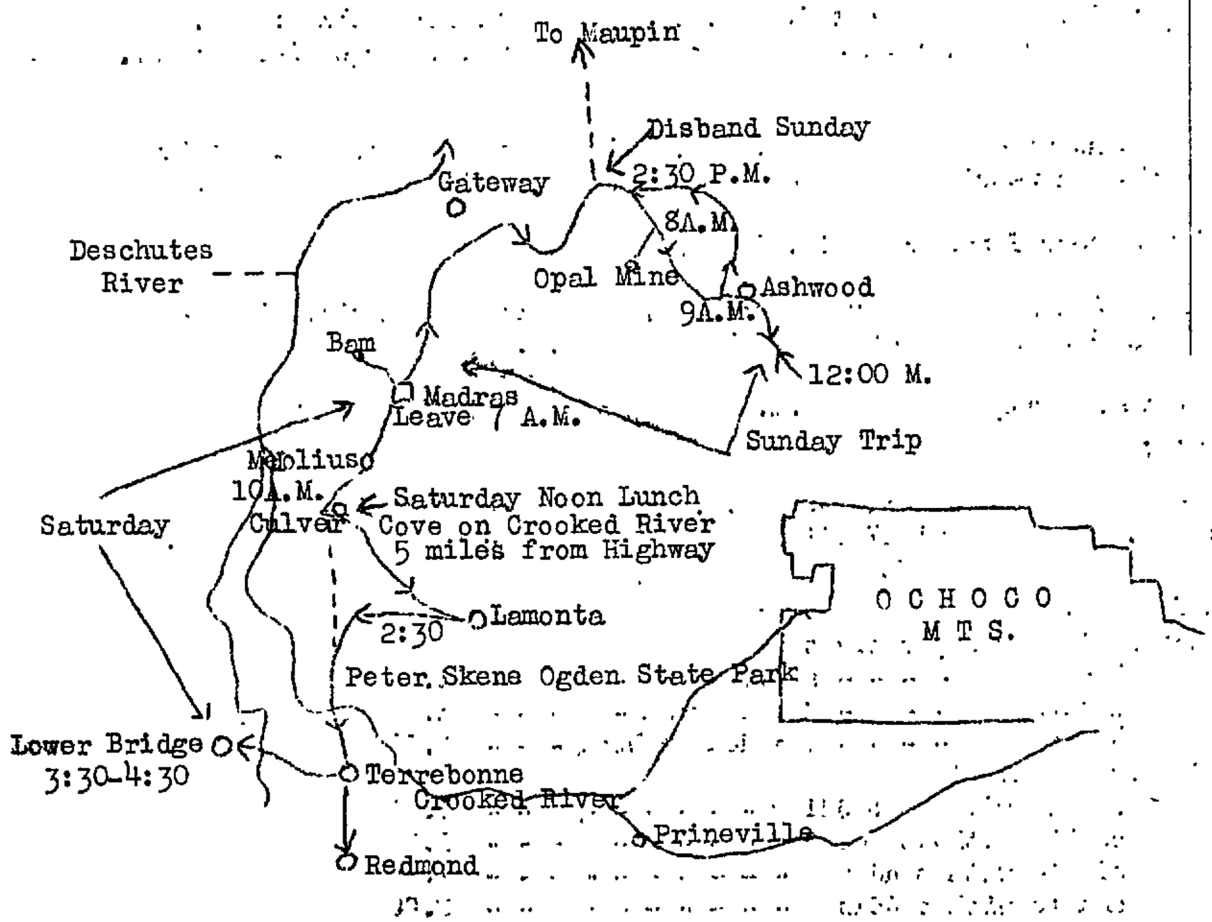
TOPOGRAPHIC MAP OF NORTH CENTRAL OREGON

GEOLOGICAL MAP OF NOTH CENTRAL OREGON

Both by

Dr. E. T. Hodge
Mr. L. H. Irving
Mr. J. Wimmer

ROUTE OF TRIP MAY 30-31, 1936



INTERESTING DISCOVERIES

(Morning Oregonian - April 13, 1926)

JEROME, ARIZONA.

Tracks of giant cats that trod the soil of Arizona not less than 100,000 years ago have been discovered by Professor H. H. Ninninger of McPherson College - McPherson, Kansas; in Oak Creek Canyon, 25 miles from here - he announced today.

Fifty of the tracks are visible, embedded in pleistocene limestone, which were unearthed from underneath more than 100 feet of sedimentary material of the Pleistocene period. Professor Ninninger said some of the tracks measure more than 6 inches in diameter.

The party Professor Ninninger heads plans to chisel out as many of the tracks as possible.

The discovery is characterized by the Professor as "one of the most important paleontological discoveries ever made in the southwest."

BEND, OREGON.

A mineralized hoof of a horse and a tooth of some large herbivorous creature were among remenants of prehistoric life found at Fossil Lake in Lake County, Sunday afternoon (April 11) by a group of Bend fossil collectors.

It was found by the fossil hunters that the wind and rain of the past winter had exposed a large number of mineralized bones. Many of these stony remenants of extinct life are those of birds.

The mineralized hoof believed to be that of a horse of the Pleistocene age, is comparatively small.

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APPENDAGES

George Wimmer after spending an evening reading Walcott's famous monograph on the "Appendages of Trilobites" said "I can't see why a man would spend 43 years hunting for and studying the legs of trilobites when there are so many other much more interesting legs to be seen."

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THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol. 2 - No. 11 Portland, Oregon June 10, 1936

Edwin T. Hodge, Editor
2915 N. W. Luray Terrace,
Portland, Oregon.

Raymond L. Baldwin, Business Manager
2725 N. E. 50th Avenue,
Portland, Oregon.

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Address all other correspondence regarding the bulletin and changes of address to the Business Manager.

MEETINGS

June 12, 1936 (Friday) - Dr. E. W. Lazell is the outstanding authority on minerals in Portland. For many years he has given special study to Gems minerals. Dr. Lazell's lecture will be an unusual opportunity for the members of our Society to get authoritive information on Gems minerals & Gems.

June 26, 1936 (Friday) - Mr. Lewis McArthur. Topographic maps.

FIELD TRIPS

June 14, 1936 (Sunday) - North of the Columbia River and in the "far beyond" amid the mountains is an unknown land. Our scouts have sought to region out and have enthusiastically reported it is worthy of the attention of our Society. The trip to Copper City, Silverstar Mountain and vicinity will be lead by those famous explorers, Joe Wimmer and Claire Holdredge.

July 4-11, 1936 - The trip to the Alps of America under the leadership of Dr. Donald Wilkinson promises to attract many of our members. Dr. Wilkinson announces that his party will furnish meals for $1.25 a day but that the members will be expected to assist in dish washing.

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NEW MEMBER

Jeff Watson	- - - -	Forest Grove, Oregon
Mrs. Lilla Leach	6615 S. E. Foster Road	Portland, Oregon
Francis T. Jones	- - - -	Forest Grove, Oregon

CHANGE OF ADDRESS

Mr. Carl P. Richards	Box 611	Bonneville, Oregon

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REPORT OF OUR FIELD TRIP ON MAY 17TH

Into the Unknown

The Arctic, the Himalayas, the deserts of China even, have been explored geologically, yet the area between the oldest settled region and the largest city of Oregon is an unknown land. May 17, a caravan of high spirited members of the geological society set out to explore this long neglected area. The caravan was led by Dr. Watson of Pacific University, Forest Grove.

Near Beaverton an old quarry was examined. It was quite apparent that the quarry was located on an old fault, but most ot the fault face had been destroyed. Broken up rocks lay where the fault plane would have been. At one side giant breccia lay between the faces, adjacent to which was finer breccia. Bordering this the rocks were distorted so that they had a platy effect, which is the result of cooling rather than of faulting. This platy effect is better developed in andesites than in basalts. At first the rock was thought to be Columbia River basalt, but the G-men got to work and it was soon proved to be an area of a local eruption of Cascan andesite.

Displacement was probably not more than a foot or two, and that was primarily due to rock distortion. Good slickensides were found with striations running north and south. The query was, "Is this part of amajor fault?" Oregon is a land of enormous faults, yet there have been no earthquakes here since human settlement. Is the period of adjustment over? Has Oregon become stable, or does its failure to adjust itself portend a great adjustment someday? Are the rocks so wedged together that they are able to withstand present earth stresses? As yet no seismographic work has been done. There is not even a seismograph in the state.

In the Hillsboro valley four miles north of Hillsboro the caravan stopped where a good view of the hills bordering the valley could be obtained. The even crest of the hills, the mature type of topography, and the average elevation of the hills was noted. At only a few places the elevation reached three thousand feet. The average heighth of the hills was one thousand feet.

At once the G-man saw evidence of a plunging syncline, which had been folded and eroded. The edges of which swung around the line of folding forming what appeared to be a cuesta. Such a cuesta has not yet been verified, but there is evidence to support it. The outcrops form long gentle slopes ending in an escarpment at their crests. The great mass of rock forming these hills comes out of the Cascades near Oregon City and swings in a great arc north and west.

Diller believed a poneplain extended from the Cascades west and from the Columbia River to northern California. The evenness of the edge of the outcrops attest this. The hardrock would have been reduced to a common level, sea level, except for a few isolated hills. Later, according to Diller, this peneplain was uplifted. The soft rocks were subjected to vigorous erosion and were cut down rapidly. The hard rocks were cut down less rapidly and retained the surface character of the old peneplain.

Dr. Hodge stated he had never been able to agree with Diller. The surfaces were not uniform, and were too irregular. The peneplain of Diller covers such a small area, and contains such different physical characters. Dr. Hodge offered the alternate explanation of integrating effect of distance on hills of varying elevation. The hills around Hillsboro plain were probably of uniform height because they were the outcropping edge of basalt of the south plunging syncline.

The Hillsboro plain is an inclosed basin with two main outlets, the Chehalem and Tualitin rivers, both flowing south out of the valley. These are narrow gorge-like outlets. There must have been a large outlet, which was closed by some sort of dam, the finding of which would solve many riddles.

This lowland of the Hillsboro plains is a great geological puzzle. The surrounding hills are not composed of the same material as the valley fill, which is at least one thousand feet deep. Near Hillsboro part of a log was found (not fossilized) one thousand feet below the surface. The width of this old valley is as yet unknown. At Newberg after digging a considerable depth salt water was obtained, but bedrock was not reached. How could there have been such a large area filled up at least five hundred feet with river material without having a through way for the river to have cut? There must have been a great river with an outlet to the sea. It must have been simpler than the outlet of the Columbia today. What happened to it? Was it choked?

The bottom of the valley at Hillsboro was once fifteen hundred feet higher than it is today. (The Portland area also, was over eighteen hundred feet higher than it is today.) The bottom of the valley was once five hundred feet higher than sea level. Dr. Hodge is working on the theory that the land was submerged and the rivers filled up the valleys to a high elevation. Then the land has since been raised about five hundred feet, which makes it about one thousand feet above sea level. The soft valley fill was then trimmed out, but the old river doesn't flow out anymore. The present streams flow in a very round about way to reach the Columbia.

Dr. Watson suggested that the streams were flowing south as the small creeks do now to join the Willamette river, when the country was fifteen hundred feet higher than now. They would have formed an intergrated river system, with a series of V-shaped valleys lying north, northeast. Such a system would have carved the Chehalem and Tualitin valleys. Did the Willamette at that time flow through the Clackamas valley? Dr. Watson further suggested that the lavas coming out of the Cascades near Oregon City blocked the streams there, causing the water to be dammed to the four hundred and fifty foot level. This would cause water to spill over Oswego Lake at the four hundred fifty foot level, and would have cut the gorge when it spilled over. Dr. Watson thought there might have been a second outlet near Oregon City due to a second lava flow. This might account for the valley filling and the occasional appearance of terraces surrounding the Willamette and other valleys here. Dr. Hodge thought the four hundred and fifty foot level was a good suggestion, but the outlets of Oswego, Tualitin, and Chehalem rivers are narrow. A V-shaped valley should get larger as it goes downstream. Dr. Watson believed there could have been a more complicated cutting down and filling in since then.

The first stop made in the hills surrounding the Hillsboro valley was on the East Fork of Dairy Creek. Six lava flows of Columbia River basalt were counted at the quarry. The scoriaceous material composing the top layer of each flow was soft and easily weathered, thus facilitating the identification of the boundaries of each flow. These basalt outcrops were found exposed on the upper surfaces of the hills. The red soils making up the soil covering of the hills was the Olympic type of residual soil resulting from the weathering of basalts.

The slope of the hills ran parallel to the valley. This valley was much larger at one time. The old valley had been partly dissected and cut to the level on which we stood. It had since been uplifted, and the stream had cut down to its present level, exposing the underlying bedrock of the valley, which is marine Oligocene shales. These shales upon closer examination proved to be a fossil hunter's paradise. Many interesting fossils were found. Dr. Jones' small son found the first one, and delighted all, and most expecially his proud father. Fossil clams, gastropods, and without doubt foraminifers were found. These marine Oligocene deposits make excellent hunting grounds. The shales are soft and are thus quite easily eroded exposing the fossils.

As we traveled through the hills on the way to Bacona we crossed several types of formations, sandstones and other sedimentaries. Near Bacona at an elevation of approximately twenty-four hundred feet a splendid view of the hills to the northwest in Columbia County was obtained. Those hills extend in great anticlinal folds northwesterly from Portland.

At first we searched that magnificent panorama for evidence of Diller's peneplain. Could we detect a common elevation? Dr. Hodge noted a seeming concordance of elevation between the tops of the highest hills, but remarked that the integration of land surfaces due to distance is often misleading. A few flats on the tops of the hills was noted, but as yet their cause is unknown. There was nothing there in all that vast area to convince the G-men of a peneplain.

Did a large river find its way to the sea through this area? An attempt was made to picture its valley. The area five hundred feet below the twenty-four hundred foot level was filled with alluvium to the crest of the hills. Then, one could imagine such a valley. A river must have crossed it, but how did it get across the lowland? If the lowland was filled to the same level, then a river could have found an outlet to the sea this way. If there really was such an outlet, then the river flowed at a high elevation, and the country to the north and south would have been cut out.

Closer examination of the topography of this country proved most interesting. The longer we looked the more we saw. A big mound on the further hills was thought to be of some other formation, an intrusive perhaps. To the south an old volcano was detected. Toward the north a long flat surface was interpreted by our G-man as perhaps an old lava flow. A smooth slope, much eroded, was thought to be an inclined mesa. Also, it was noted the basalt rocks are younger than the hills, which are mainly composed of marine Oligocene sediments. The basalts are Miocene and have been folded and eroded.

After viewing the larger aspects of the scenery we came back again to our ever present cry, "Why?" We were launched again......... What caused the Nehalem River and Gales Creek to work headward here? What determined their course? Was it this old valley fill? These streams form a curvature with the Columbia River and lie roughly parallel to it. Dr. Hodge has not yet worked out a theory as to the meaning of this parallelism, but there is a hard rock mountain barrier between the two drainage systems.

The next stop was at a road cut after dropping down to the eleven hundred foot level in the same hills. Here Dr. Hodge set us to work cracking pebbles. What kind were they? What was their story? A census of the pebbles would tell where they were from and where the river flowed that carried them.

Were they interbedded in the lava? Were they basalt or andesite pebbles? Could we find any pebbles that weren't igneous? We found they were mostly glassy andesite and Troutdale grit. None were found that weren't egneous and none were found interbedded with the overlying lavas, but a more thorough search is necessary before any certain results can be deduced.

The exposure showed torrential downstream bedding. The gravels carried by the stream ranged from fine to coarse. Long slablike pebbles were found. The overlying lava flow was andesite and identical to the andesite lavas east of Troutdale. The pebbles were well rounded and the matrix in which they were bedded was volcanic tuff. They were well eemented like the material on the Sandy River. This would indicate that vast quantities of ash and volcanic bombs blanketed the country, and streams flowing westward to the sea spread it out as an alluvial fan over the top of the old stream beds. Was this volcanism subaquecus? Could these andesite lava flows have blocked off the valley so that the river had to find a new outlet to the sea? Did its tributaries cutting back discover this weak zone and so were able to cut back very rapidly?

One other question puzzled many of us. If these gravels were not rolled a long way in the stream bed, what agent rounded them? Did they lay a long time exposed to the air before they were covered by lavas? Are they wind blasted as the result of the desert climate in which they were oxidized rapidly? If the volcanism was subaqueous and the lavas were blown out into the water while still hot was the oxidation while chilling sufficient to round them?

At Buxton the thirsty travelers found relief. The icebox of the little store was verily raided. Beverages were to be had, but caution was needed! The bottles must not appear outside the store. Leo saw to it that all good men were in.

At the railroad trestle not far from Buxton a long stop was made that the "hunters" might bag their game. The steep bank to the trestle was climbed. Dr. Hodge led us across the trestle. He tarried not to explore such a magnificent panorama as was to be had. He watched his feet and hurried on.

The fossil grounds were Oligocene sandy shales exposed in the railroad cut. They formed the bedrock, and were folded. Good jointing planes were found. This exposure is expecially noteworthy as it proved to be quite definitely a near shore deposit. Fossil leaves of trees were found closely associated with fossils of crabs, clams and other near shore creatures, which at the present time live in fairly shallow water.

The close of a happy day was drawing near as we stopped at Gale's Creek near Glenwood on the main road to Vernonia. Here at an altitude of five hundred feet an igneous dike had come up to the surface through the underlying shales. These shales were definitely bedded, and where they came in contact with the igneous material were partially metamorphosed. An Oligocene fossil was found which had been baked. The dike was andesite and post Oligocene in age. It may have fed lava flows of Miocene age.

The bedding of the Oligocene sediments of the stream bank showed a very interesting structural feature. There was a sharp change of dip in the bedding due to a sharp flexure or fault.

The caravan broke up at Gale's Creek and joined the other little ants speeding along the highway. Each found his own pace, and so hurried homeward blessedly tired, but carrying in himself that uncanny feeling of having had a glimpse into the unknown.

Eva Catlin.

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OUR PUBLIC SPEAKERS

May 7, DR. E. T. HODGE was the speaker at the Active Club. His subject was "The Past and Future of Bonneville".

May 11, DR. ALICE M. BAHRS spoke before the Mother's Club of St. Helen's Hall Junior College on the subject of the Geology and Scenery of Yellowstone Park.

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OUR MOST URGENT NEED

With all the talent in the Society it is more than strange that no one has composed either the words or music for a Society song.

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ARTICLES AND REVIEWS

Allison, Ira S.

Pleistocen Alluvial Stages in Northwestern Oregon: Science, n. s., v. 83, no. 2158, pp. 441-443, May 8, 1936.

Mr. Allison presents data on the alluvial terraces of the Willamette Valley whichmay throw some light on the Pleistocene history. He recognizes an old terrace such as in T. 6 S., R. 6W., in Polk Countybeginning at heights of 1000 - 1500' which is well dissected and remains only where protected by harder underlying rocks. This may be equivalent to Nebraskan glaciation. If so, the Satsop of Bretz exposed at Troutdale is the equivalent of Miocen Ellensburg or Hood River formation of Buwalda and Moore.

The oldest terrace which is well defined is represented by high gravel terraces along the valleys in the Cascade Mountains and by perched remnants in the major valleys. Deposits are deeply weathered to 20-30 feet along terrace fronts. Probably Kansan in age. Next in order is a lower terrace irregularly oxidized to depths of 10-15 feet, pebbles decomposed, and parts resemble the gumbotil and gumbosand of Illinoian drift.

A younger terrace than this Illinoian is represented by the Willamette silts, with a few feet of weathering. This is probably Wisconsin in age. A still lower and younger terrace standing 15-30 feet above the streams is recognized. It is not older than late Wisconsin and may be Recent. Correlated with a weak stage of valley glaciation near Zigzag and fresh pumaceous gravels in Cowlitz Valley, Washington. Since then streams have cut through into underlying solid rock. The air-laid pumice of Crater Lake overlies the youngest moraines of the area and are post-glacial

Treasher.

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PROGRESS REPORT ON THE NEW STATE GEOLOGIC MAP OF CALIFORNIA

Olaf P. Jenkins, San Francisco, California

Data, accurate enough for a map on the scale of 1:500,000, are available for about 65 per cent of the State. Of the remaining 35 per cent, part is badly in need of revision while the rest may be considered almost blank. The sources of information are wide-spread. Great care has been taken in compilation and drawing and also in systematically cataloging the material used. The map may be inspected and any new information will be most welcome. The collection and coordination of maps of so many different scales have brought out many interesting regional features. The faults of the Coast Ranges south of San Francisco are of special interest in this regard.

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AGE OF THE CLARNO FORMATION

Ralph W. Chaney, Berkeley, California

The clarno formation, comprising basic lavas, agglomerates and fine-grained tuffs, is widely distributed in eastern Oregon. Recent collections of fossil plants from new localities indicate a close agreement in age with the Comstock flora and the oldest flora at Ashland, both of which are referred to the upper Eocene. There are numerous plant species in common with the floras of the rhyolitic tuffs of the Auriferous Gravels in California. The presence of a wide-spread flora of a warm-temperate to subtropical type in western America during the upper Eocene is consistent with other evidence regarding the climate of this epoch.

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GEOLOGY OF THE NORTH SANTIAM RIVER DISTRICT, OREGON

T. P. Thayer

The area discussed comprises a section extending from the Willamette River at Independence to the Cascade Mountain summit between Olallie Butte and Mt. Jefferson. For purposes of geological description it is found convenient to divide the Cascade Mountains in Oregon into two parts, the Western Cascades and the High Cascades. The western Cascades consist of folded volcanics of Miocene age or older which formed a mountain range at the beginning of the Pliocene. The High Cascades form the drainage divide of the mountains as a whole, and are a young range of unfolded vocanics built up in the main to the east of the Western Cascades. The series forming the two divisions are separated stratigraphically by a very marked unconformity which can be traced the entire length of the Cascades in Oregon.

Formations

The oldest known formation in the North Santiam area is the marine Illahe formation, of Middle Oligocene age, which is well exposed in the western slopes of the Salem Hills. The beds of this formation are mainly fine bedded tuffaceous sandstones which east of Turner grade into non-fossiliferous pebble beds. Eastward these pebble beds probably grade into continental pyroclastics and fine tuffs of the Mehama formation. Unconformably overlying the Illahe and Mehama formations are the Stayton Lavas which consist of basalts west of Stayton and become more adesitic eastward. The lavas are about 400 feet thick and thicken to the north east. Conformably overlying the Starton Lavas is the Fern Ridge Formation consisting of conglomerates and pyroclastics ranging up to fifteen hundred feet in thickness. East of Mehama andesite flows becom so numerous in the Mehama and Fern Ridge formations that formational identity is lost. These lavas are therefore grouped in the Sardine series, which in the vicinity of Sardine Mountain is some 6000 feet thick. The Sardine series grades downward into the Breitenbush series of 7500 feet of more or less water-worked pyroclastics. Rhyolite occurs at the base of the exposed Breitenbush section, and in the Western slope of the High Cascades.

The Illahe formation is correlated with the Eugene and Pittsburg Bluff formations. The Mehama is probably equivalent to the Eagle Creek or Warrendale formation of the Columbia River Gorge. The Stayton and Sardine lavas are probably Miocene, and similar in age to the Columbia River Basalts, whereas the Breitenbush tuffs may be John Day or Clarno, or both.

The High Cascades consist of four series of volcanics, these being, in chronological order, the Outerson, "Minto," Olallie, and Santiam lavas. The last two series are very likely of the same age. The lavas are probably Pliocene-Pleistocene.

Structure

The Western Cascade formations have been folded into a series of flexures trending NE - SW. These have been named from west to east, the Willamette syncline, Mehama anticline, Sardine syncline, and Breitenbush anticline. Dips in the Stayton lavas average 3° or less in the two first-named structures. The Breitenbush anticline is very asymmetrical, having 50° dips in the west limb and 12° dips in the eastern. All structures plunge gently northeastward. A diorite plug about a mile in diameter is well exposed in the Sardine syncline. The eastern limit of the Western Cascades is a rather straight eastward facing scarp which cuts off the east limb of the Breitenbush anticline, and suggests a fault scarp. The fault has been named the Cascade fault.

The Western Cascade rocks had been folded, intruded by diorite and mineralized, block faulted, and eroded to a relief of about 4000 feet before the first High Cascade lavas were erupted.

The Outerson lavas as a whole dip eastward, as they were poured out on the Cascade scarp, but in part lap over on the Western Cascades. The Minto lavas form the main bulk of the High Cascades and were extravasated from vents near or along the present crest of the range. These lavas formed a series of broad shield volcanoes which were deeply eroded before the present-day peaks of the Olallie lavas (Mt. Jefferson, Olallie Butte, Mt. Washington, etc.) were built up. The Santiam basalts partially filled the North Santiam valley which was cut in the Minto and Outerson lavas.

South of Mt. Jefferson the High Cascades are triangular in section because of alignment of the vents. North of that peak the range is more of a plateau and lower, apparently because of haphazard scattering of the vents. Numerous cones of Olallie age (Sisi Butte, The Pinhead Buttes, et.) are scattered over this plateau.

Regional Structural Relations

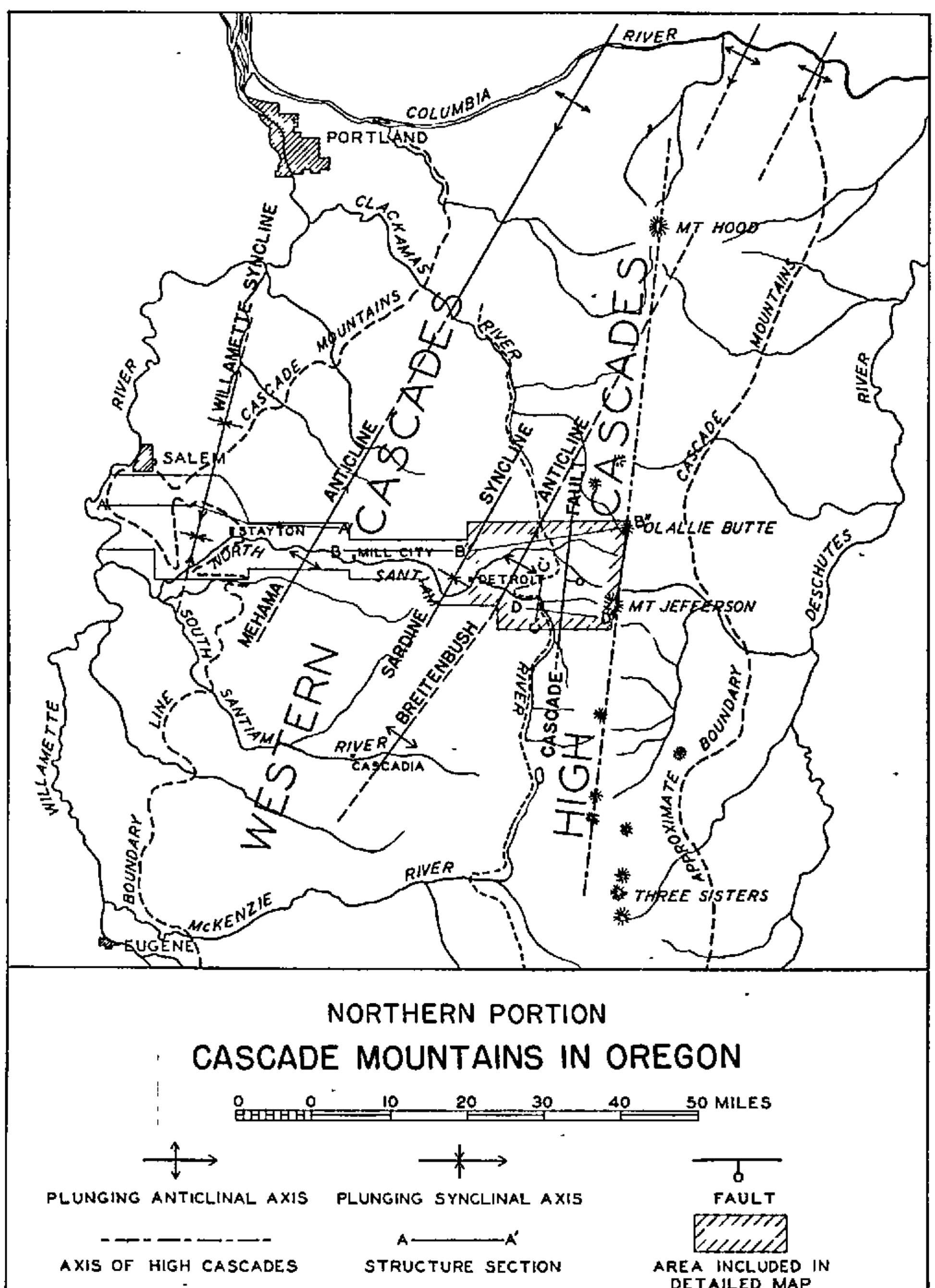
The Western Cascade folds, as we have seen, trend northeast and southwest. Eastern Oregon folds, on the other hand, trend nearly east-west. These two structural systems meet under the High Cascades, in a belt of great volcanic activity. The alignment of the volcanic plugs and peaks, and the eastern scarp of the Western Cascades suggests this zone may be one in which faulting on a considerable scale has occurred. The faulting probably occurred during and after the late Miocene orogeny of the Pacific Northwest. Such faulting is beautifully developed in the Klamath Lake region.

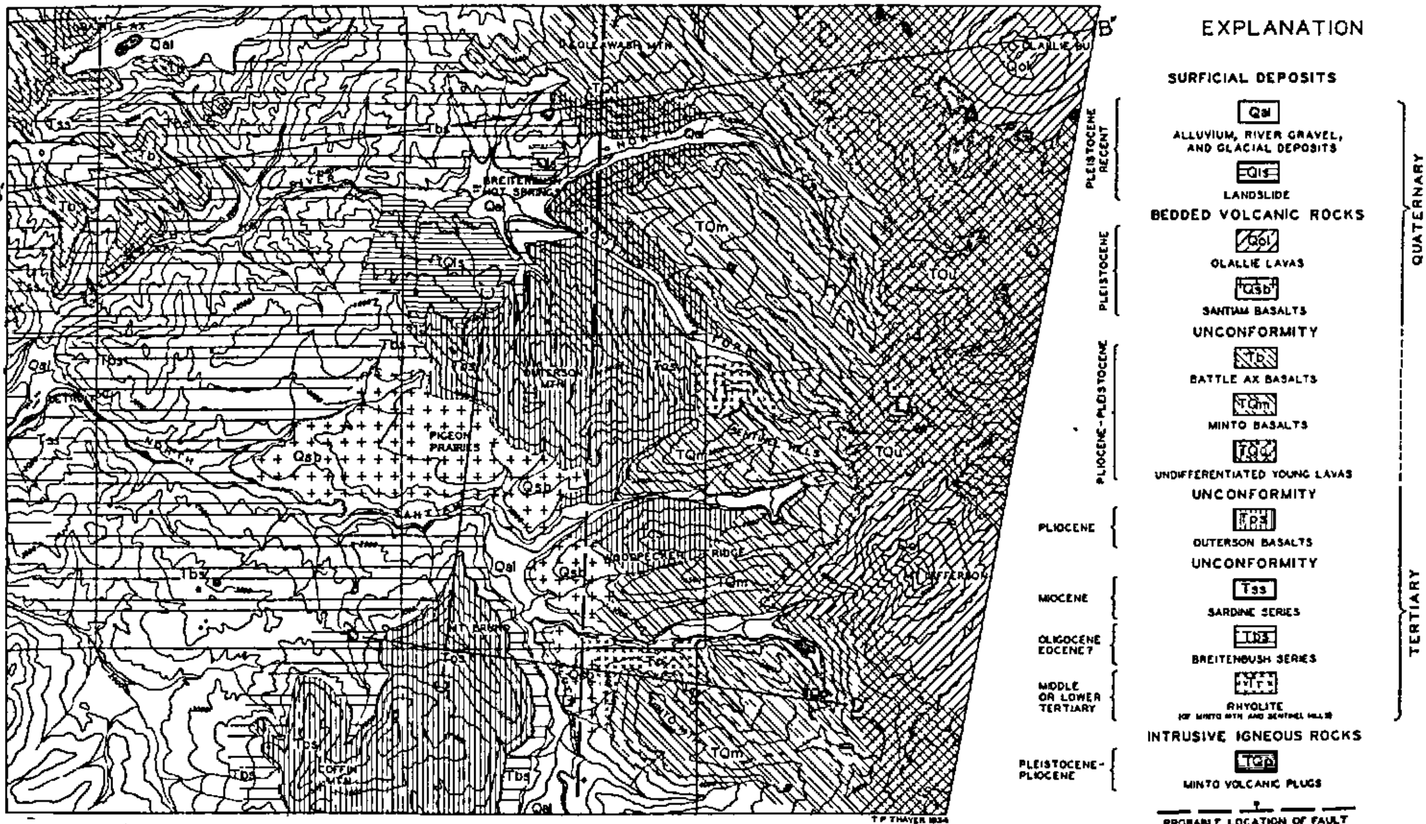
Glaciation

There have apparently been three epochs of more or less extensive glaciation in the Cascades. During the first, or Mill City epoch, a glacier extended down

The Western Cascade formations have been folded into a series of flexures trending NE - SW. These have been named from west to east, the Willamette Syncline, Mehama Anticline, Sardine Syncline, and the Breitenbush Anticline.

This cut together withthose on the next page to accompany Dr. Thayer's article, which appeared in our Bulletin - Vol. #2 - No. 11 - June 10, 1936.

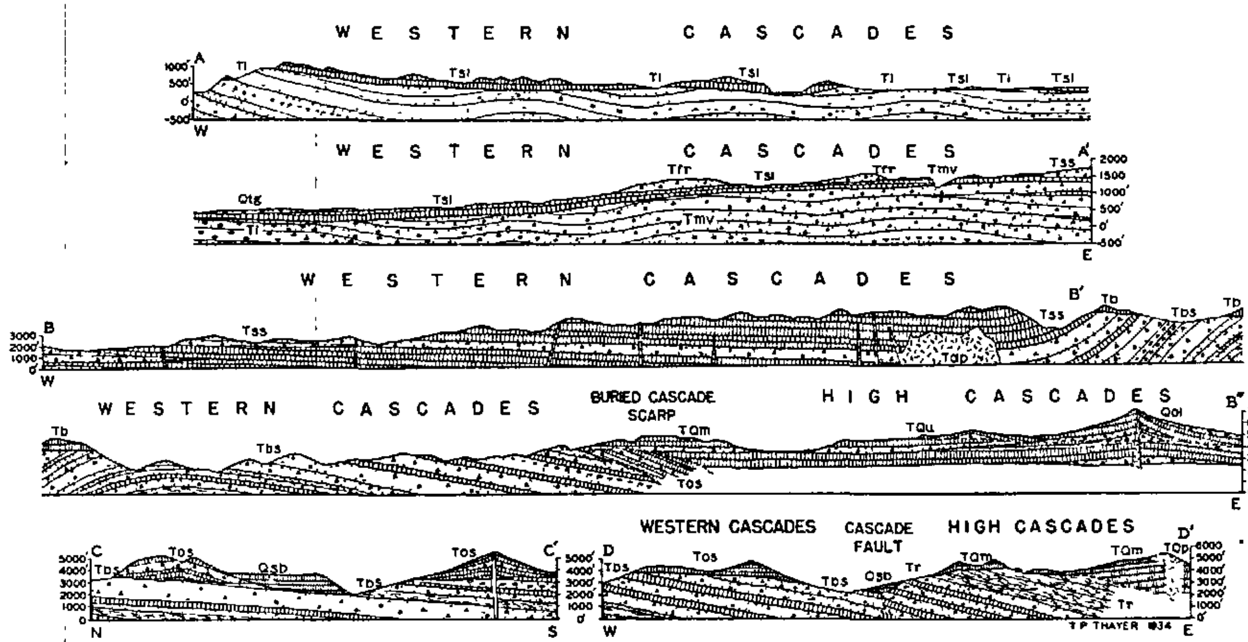




GEOLOGY OF PORTIONS OF THE MILL CITY AND MT. JEFFERSON QUADRANGLES, OREGON.

1 0 1 2 3 4 5 MILES

CONTOUR INTERVAL 500 FEET



GEOLOGIC STRUCTURE OF THE NORTH SANTIAM RIVER SECTION OF THE CASCADE MOUNTAINS IN OREGON

0 1 2 3 4 5 6 7 8 9 10 MILES

Qtg	TERRACE GRAVEL	TQp	MINTO VOLCANIC PLUGS	Tl	ILLAHE FORMATION
Qol	OLALLIE LAVAS	Tb	BATTLE AX BASALTS	Tmv	MEHAMA VOLCANICS
Qsb	SANTIAMBASALTS	Tos	OUTERSON BASALTS	Tss	SARDINE SERIES
TQu	UNDIFFERENTIATED YOUNG LAVAS	Tfr	FERN RIDGE TUFF	Tbs	BREITENBUSH SERIES
TQm	MINTO BASALTS	Tsl	STAYTON LAVAS	Tr	RHYOLITE
		Tdp	DIORITE PORPHYRY		

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

The North Santiam River to a point about four miles below Mill City, and deposits occur as far east as Gates. Lateral Moraines are found also, some four miles below Mill City on a broad bench north of the river. The glacial "U" profile in the gorge east of Niagara has been destroyed. Varved silts and outwash gravels are abundantly exhibited among the deposits, indicating old glacial lakes which were filled.

At Detroit Ranger Station lake deposits and gravels were caught behind a morainic dam near the Quartzville trail bridge. The Detroit glaciation was probably considerably later than the Mill City.

Beautiful moraines occur just below Tunnel Creek on the North Santiam River. These are very young, and represent the last main glacial epoch. Glacial cirques are very common in the Western Cascades, and glaciated valleys and upland surfaces dominate the High Cascades.

Physiography

Dip slopes dominate the Western Cascades to the crest of the Mehama anticline. East of the axis of that structure the Miocen and older rocks have been maturely dissected into narrow ridges and valleys with a relief of about 4000 feet.

Structural surfaces dominate the High Cascades, and the physiography is a direct expression of the structure. South of Mt. Jefferson the High Cascades are essentially a linear pile of lavas, separated from the Western Cascades by the North Santiam-McKenzie structural valley. North of that peak the boundary is not physiographically distinct, as the younger lavas spread over the Western Cascade margin. The younger peaks of the High Cascades have been more or less modified by glaciers.

Drainage changes have been numerous. The North Breitenbush River beheaded Cub Creek, a tributary of the Clackamas, and has cut down some 800 feet since the capture. The North Santiam River above the right angle bend south of Outerson Mountain originally drained into the McKenzie. It was reversed by a combination of glacial scour on the Santiam basalts, and extrusion of lavas in the vicinity of Fish Lake. The North Santiam River east of Detroit may have been reversed when the High Cascades were built up east of the Western Cascades, as that portion of the valley is at least in part pre-High Cascade.

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Thayer, Thomas P.

Structural Relation of the Central Willamette Valley to the Cascade Mountains: Geological Society of America Proceedings, 1933, p. 315, 1934

Discussion limited to structure of S. portion of Salem Hills and its relation to the structure of the Cascades. Formations of volcanic origin. Illahe formation is near-shore marine, tuffaceous sediments of lower-middle Oligocene grading E. into suaaerial Mehama Columbia basalts. Fern Ridge ruffs conformably overlie Stayton lavas. Salem Hills are eroded, warped, E. dipping monocline of stayton lava lying on eroded, gently folded Illahe. E. the lavas flatten and form shallow Stayton basin. E., rise with conspicuous slopes and disappear under Fern Ridge tuffs. Mehama volcanics unconformably underlie the lavas. Salem Hills are western limb of syncline continuous with and part of Cascade Mt. structure. E. boundary of Willamette Valley resulted for erosion. (Treasher)

Thayer, Thomas P.

Structure of North Santiam Section of the Oregon Cascades: Geological Society American Proceedings for 1934, pp. 324-325, 1935.

Section follows N. Santiam River from Salem to Mt. Jefferson. Cascades divided into 2 structural units, Western Cascades and High Cascades. Western Cascades consist of Miocene and early Tertiary lavas folded into N.E. trending structures, intruded locally by diorite. Dips are low. E boundary is the irregular N-S, east facing Cascade scarp, buried by High Cascade lavas. Eastern dips are high, up to 50° in an symmetrical anticline exposing 13,500' volcanic section. Unconformity between Western and High Cascade lavas is marked. Younger lavas are olivine basalts with initial dip. Similarity of West Cascades and Columbia Gorge sections indicates their continuity. Alignment of High Cascades vents, eruptive centers, and the scarp indicate N-S fractures cutting obliquely across W. Cascade structure. To be regarded a northern extension of Basin and Range province. (Treasher)

Wilkinson, W. D.

Spherulites in the Clarno Formation Acid Lavas: Geological Society of America Proceedings for 1934, p. 330, 1935.

3 types based on appearance in plane polarized light (1) light brown transparent (2) dark brown opaque, (3) colorless, transparent and occurring only in cavities. First 2 types are composed of orthoclase and quartz, 3rd is quartz alone and develops only in cavities. Origin due to rapid cooling resulting in supersaturation with development of numerous centers of crystallization. Crystals grow radially from these centers until saturation is reached, when normal crystal growth takes place. No special conditions except those which are supposed to exist in acid lava are necessary to the proposed hypothesis. (Treasher)

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SPECIAL NOTICE

Anyone interested in studying Geology of the Columbia River Gorge for the week of July 6 to 11th see:

J. WIMMER

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AMATEUR GEOLOGISTS TOUR, WASHINGTON, D. C.

The presence of dinosaur bones, petrified wood, shark's teeth and seashells in the earth where the architectural masterpieces of modern Washington now stand, will be explained by Park Naturalist, Donald Edward McHenry, National Capital Parks, to persons accompanying him on a Geological Tour of the National Capital on Sunday, May 17.

The tour will start in the region of the Potomac and proceed northward over the familiar Washington hills. Near the National Zoological Park Mr. McHenry will point to gravels of 100,000,000 years ago resting upon rocks probably 1,000,000,000 years old. Here the human finger can cover a crack representing a span of approximately 750,000,000 years, the Naturalist believes. Mr. McHenry will explain how the old rocks were shoved up and over the younger oceanic deposits by the restless movements of the surface of the earth.

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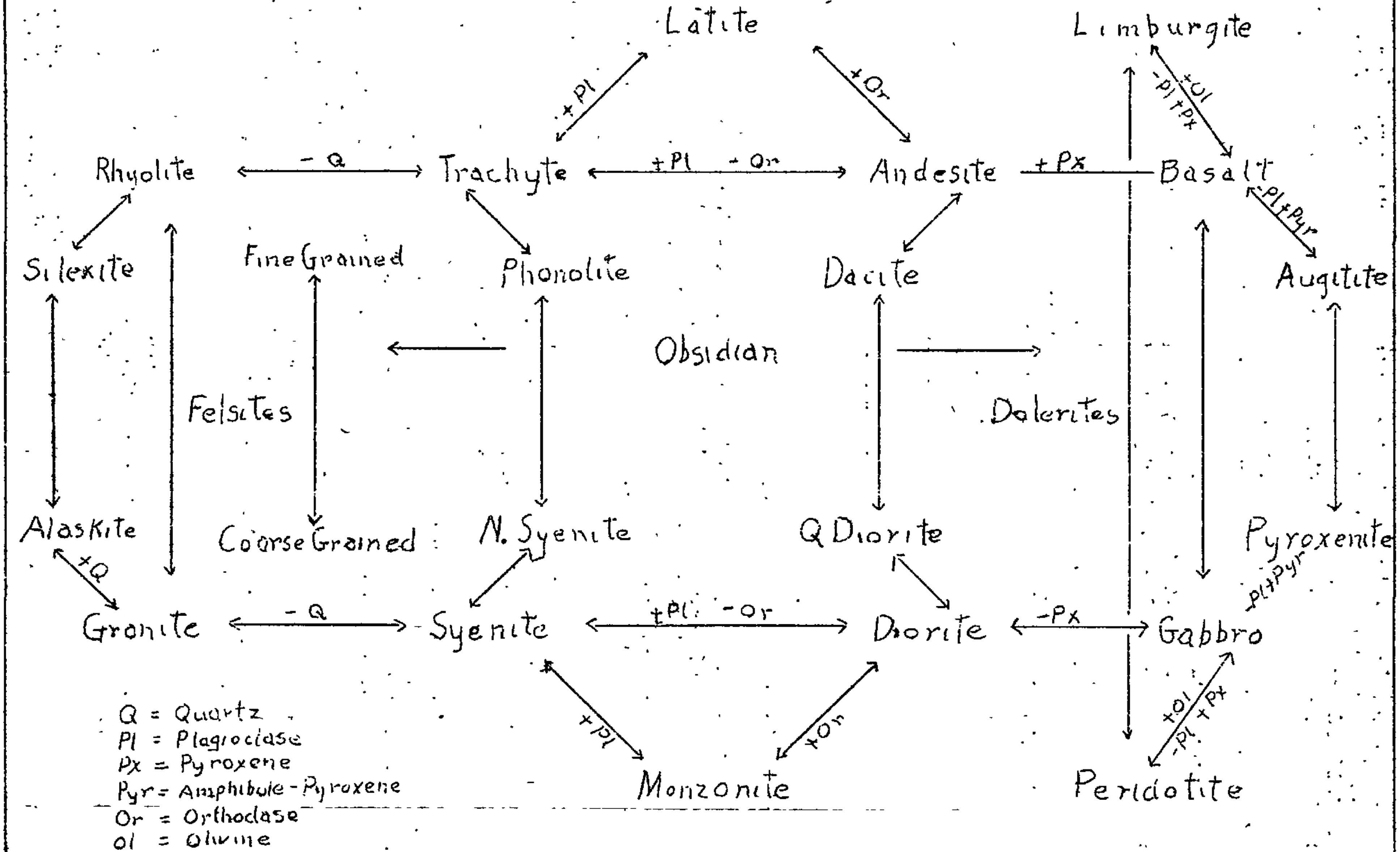
IGNEOUS ROCK RELATIONS

E. T. Hodge - W. D. Wilkinson - Wayne Felts



The Rock Chart in plate I is designed to aid in rock classification as well as show relationships between the common rock types.

In all rock definitions, certain minerals are considered as essential, other minerals may occur which are called accessory minerals. It is evident that an essential mineral in one case may at times become an accessory mineral in another rock.

In the case of the rock definitions illustrated in the chart the essential minerals are listed: Q - Quartz, Pl - Plagioclase, Or - Orthoclase, Px - Pyroxene, Pyr - Amphibole and Pyroxene, Ol - Olivine. These minerals are those most commonly used in rock classification and in determing the rock name it is assumed that one can recognize these several minerals.

Beginning in the lower left hand corner of the chart with the definition of a granite it is possible by following the arrows and noting the subtraction or addition of minerals to arrive at the definition of any one of the rock types listed. At the same time the relationship however remote is shown.

The rocks listed in the lower half of the chart are all coarse grained the vertical arrows point to the fine grained equivalents, which are listed across the top of the chart. The left hand side of the chart includes the common light colored or acid rocks and the right half of the chart includes the darker colored rocks.

If a granite is a coarse grained rock composed essentially of Quartz and Orthoclase then in using the chart, it follows that a Rhyolite is of the same composition but fined grained. The Syenite is the same as to texture but the Quartz has been subtracted from the Granite. If Plagioclase is added to, and Orthoclase subtracted from the Syenite then the rock would be known as Diorite.

By following out this process it is possible to trace the relationships which exist between all of the rocks listed on the chart.

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A SIMPLIFIED TABLE FOR THE RECOGNITION OF SOME OF THE COMMON MINERALS

General

All matter is composed of chemical elements such as oxygen, silicon, iron, aluminum, etc. In nature these elements are usually combined together to form compounds which differ from one another in physical properties as well as in chemical composition.

A MINERAL may be defined as an inorganic substance occuring in nature which has fairly definite chemical and physical properties. Minerals may be chemical compounds or elementary substances (native gold, native copper, etc.).

From the definition above it is seen that substances which have been made in the laboratory and smelting furnace are not minerals.

Many minerals, under favorable conditions of formation, grow in definitely shaped solid geometric forms bounded by plane faces and known as CRYSTALS. This geometric form is the result of well ordered arrangement of the atoms making up the crystal. Crystallization may take place (1) from solution, (2) from fusion, (3) from vapor.

Physical Properties

Most of the common minerals can be identified by their characteristic properties. Microscopic examination or blowpipe analysis is necessary for the identification of some minerals. The minerals listed below can be recognized by their physical properties and one simple chemical test. The more important properties are here mentioned.

HARDNESS (H) refers to the resistance which a mineral offers to being scratched. The following is Moh's standard scale of hardness:

1. Talc	6. Orthoclase
2. Gypsum	7. Quartz
3. Calcite	8. Topaz
4. Fluorite	9. Sapphire (corundum)
5. Apatite	10. Diamond

In the work of this course, hardness may be determined approximately by employing either:

a. Finger nail - hardness 1 to 2, rarely as much as 3.
b. Penny - hardness approximately 3.
c. Steel knife - hardness 5 to 5.5.
d. Quartz crystal - hardness 7.

CLEAVAGE (C) is the property of certain minerals of splitting in definite directions yielding smooth, plane surfaces known as cleavage surfaces. In mica, for example, the cleavage is perfect and in but one direction; in feldspar it is good in two directions; in quartz, cleavage is absent. a cleavage surface may be very small or it may be quite large depending upon the size of the crystal or mineral grain. It must not be confused with a crystal face which is in no way a product of cleavage.

FRACTURE (F) refers to the character of a surface produced when a mineral is broken in any direction other than along a cleavage plane. Fracture may be described as even, rough, splintery, or conchoidal (smooth curved elevations and depressions such as in flint), etc.

LUSTER (L) refers to the appearance of a surface when viewed under reflected light. Varieties of luster are vitreous (glassy), pearly, greasy, metallic, earthy etc. To obtain the proper luster of a mineral the surface examined must be a relatively fresh one.

STREAK (S) is the color of the mark made by some minerals when scratched on a hard, white surface such as unglazed earthenware (streak plate). Streak is, thus, the color of a mineral's powder. Many minerals give no distinct streak. This is especially true of most minerals harder than the knife and of light colored minerals

SPECIFIC GRAVITY (G) is the ratio of the weight of a substance to the weight of an equal volume of water. It is expressed by a figure. Most of the common rock-forming minerals have a specific gravity ranging from 2.5 to 4.

COLOR is an important aid in the identification of some minerals. In many cases, however, color is not a distinguishing characteristic.

SPECIAL PROPERTIES such as taste, feel, magnetism, etc., sometimes aid in the determination of a mineral.

REACTION WITH ACID is a chemical test which identifies a few minerals. Calcite for example, effervesces freely when cold hydrochloric acid (HCl) is applied, while dolomite effervesces freely only when hot acid is applied.

In the accompanying table the minerals are arranged on a bases of luster, hardness, streak, color and cleavage. The original table from which this was taken may be found in Dana's Manual of Mineralogy.

METALLIC OR SUBMETALLIC LUSTER

(1) Very Soft - Will readily leave a mark on paper.

Hardness	Streak	Color	Cl.	G	Crystal Structure	Remarks	Name	Comp.
1 - 1.5	Black	Steel gray Iron black	Perfect	2.2	Rhombohedral Micaceous	Diff. from Molybdenite by brown tinge to its black color	Graphite	C
2.5	Gray Black.	Lead gray	Perfect Cubic	7.6	Cubic crystals & massive		Galena	PbS
2 - 2.5	Bright red	Red		8.1	Earthy	Earthy form Not common	Cinnabar	HgS
Marks paper easily	Red Brown	Red Brown		5.2	Earthy	Often known as Red Ochre - paintore	Hematite	Fe_2O_3
Marks paper easily	Yellow brown	Yellow brown		3.6	Earthy	Often known as Yellow Ochre	Limonite	$Fe_4O_3(OH)_6$

METALLIC OR SUBMETALLIC LUSTER

(2) Can be scratched by knife but will not readily leave mark on paper.

Hardness	Streak	Color	Cl.	G	Crystal Structure	Remarks	Name	Comp.
Marks paper with diff.	Black	Lead gray	P-Cubic	7.6	Isometric-cubes Granular	Held in candle flame reduced - globules of metallic lead collect	Galena	PbS
5.5 - 6.5	Brown to Red	Dark brown	F-uneven	5.2			Hematite	Fe_2O_3
5 - 5.5	Yellow Ochre	Dark brown to Black	F-splintery	3.6			Limonite	$2Fe_2O_3 \cdot 3H_2O$
2 - 2.5	Red	Vermilion	F-uneven	8.1	Rhombohedral		Cinnabar	HgS
2.5 - 3	Copper	Copper-red	F-hackly	8.8	Isometric	Malleable	Copper	Cu
2.5 - 3	Silver-White	Silver	F-hackly	10.5	Isometric	Malleable	Silver	Ag
2.5 - 3	Gold-Yellow	Yellow-gold	F-hackly	19.	Isometric	Malleable	Gold	Au
3.5 - 4	Black	Brass-yellow	F-uneven	4.2	Tetragonal	Color & softness	Chalcopyrite	$CuFeS_2$

NON METALLIC LUSTER

Gives a colorless streak

(1) Can be scratched by fingernail

Hardness	Color	Luster	Cl	G	Crystal Structure	Remarks	Name	Comp
2 - 2.5	Pale brown, green, yellow white	Vitreous, Pearly	Perfect basal	2.8	Monoclinic	Perfect cleavage	Muscovite	$H_2KAl_3(SiO_4)_3$
2.5 - 3	Dark brown	Vitreous	Perfect basal	3	Monoclinic	Perfect cleavage	Biotite	$(HO)_2(MgFe)_2(AlFe)(SiO_4)_3$
2 - 2.5	Green	Vitreous, pearly	Perfect basal	2.7	Monoclinic	Perfect cleavage inflexible	Clinochlore	$H_8Mg_5Al_2Si_2O_{18}$
1	Apple green	Pearly, Greasy	Perfect basal	2.8	Monoclinic	Softness & Greasy feel	Talc	$H_2Mg_3(SiO_3)_4$
2	Colorless to Gray	Vitreous	Perfect Pinacoid	2.3	Monoclinic		Gypsum	$CaSO_4 2H_2O$

(2) Cannot be scratched by fingernail, but can be scratched by a cent.

Hardness	Color	Luster	Cl	G	Crystal Structure	Remarks	Name	Comp
2.5	Colorless & White	Vitreous	Perfect cubic	2.1	Isometric	Common salt	Halite	$NaCl$
3 - 3.5	Colorless & White	Pearly Vitreous,		2.9	Orthorhombic		Anhydrite	$CaSO_4$
3	Colorless	Vitreous	Rhombohedral	2.7	Rhombohedral	Effervesces in Cold Acid	Calcite	$CaCO_3$
3 - 3.5	Colorless	Vitreous pearly	Perfect basal prism	4.5	Orthorhombic	Unusual weight	Barite	$BaSO_4$
3.5 - 5	Olive to blackish-green, yellow-green	Greasy, wax-like	F uneven	2.6			Serpentine	$H_4Mg_3Si_2O_9$
2 - 2.5	Colorless or white	Dull	Earthy	2.6		Hydroscopic	Kaolinite	$H_4Al_2Si_2O_9$

NON METALLIC LUSTER

Gives a colorless streak

(3) Cannot be scratched by a cent, but can be scratched by a knife.

Hardness	Color	Luster	Cl	G	Crystal Structure	Remarks	Name	Comp
4.5 - 5	Colorless, White	Vitreous, Pearly	Pinacoidal	2.7	Monoclinic	Radiating Structure	Pectolite	$HNaCa_2(SiO_3)_3$
5 - 5.5	Colorless, White	Vitreous	Prismatic	2.2	Orthorhombic		Natrolite	$Na_2Al(AlO)(SiO_3)_3 \cdot 2H_2O$
5 - 6	White, Green, Black	Vitreous, Pearly	Prismatic 55^o and 125^o	3-3.5	Monoclinic	Cleavage	Amphibole Group	Calcium, Magnesium MetaSilicates
5 - 6	White, Green, Black	Vitreous	Prismatic at 90^o	3-3.5	Monoclinic	90^o cleavage	Pyroxene Group	Calcium, Magnesium, MetaSilicates
3	Colorless, White	Vitreous	Rhombohedral	2.7	Rhombohedral	Effervesces in cold acid	Calcite	$CaCO_3$
3.5 - 4	Colorless, White	Vitreous Pearly	Rhombohedral	2.8	Rhombohedral		Dolomite	$CaMg(CO_3)_2$
3 - 3.5	Colorless, White	Vitreous, Pearly	Basal and Prismatic	4.5	Orthorhombic	Unusual Weight	Barite	$BaSO_4$
4	Colorless, White, violet	Vitreous	Octohedral	3.1	Isometric	Fluorescence	Flourite	CaF_2
5 - 5.5	Colorless, White	Vitreous	F uneven	2.3	Isometric		Analcite	$NaAl(SiO_3)_2 \cdot 2H_2O$
5	Green, brown, Colorless	Vitreous, Greasy	F uneven	3.1	Hexagonal		Apatite	$Ca_4(CaF)(PO_4)_3$
3.5 - 5	Olive, greenish to white	Greasy, Wax-like	F uneven	2.6			Serpentine	$H_4Mg_3Si_2O_9$

METALLIC OR SUBMETALLIC LUSTER

Cannot be Scratched by knife.

Hardness	Streak	Color	Cl.	G	Crystal Structure	Remarks	Name	Comp.
6 - 6.5	Greenish-black	Pale brass yellow	F uneven	5	Isometric		Pyrite	FeS_2
6	Black	Black	F uneven	5	Isometric	Strongly magnetic	Magnetite	Fe_3O_4
5.5 - 6	Brown to Black	Black	F uneven	4.3	Rhombohedral		Ilmenite	$FeTiO_3$
5.5 - 6.5	Red - Brown	Dark brown to black	F uneven	5.2	Rhombohedral		Hematite	Fe_2O_3
5 - 5.5	Yellow-brown	Brown	F splintery	3.5-4	Earthy		Limonite	$2Fe_2O_3 \cdot 3H_2O$

NON METALLIC LUSTER

Give a definitely colored streak

Hardness	Streak	Color	Cl.	G	Crystal Structure	Remarks	Name	Comp.
5.5 - 6.5	Red-brown	Dark brown to black	F uneven	5.2	Reniform Rhombohedral		Hematite	Fe_2O_3
5 - 5.5	Yellow-brown	Brown	F splintery	3.5-4	Mammillary or Stalactitic		Limonite	$2Fe_2O_3$ $3H_2O$
3.5 - 4	Light green	Bright green	F uneven	4	Monoclinic	Effervesces in cold acid	Malachite	$CuCO_3 \cdot Cu(OH)_2$
3.5 - 4	Light blue	Azure-blue	F uneven	3.7	Monoclinic	Effervesces in cold acid	Azurite	$2CuCO_3 \cdot Cu(OH)_2$

NON METALLIC LUSTER

Gives a colorless Streak

(4) Cannot be scratched by a knife, but can be scratched by quartz.

Hardness	Color	Luster	Cl	G	Crystal Structure	Remarks	Name	Comp.
6 - 7	Yellow to Green	Vitreous	Basal	3.4	Monoclinic		Epidote	$Ca_7(Al.OH)(AlFe)_2(SiO_4)_3$
5 - 5.5	Colorless, white	Vitreous	Prismatic	2.2			Natrolite	$Na_2Al(AlO)(SiO_3).2H_2O$
6	Colorless, white Red, Green	Vitreous Pearly	Basal & Pinacoidal	2.6	Monoclinic		Orthoclase	$KAlSi_3O_8$
6	Colorless, white Greenish	Vitreous Pearly	Basal & Pinacoidal	2.6	Triclinic		Plagioclase Feldspars	
5.5 - 6.5	Gray, Brown, black	Pearly Bronze-like	Prismatic	3.2	Orthorhombic		Enstatite Hypersthene	$MgSiO_3$ $(FeMg)SiO_3$
5.5 - 6	Gray, white colorless	Vitreous to Dull	F uneven	2.5	Isometric	Trapezo-hedrons	Leucite	$KAl(SiO_3)_2$
6.5 - 7	Olive to Green and Brown	Vitreous	F uneven	3.3	Orthorhombic		Olivine	$(MgFe)_2SiO_4$
7 - 7.5	Red-brown to Brownish-black	Resinous	F uneven	3.8	Orthorhombic		Staurolite	$(AlO)(Al.OH)Fe(SiO_4)_2$

NON METALLIC LUSTER

Gives a colorless Streak

(5) Cannot be scratched by quartz

Hardness	Color	Luster	Cl	G	Crystal Structure	Remarks	Name	Comp
8	Colorless, yellow bluish, greenish	Vitreous	Perfect Basal	3.5	Orthorhombic		Topaz	$(AlF)_2S.O_4$ (OH)
7	Colorless, & Variable	Vitreous Greasy	F Conchoidal	2.6	Rhombohedral Trapezohedral	Crystals & Fracture	Quartz	SiO_2
9	White, gray Brown	Adamantine to Vitreous	F Uneven	4	Hexagonal	Hardness	Corundum	Al_2O_3
7 - 7.5	Green, yellow, colorless	Vitreous	F Uneven	2.7	Hexagonal	Crystal Prisms	Beryl	$Be_3Al_2(SiO_3)_8$
6.5 - 7.5	Brown to red	Vitreous	F Uneven	3-4	Isometric	Dodecahedrons	Garnet	$R''_3 {}''_2 (SiO_4)_3$ R'' Ca, Mg, FeMn R''' Al, Fe, Cr

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

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LECTURES

June 26, 1936 (Friday) - Maps bring up visions of countries to be explored. Maps tell us what and where the surrounding countries are, when we are upon the exploration trip. Mr. Lewis McArthur is the Oregon Representative of the National Geographic Board. He is an enthusiast on maps and will convey his enthusiasm to you when he lectures next Friday evening on "Topographic Maps".

July 10, 1936 (Friday) - Ray Treasher - Geology of Mt. St. Helens.

July 24, 1936 (Friday) - Claire Holdredge - Diamond Mining in Africa.

Aug. 14, 1936 (Friday) - F. P. Keen, Entomologist, U. S. Forest Service - Climate During Last 800 Years as Shown by Tree Rings.

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TRIPS

Our trip to the Alps of America, scheduled July 4 - 11, is cancelled as explained in the following letter to Ken Phillips from Dr. Wilkinson:

"Owing to the few boys who registered for the summer geology it will be impossible for us to finance a trip of the proportions outlined and announced earlier. I talked the matter over with Dean E. L. Packard and he was of the opinion that we shouldn't plan to make a trip. So I would appreciate it if you would be kind enough to announce to the Society that a change of plans is necessary and that the trip will not be taken by the camp this season. I hope this doesn't inconvenience too many people and while an apology to them is inadequate still I offer it."

July 4th and 5th, 1936 - Spirit Lake Trip. Leader: Ray Treasher.

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HONORS IN OTHER FIELDS THAN GEOLOGY

Our fellow member Dr. Edwin E. Osgood, Assistant Professor of Medicine at the University of Oregon Medical School at Portland, with the aid of Alfred N. Muscovitz, junior student at the school, recently completed a new apparatus which press dispatches from East refer to as a "New Synthetic Life Apparatus" and acclaim it as of even greater promise than the artificial heart devised last year for the Rockefeller Institute of Medical Research by Colonel Lindbergh and Dr. Alexis Carrel.

This invention of Dr. Osgood was freely offered to the medical profession through an article and diagram in May 30 issue of the Journal of the American Medical Association "with the hope that other investigators may aid us in realizing, as rapidly as possible, its full potentialties".

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PERSONAL

Mr. Richard Bogue, a member, now at Columbia University, will spend the summer in Cuba studying the chromite deposits.

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THE MADRAS TRIP

It was with all worldly cares and worries left behind that eighty-five people met at Madras on Decoration Day morning for two wonderful days of exploration in the neighboring canyons and mountains. Under the excellent supervision of Joe Wimmer and the entire trip was made without serious mishap or delays.

Promptly at 7:00 o'clock Saturday morning the caravan left to view a massive structure of pillar basalt, nine miles from Madras along the Warm Springs Highway. Tree casts and leaf molds were also seen, and those who were ambitious managed to get specimens from imprints from large boulders.

The party assembled again at Madras, and drove past Metolius to a point from which we hiked one and a quarter miles to a viewpoint. The canyon here is 800 feet deep. Across the Deschutes River is the Canadian Bench, and between the Deschutes and the Crooked River are The Island and The Peninsula, which are intracanyon flows of late Pleistocene time. Ages ago a river flowed in this canyon, prior to the basaltic flow. Since then the basalt has filled in the canyon, and the rivers cutting through it now are in almost the same place as the former rivers. To the north we saw Round Butte, believed to be one of the vents from which the lava issued. In the Crooked River we saw Eagle Rock, standing about 50 or 60 feet high, on which eagles have been nesting for thirty or forty years.

From this point we walked to the Kettle, which is formed of solid basaltic rock. There is a visible seam or uncomformity separating the basalt from the aqueous rock underneath. A theory was presented that at one time the river was divided, and part of it came down at this point. There was a giant waterfalls, which undermined the stratified rock and also some of the basalt was fractured, and at some future time will no doubt tumble down. Looking across the river we could see springs running into the Deschutes, which is a very common sight all along this region. Opal Springs is listed by the government as one of the ten largest springs of underground water flow in the country.

From there we drove to the Cove, and again saw an excellent contact between the stratified and igneous rock, which is repeated in many places in the canyon.

It was then 11:30, and as everybody had worked up a good appetite, we drove down into the canyon of the Crooked River and had lunch at the camping grounds. After a short rest we took a road out of Culver and stopped at a field to hunt for volcanic bombs. These are fragments of lava which have been thrown high into the air by a terrific explosion. Before hitting the earth they cool in a tear-drop form. Several very good bombs were found.

We were all ready for the next point of interest when it was discovered that Eva Catlin, Mr. Maxwell and Mr. Jennison were missing. It was feared that perhaps they might have fallen over the cliff while chasing a bomb, but it turned out they were so wrapped in deep contemplation of past geology of the canyon that they failed to hear the "Let's Go" whistle.

Our next climb was to the top of one of the Gray Butte Hills, where we had an opportunity to get leaf imprints in shale. To the east was Gray Butte, to the southwest Haystack Butte, and to the west Juniper Butte. All three buttes are part of the old Clarno formation, which is an extension of the Ochoco Mountains, formed before lava flowed over the valleys we had visited earlier in the day. The lava made an island of the territory within the surrounding buttes. They formed one entire mound or quaquaversal fold. This mound has since been eroded and cut by streams and now forms the portions known as these buttes.

After working industriously splitting shale in hopes of making a discovery--and there were a few made--we drove to the Diatomite Mines west of Terrebone. Here we ran up against an unforseen obstacle, as the person in charge who was to show us through the mine was not there, so we had to content ourselves with hacking out a few specimens. Those who liked steep climbing got to the top of the cliff and saw the diatomaceous earth piled up in long rows. This is used for making toothpaste, powder, silver polish, etc., and is formed from cells of plants that lived in a fresh water lake.

This was the last stop for the day, so we headed for Madras and dinner, after which we had a surprise in store, planned by Thomas Carney. We assembled again at 7:30 and while admiring a beautiful sunset drove down the Warm Springs Highway to Mr. Irving's place on the Deschutes River for a big bonfire party. With the aid of willing helpers a big fire was soon roaring. Under the light of an almost full moon sixty-six members and guests spent a very enjoyable evening. Dr. Arthur Jones led us in the songs, "Hail! Hail! The Gangs All Here," "Let Me Call You Sweetheart," and "There's a Long, Long Trail Awinding". Mr. Phillips introduced Mr. Dagner and Mr. Louis Irving, both residents of Madras, who so kindly contributed their time both days in showing and explaining to us the work of nature and of the ages in the surrounding country. Mr. Irving told us what we were going to see the next day, and also recited the poem, "The Hand Upon Your Shoulder".

Leo Simon reported seeing thirty-six species of birds and seventy-five species of flowers during the day. He identified a number of wild flowers, among which were zygademis, or poison camas, wyethia, balsamroot, penstemmons, lewisia rediviva or rock rose, ocean spray, and eriogonum. It might interest those who thought we were seeing sage all day to know that it is not sage, but artemisia, which belongs to the composite family. It has been misnamed because of its sage-like odor.

Dr. Cooper told us an amusing story about Dr. Claude Adams, Joe Wimmer, and Leo Simon, and also gave an interesting talk on hobbies. Announcements of future trips were made by Joe Wimmer and Ray Treasher. J. C. Stevens told us a Bed Time Story, and the evening ended with another song "Land of the Empire Builders" led by Dr. Arthur Jones.

After a good nights sleep we left at 7:00 o'clock Sunday morning and drove through the Baldwin Sheep Co. or Hay Creek ranch, one of the largest in the west. At one time there were between 22,000 and 25,000 head of sheep on this ranch. This section shows many good illustrations of anticlines. The Hay Creek Anticline is one of the largest structures in the country, the anticlines trending both north and south, and east and west.

At Richard's Hill we found agates formed in volcanic rock and large quantities of geodes. The mineral water which seeps into the cavities that were originally gas bubbles first fills the edges and then gradually fills in the center. When the solution is deposited in layers from bottom to top, a banded strata results. Quartz crystals must have plenty of space in which to grow, and slow growth is necessary for development of large crystals. Small amounts of impurities in solution prevent the crystals from becoming large.

When everybody had found more geodes than they could possibly carry, we left for the next stop at the top of Ashwood grade. Here we saw deposits of chalcedony, large sections of opalized wood, and the second largest agate in Oregon. A litter farther on we found tree casts of calcite, agate and jasper. These are formed by the inside part of a buried log decaying. As water seeps down into the ground it contains different crystals, which are deposited inside the trunk, and crystallization also takes place in the pores of the wood. The vacant space is filled with crystals from the water. Some of the calcite crystals are slightly fluorescent.

After having lunch at the Jones Ranch we saw a clastic dike, which was divided into two sections of about four feet each. There was about four feet of sediment between the two parts. There is no igneous material present. At one time an enterprising oil explorer had dug between the dike hoping to strike oil, but was not successful.

From here we drove again to the top of the Ashwood grade and visited a Polka-Dot chalcedony deposit, the upper end of which is an old Indian quarry. Mention was made of a series of channels and mounds that are seen along the Wapinitia Cut-off on both sides of the highway between Timber and Maupin. The mounds are elongated with a drainage pattern between them, and are floored with boulders. There are also a few circular mounds, which are higher. They may have been formed by water making a drainage pattern over deposits of ash of several feet thickness above the basalt. The flatter the slope, the more circular are the mounds, and the steeper the slope the more elongated they are.

We also were shown some jars of desert glass. The glass had turned an amethyst color due to the action of the suns rays and the dryness of the atmosphere. One jar had been lying outside for two or three years and another for about twelve years.

Inasmuch as some day we will have a museum in Portland, it was suggested that members, when bringing home samples of various rocks for their own collections, also make a museum specimen at the same time. These are a 3" x 5" size. The piece selected should be a little larger, as it has to be whittled down. It should be worked from the edges, and two or three fragments of fresh rock should be kept for thin sections.

At this stop it was discovered that one of the cars was down the road aways because of engine trouble. Mr. Stevens very kindly went back and towed it in to the highway.

The party disbanded about 4:30 on the Dalles-California Highway seventeen miles north of Madras with many regrets of the holiday ending so soon. Every car was well loaded with the many specimens found during the two days.

Those who contributed to the discussions at the various stops were Louis Irving, L. B. McNabb, Russell Collins, Franklin Davis, Clarence Phillips, Dr. Francis Jones, Ray Treasher, Prof. Watson, and J. C. Stevens.

It has been rumored that Tracy Wade is contemplating organizing a trip to the North Pole in the near future. He would like at least one hundred volunteers of good, true, sturdy, fearless, adventurous geologists to accompany him. Anyone who has an itching foot for distant places should get in touch with Mr. Wade immediately.

Constance Endres

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REVIEWS

The Transportation of Sand by Wind at Clatsop Spit

Some geological wag has defined sand as "a group of rocks each one of which is so small that you can't stumble over it." He might have added that these "rocks" collect into sand drifts or dunes to form stumbling blocks for Man and all his means of transportation, and that their removal is a continuing engineering problem.

Preliminary studies of the erosion of Clatsop Spit, at the mouth of the Columbia River, indicated that wind drift was an important factor. Experiments were undertaken to establish the order of magnitude of this drift. Results of these experiments are summarized in Civil Engineering for May 1936, by M. P. O'Brien, University of California, and B. D. Rindlaub, U. S. Army.

Air moving over the sand produces a tractive force which tends to move the sand; conversely, the relatively fixed sand tends to retard the motion of the air. It was found that wind velocity at a point 10 feet above the sand was nearly twice that at the surface of the beach, the greatest differences being noted early in the morning while the air was cool and the sand wet. Sand movement generally referred to air velocity at a point 5 feet above ground.

During the experiments, wind-blown sand was trapped in a rectangular flume-like box provided with transverse riffles. At high wind velocities, an unknown amount of sand was blown through or over the trap; so that the results show only the amount of sand moving near the surface of the beach. "On one occasion, sand was unpleasantly evident at 8 feet above the beach during a heavy rainstorm accompanied by wind of 48 miles per hour."

Sieve analyses showed that the grains of sand varied in diameter from 0.003 to 0.01 inch, the most common size being 0.008 inch. Specific gravity was found to be 2.65. The sand grains were well rounded.

For wind velocities of 9 miles per hour or less, there was no appreciable sand movement. For winds of 20 feet per second or more, the sand drift was found to follow the formula - $G = 0.036 V^3$, where G is the daily weight in pounds of dry sand per foot of beach measured at right angles to the direction of the wind, and V is velocity of the wind in feet per second. The astonishing amount of work done by the wind may perhaps be better visualized by considering that, if a line 100 feet in length were stretched at right angles to the direction of the wind, the total weight of sand drifting over the line in 24 hours would be -

10,000	pounds for a wind of 12 miles per hour	
91,000	" " " " " 20 " " "	
225,000	" " " " " 27 " " "	
1,420,000	" " " " " 50 " " "	(extrapolated)

The experiments described by O'Brien and Rindlaub are believed to be the first made to determine sand drift quantitatively in relation to air movement.

K. N. P.

Analysis of Willamette Valley Fill

Wayne M. Felts, Corvallis, Oregon

A cut near St. Paul, Oregon, exposes a thirty-five foot section of Willamette Valley fill consisting of alternating beds of fine sands and silts with very little clay. These sediments are composed of angular grains of quartz, mica, feldspar, magnetite and other minerals, and of sharp fragments of granite, basalt, and other rocks. Although water-laid they are clearly of glacial origin.

Tertiary Stratigraphy of Western Washington and Oregon

Charles E. Weaver, Seattle, Washington

In western Oregon, Washington and southern Vancouver Island more than 20,000 feet of sandstones, shales and conglomerates of Tertiary age and of both marine and continental origin rest unconformably upon older Paleozoic and Mesozoic rocks. These older formations were folded, faulted, uplifted, eroded and beveled to a condition approximately a coastal plain prior to the middle of the Eocene period. During the middle and upper Eocene this surface was slowly and differentially warped downward permitting the easterly transgression of marine waters over its surface to a position approximating that of the Cascade Mountains of Oregon and Washington. It is believed that this plain extended far into Eastern Oregon and Washington and upon its irregular and warped surface localized basins were developed within which continental deposits accumulated. The interfingering of marine and continental deposits lay in a belt on the western side of the Cascades. At the close of the middle Miocene western Washington was subjected to earth movements which uplifted the Olympic Mountains and strongly folded all the pre-upper Miocene formations, into folds trending N 70° W. This surface was strongly eroded and locally submerged during the upper Miocene and lower Pliocene with the accumulation of over 1500 feet of marine sediments. At the close of the Pliocene both Oregon and Washington were subjected to earth disturbances which caused major north and south upwarps to become superimposed upon the older Miocen northwest and southeast structures.

Variations in the Alkaline Content of Acidic Lava

Richard E. Fuller, Seattle, Washington

In southeastern Oregon on the eastern scarp of Steens Mountain, several acidic volcanic vents show, in their glassy margins, the development of spherulites which as a rule occur in inclined bands. Evidence indicates that the formation of these felsitic bands has been induced by the rise of volatiles along lines of flowage. The inconsistent irregularities between the chemical composition of these spherulites and that of the enclosing perlite lead to the detailed study of a rhyolitic flow and vent exposed in the valley of Little Alvord Creek. Since the variations in this instance were small, the results were checked with a series of fifteen chemical analyses. The perlite was found to have retained a relatively constant composition, while the felsite with increased gassing showed principally a progressive loss of both potash and alumina and an enrichment of silica. The other constituents remained approximately constant. The variations appeared to be dependent solely on the local passage of either volatiles or highly mobile solutions. Where free from alteration the felsite differed from the glass only in the hydrous content which was lost on crystallization.

Crickmay, Collin H.

Problems of Cascadia: Geological Society America Proceedings for 1934, p. 73, 1935.

Composition of stratal columns in general is discussed, and peculiarities in Pacific margin of North America is contrasted with those of other better known regions. Pacific columns are abnormally high in limestone and volcanics. Evidences from conglomerates and other coarse sediments in the W. Cordillera show small land masses of continental materials in the intermontane belt, but only volcanic land on the west coast. It is concluded that there never was any one great borderland such as Cascadia has been supposed to be. (Treasher)

Sanborn, Ethel I.

Comstock Flora of Western Oregon: Geological Society Proceedings for 1934, pp. 388-389, 1935.

An Eocene flora of 38 species from R. R. cut N. of Comstock, Douglas County, 20 miles S. of beds where Goshen flora was secured. Is older than Goshen with no species in common. Many species are now living in warmer parts of N & S. America. The Pteridophyte ore represented by an Equisetum and 2 true ferns. Most abundant leaves are those of Cinnomomum dilleri Kn and Lonchocarpus Oregonensis, n. sp. (Treasher)

Schenck, Hubert G. and Turner, F. Earl

Eocene Pleurotomarid from Oregon: Geological Society America Proceedings for 1934, p. 387, 1935.

Collected in an impure limestone west of Dallas, Oregon By Harry E. Wheeler. Beds of Cowlitz age and upper Tejon. Believed to be first and only record of genus Pleurotomaria in the Tertiary deposits of the Pacific Coast of North America. (Treasher)

Modern Mound-Building

American Naturalist
Vol. 12, p. 322
1878

The Tualati tribe of the Kallapuya stock, living near Forest Grove, the

Yamhill tribe formerly occupying the valley now called the Grand Ronde Reserve, Yamhill and Polk counties, Oregon, and probably all the Kalapuya tribes of the Willamette valley are accustomed to invoke the celestial powers by working themselves violently into a state of utter exhaustion. They roam all night without eating, put themselves into a sweat and leap into a cold river, and scale high mountains to see the sun rise. At the appearance of the god of day they exclaim, "O, I am poor! O, I am poor! Make me rich! Make a chief of me!" (The chiefs being the wealthiest men in the tribes.) During the night they throw up with their hands little mounds from three to seven feet long and from twelve to eighteen inches high. Their design is not to conceal property or to bury the dead, but simply to work themselves into a terrible sweat, their exertions occupied five nights, the wandering about without food being kept up during the day. These little hillocks are ever after kept in repair. They are erected principally by girls on their first menstruation, by parents who have lost children, by others after bereavements, and by young people generally who thus expected to obtain riches by dreaming of eagles and other good portents. These tamanowus dreams are regarded very highly among them. (Albert S. Gatschet)

The Diminutive Mounds of Oregon

American Naturalist
Vol. 12, p. 562
1878

The Diminutive Mounds of Oregon Indians alluded to in the May number, page 322, can be seen and investigated at the present day near the former homes and haunts of the several Kallapuya tribes, although the majority of the natives were removed over twenty years ago (shortly after the Government treaty of 1855) to the Grand Ronde Reserve in Yamhill and Polk Counties. The Tualati name for these earthworks is "atudship". Many of them are visible about six miles west of Forest Grove, on the eastern slope of a wooded hill, which slants down towards McCloud's Farm and the track of the narrow gauge railroad. Low elliptic or oblong ditches include four, five, six, or even seven of these rounded parallel moundlets. This location was the ancient home of the Tualati, or, as they call themselves, Atfalati tribe, who derived a portion of their daily food from the "wild potatoes" (or Wapatu in Chinook jargon) growing at the bottom of the neighboring Wapatu Lake. It is the root or bulb of the Sagittaria Sagittifolia and was gathered by the women of the tribe, who caught it between the toes, or by pressing both feet together, and had to stand in water up to the waist all day during the ripening season.

Although the custom of throwing up atudship is gradually disappearing among the Indians on Grand Ronde Reserve, some mounds of this description are still to be seen on a high hill north of the agency buildings. On this mountain top they awaited the rise of the sun after having exerted themselves during the night in carrying up-hill heavy rocks in Sisyphus fashion, and rolling them down again. Other hillocks are thrown up in the hush of night by the female portion of this Indian community, who seem more interested than the males in keeping up this antique custom of their forefathers, on a flat-topped eminence about one mile east from the seat of the Grand Ronde Agency. (A. S. Gatschet)

GEE-OL-O-GEE -- A GEOLOJOKER

With Apologies to the Composer of
"The Man on the Flying Trapeze"

By
DR. ARTHUR C. JONES

1.

There was once a young fellow of promise and pluck,
  He was headed for fame, but he had some bad luck;
Doc' Hodge got him started to studying rock,
  He's a bug now on ge-ol-o-gy.
Oh, his friends have all left him in sorrow
  And his frat pin's in permanent hock,
While he wanders about and you may hear him yell,
  "Come and see what I've found in this rock!"

OH! ----------------

Chorus:

That crazy young man with his ge-ol-o-gees,
He whacks at a pebble and says with a wheeze,
"I think this is granite, or mica, - or cheese."
While his love she has wandered away.

2.

Oh, Davis is mostly consistently late,
  He hurries to catch up but can't keep a date;
Geology trips are his favorite bait
  But he always is given the "razz".
Oh, he talks like a lawyer at bonfires
  And he always is ready for "chuck".
He's a paleontologist, just take my word,
  But you can't find the beat of his luck.

OH! ---------------

Chorus:

That daring young man with his ge-ol-o-gees,
He picks up a fossil and says, "If you please,
This must have been something that lived in the seas,
And I think it's - - - - Ah - Oligocene.

3.

Joe Wimmer's a schemer, he puts it across,
He wished this song on you, and now it's your loss.
He's a mathematician who added a sauce
To his figures with ge-ol-o-gee.
He has worked out equations for shell fish,
And a formula too for the bugs;
He can give you the dope to the forty-ninth power
On the age of Pre-Cambrian slugs.

OH! ------------------

Chorus:

That wearing young man with his ge-ol-o-gees,
He doubts Doctor Hodge's fine spun theories,
He argues his points in the cold winter's breeze
'Till everyone wanders away.

- - - - -

TO THE LADIES

Those gallant geology wives who accompany their husbands on field trips, and take the wheel of the family motor when occasion arises!

At the merest hint Sunday, on the Silver Star trip, that one geologist, (at least) had weakened, and sent back a request for his lady to follow in the car, four women with one accord hastened to the rescue of their spouses and others of the perspiring party who were admittedly grateful for the lift.

Orchids to Mrs. Hodge, Mrs. Holdredge, Mrs. Treasher and the lady from Camas!

THE JUNE 12TH MEETING

When is a topaz not a topaz? When it is a piece of common quartz, as is often true in the case of the "golden topaz," which may be just a bit of citrine quartz masquerading as the genuine stone. The deception may be easily discovered by the weight, as the real topaz is heavier.

The inside story of the zircon reveals this popular stone as a gay deceiver, relying, as many another beauty, upon subtle make-up to enhance its charm. The regal starlight blue zircon is artificially colored, it was explained by Dr. E. W. Lazell in his lecture before the Society Friday evening, June 12th. Zircons are found chiefly in malaria-infested swamps in Siam, and its native tones are orange-red and reddish brown, (Hyacinth), and brownish-yellow, (Jacinth). Subjected to intense heat it becomes colorless, and it is then the secret process of its delicate make-up is applied.

A ruby is a red sapphire, found in Burma. All other colors in this corundum family are called simply sapphires. Montana sapphires range through rainbow tints, and include a chameleon-like member which appears orchid in daylight and green at night.

Tourmalines, though mostly rosy pink, are sometimes green. Found in Mesa Grande, San Diego County, California, tourmalines are becoming increasingly valuable.

Though there are few precious stone in Oregon, tiny topaz and baby zircons are cradled in the black sands along our coast.

Besides Dr. Lazell's exhibit of crystals and semi-precious stones, Tom Carney who is a florist by vocation and a mineralogist by avocation, exhibited a fine collection of cut gems and crystals from all over the world. He cuts and polishes the stones himself. He showed an exquisite cornflower-blue sapphire, a rare jewel from Ceylon. A sparkling emerald green sapphire; a Cape ruby from South Africa; lapis lazuli from Russia; aventurine from Spain; Mexican turquoise; Canadian quartz, flecked with mica, and agates from Newport Beach are included in Mr. Carney's collection.

A dainty Thompsonite from Lake Superior, flat-cut and polished, looks like rose chintz, the chintz "design" being the skeletons of tiny marine animals.

One learns from Mr. Carney that one's prized tiger-eye cameo is petrified asbestos from Nigeria. The truth about its humble origin was somewhat softened, however, as he corroborated our cherished belief that the said tiger-eye, (crocidolite), is responsive to moods, changing from dull to bright and vice versa, in sympathy with its wearer.

Dr. Lazell, in his lecture, traced for the audience the evolution of the diamond-cut from the 17th Century to the modern American brilliant-cut: The lapidary's craft was discussed, as were certain phases of gem characteristics and faceting. He gave a list of books covering the subject: Curious Lore of Precious Stones, Kuntz. Gems of North America, Kuntz. Gems, Krause and Holden. Gems and Decorative Stones, King. Key to Precious Stones. Text books (in German) by Bauer and others.

Both exhibitors claim mineralogy as merely a hobby--but a fascinating one, Dr. Lazell's profession being that of engineer. The Society is indebted to him for a most entertaining talk, and to both men for the beautiful exhibits.

Polly Linden.

SEDIMENTARY AND METAMORPHIC MINERALS

The minerals of this discussion are those which constitute the major part of the sedimentary and metamorphic rocks.

Certain of these minerals have characteristic reactions with acid, such as HCl (hydrochloric acid). WARNING: this acid will not harm the skin but will damage clothing. Care should be taken not to spill acid on clothing or leave spilled acid on table tops where clothing may come in contact with it. Use the acid sparingly. Shake the bottle so that a drop of acid is on the stopper and then touch the stopper to the mineral to be tested. One such test should be sufficient if the test is positive, and needless application of acid to minerals which do not react should be avoided. Do not pour acid on a specimen and do not drop pieces of minerals into the bottles; serious accidents may result.

Description of Sedimentary and Metamorphic Minerals

CALCITE. Usually white or colorless. May be tinted blue, green, brown or red.

Chemical composition: Calcium carbonate, Ca CO_3.

Occurrence: Calcite is a very common mineral, the chief constituent of limestones and marbles. It is also commonly found in veins in almost every kind of rock.

Us: Calcite is used extensively in chemical industries, as a source of lime, in plaster and cement, and as fertilizer; the pure transparent variety is used in optical devices.

DOLOMITE. Commonly white or pink in color.

Chemical compositon: Calcium magnesium carbonate, $CaMg(CO_3)_2$.

Occurrence: Dolomite is the principal constituent of the rock of the same name. It also occurs in crystals which usually show curved faces.

> NOTE: Calcite will effervesce freely when cold dilute hydrochloric acid is applied; dolomite will not. Dolomite will effervesce if it is powdered. These tests serve admirably to distinguish between these minerals. The same test may be used to distinguish limestone from dolomite (rocks).

GYPSUM. Usually white or pink.

Chemical composition: Hydrous calcium sulfate, $CaSO_4 + 2H_2O$.

Occurrence: Gypsum occurs in three distinct forms; massive, as tabular crystals and as fibrous masses.

Use: Gypsum is used chiefly as a source of plaster of paris and in the manufacture of fireproof wall-board.

HALITE. Generally white or colorless.

Chemical composition: Sodium chloride, NaCl--common salt.

Occurrence: Occurs as beds in sedimentary deposits associated with gypsum.

Use: Halite is used as a seasoning in culinary products, as a preservative and for various purposes in chemical industries.

FLUORITE. Commonly purple or blue, more rarely green, yellow or red.

Chemical composition: Calcium fluoride, Ca F_2.

Occurrence: Fluorite commonly occurs as an accessory or gangue mineral in veins with metallic minerals sometimes alone.

Use: Fluorite is used as a flux in the manufacture of steel, in the production of hydrofluoric acid and sometimes for ornamental purposes.

GARNET. Usually red, yellow or brown.

Chemical composition: The garnets are iron, calcium or magnesuim silicates. Almandite, the common red garnet, is an iron aluminum silicate, $Fe_3Al_2(SiO_4)_3$.

Occurrence: Garnet is a metamorphic mineral usually found in schists or gneisses, and sometimes in rocks which result from the metamorphism of limestones adjacent to igneous intrusions (contact metamorphism).

Use: Garnet is used as an abrasive in some "sand papers", and clear colored varieties are used as gems.

TALC. Generally white, silvery white or showing greenish tints.

Chemical composition: A silicate of magnesium, $H_2Mg_3(SiO_3)_4$ or $H_2O \cdot 3MgO \cdot 4SiO_2$.

Occurrence: Talc is a metamorphic mineral commonly found in schists and "soapstone"; when it constitutes the major portion of the rock, the rock is called talc schist.

Use: Talc occurring as soapstone is used to make acid-proof sinks, wash tubs, table tops, etc. Powdered talc is used in toilet powders, as a lubricant and as a filler in paper.

KAOLINITE OR KAOLIN. Generally white.

Chemical composition: $H_4Al_2Si_2O_9 \cdot 2SiO_2$.

Occurrence: Kaolin is the result of decomposition of aluminous silicates, especially feldspar. It is found as residual masses in regions of deep weathering or as transported material in beds. Residual kaolin usually contains quartz grains and sometimes iron oxides.

Use: Pure varieties are used in the namufacture of china and porcelain. Impure clays are used in making pottery, brick and tile.

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REPORT ON REGIONAL PLANNING

The attention of members of the Society is directed to a report on Regional Planning, Part 1 - Pacific Northwest, released by the National Resources Committee in May 1936. The report covers the states of Idaho, Montana, Washington, and Oregon, and gives brief descriptions of the physiography, climatology, water resources, land resources, industries, and population. With regard to geology and mapping, the report states (pp. 61, 63):

"Geology - The inner and outer forces of nature have endowed this region with great areas of mountains and valleys in which are hidden quantities of valuable minerals. These can best be measured, not by what is seen, but in terms of the geologic ore-forming processes which are clearly in evidence. The four principal ore-forming epochs have employed their forces in molding and remolding the earth crust of this region, and in so doing each has produced the conditions which give birth to quantities of valuable ores. Most of these ores lie hidden beneath the surface, but they may be found with the proper kind of exploration technique. There is plenty of visible evidence, however, in the 1,200 known occurrences of 100 different minerals. Gold leads with 350 occurrences, copper has approximately 70, silver 71, lead 69, and zinc has 26. In addition there are the remarkably rich districts which are now being mined.

Discovery and the resultant developments have up to the present time been confined to the genetic and host formations which happened to have been eroded into view. The newer techniques of exploration are based upon this general geological evidence. These will, no doubt, reveal many other very important mineral deposits which could not be found by the older methods of prospecting and exploration.

Production - The four States produce about one-fouth of the Nation's lead, one-third of its silver, one-sixth of its copper, and one-twentieth of its gold. In the non-metallic production, however the region lags far behind the development elsewhere in the Nation, where the former exceeds the metallics in total value. The retardation is due to a number of unfavorable factors such as distance to markets, high freight costs, and lack of demand within the region. With some improvement in these factors there should be a considerable expansion in the production of coal, oil, gas, phosphate, and other nonmetallics. Special mention should be given to the important possibility of producing the light metals from the alumina clays and magnesite deposits which exist in the region. This production appears to be contingent upon the successful application of certain electro-metallurgical processes which will probably be economically practicable with low-cost electrical energy. Research in this field and also in the ferro alloys should go forward as part of the general power problem.

Exploration, Prospecting, Mapping - It is the general view that most, if not all, of the outcropping mineral deposits of the country have been found. This is not true, however, with relation to the base metal deposits of the Pacific Northwest. Here there are immense areas unsurveyed upon which no white man has yet trod; some of these are literally standing on edge, others are covered with timber growth or otherwise present difficulties which have prevented the prospector from carrying out a thorough search. The great Butte discovery included an area less than 25 feet in length and a few feet in width, and the Coeur d'Alene was even less in proportion. Both represent needles found in a haystack.

The haphazard methods of the past have begun to yield diminishing returns. It has become necessary to bring into this work a more intelligent method of discovery and investigation. Fortunately, such methods are at hand.

Aerophotography, topographic and geologic mapping, drillings, geophysical surveys, and metallurgical analyses are the new techniques which will be employed in systematic progression. Thus far not over 10 percent of the mineral area of the Pacific Northwest has been studied in sufficient detail to provide base maps. Not more than 5 percent of the region has been covered in geologic maps of detail and accuracy, sufficient for the needs of exploration work."

This report, 192 pages of text with numerous charts, maps, and graphs is available from the Superintendent of Public Documents, Washington, D. C. for 50 cents.

K. N. P.

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SPIRIT LAKE TRIP - JULY 4TH AND 5TH

Leave Portland 7:00 A.M. from Old Post Office Building, July 4th.

To Castle Rock, Washington, 70 miles. Meet at Texaco Service Station at 9:30 A.M. Have a full tank of gas, oil, and water.

Trip Distances	Trip Distances
Castle Rock. (speedometer reading)	0.0
Leave Pacific Hwy., turn right	0.6
Turn right	2.7
Silver Lake, famous bassfishing	6.7
Silver Lake, upper end (take road straight ahead	9.3
Turn left	11.3
First stop,	11.8
Toutle River, Coal-Bank Bridge	12.2
North Fork of Toutle on right. We follow this fork from now on	13.3
Toutle River crossing	18.5
Gravel Deposit, Stop	19.0
Toutle Crossing	21.1
Toutle Crossing	21.9
Weyerhaeuser Camp # 502, Green River enters Toutle at this point.	22.0
Gravel Deposit, Stop	22.2
Gravel Deposit, elevation 900', Stop	23.5
Toutle Crossing (St. Helens Bridge)	25.4
Hoffstatt Creek (Area from here on to Spirit Lake washed out during the big flood of 1933)	26.4
Cliff & Old Prospect, Stop	35.3
Elk Creek	35.9
"9 Mile Bridge" If detour sign is up, cross to the other side of the river at this point	37.5
Spirit Lake	48.0

Personal Equipment Stout clothing and shoes. If it looks like rain, rain clothes will not be amiss.

Timberline Camp If the road is open so that cars can drive to Timberline, thereis a camping spot there. You will need an axe, shovel and waterbucket and a fire permit to camp there.

We will eat lunch at a convenient point. Arrive Spirit Lake about 5 P.M. Make camp. Organize at 7 P.M. for trip to Coe's Mine. Stop on way back at Harmony Falls for evening fire program. Jack Nelson will give us the history of the "Spirit Lake Apes".

July 5th. Trip to Timberline to study the glacial deposits and recent volcanism, physiography and general features of this area. The "tree wells" will also be observed. Party will break up at 3 P.M. and return to Portland.

Camping facilities. The Forest Service has an improved campground near the outlet. Take usual camping equipment, plenty of bedding. A quantity of dry kindling will not be amiss, and a good two-fisted axe will be a help. Resort accomodations at Spirit Lake Lodge, Harry Truman Prop., located alongside of campground. Cabins run about $2.50 for two. Harmony Falls Park, Jack Neson, Manager has cabins. Rates here are $2.50 for two, 50¢ additional for each additional person. Includes bedding cooking utensils and row boat. Mr. Nelson will allow tents to be pitched on his site for $1.00 per tent, plus 25¢ transportation charges,each way, across the Lake. Anyone wishing reservations should make them immediately as the place is usually filled over the holidays. In any case it would be wise to include camping equipment, just in case.

Fire Season The fire season is officially open. Forest rules request No Smoking While Traveling. This means that whenever you are in motion, in auto, horseback, or on foot, there is to be no smoking. This rule is enforced and our cooperation is asked. Please leave your firecrackers home. They are dangerous in the wood.

THE GEOLOGICAL NEWS LETTER

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of the

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LECTURES

July 24, 1936 (Friday) - Claire Holdredge - Diamond Mining in Africa.

Aug. 14, 1936 (Friday) - F. P. Keen, Entomologist, U. S. Forest Service - Climate During Last 800 Years as shown by Tree Rings.

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TRIPS

MOLALLA TRIP - JULY 26TH, 1936

The trip to Molalla on Sunday July 26th will be somewhat different from some of our other trips in this respect: fewer places are to be visited so that we shall not spend the day driving but shall have plenty of time to really examine a find.

On this trip we shall study some rather interesting clay beds; the clay from one bed having been worked up into a rather fine pottery. Also we shall see some railroad cuts showing exposed coal seams. In one of these cuts some very good prints of leaves, ferns and grasses have been found embedded in the clay.

Some large bones and teeth have been unearthed in this vicinity and we shall visit one farm and examine the spot and depth at which the specimens were located.

We are to leave 6th & Yamhill Sts. at 8:00 A.M. driving out over the 17th Street Highway to Oregon City and then on to Molalla where we start on our real trip. Total driving distance is about 90 miles.

HARRY CLARK - LEADER

Aug. 8-9, 1936 (Sat. & Sun.)	-	Wheeler, Neakahnie Mountain and Arch Cape Leader: Harry Jennison.
Aug. 23, 1936 (Sunday)	-	Upper Clackamas River Leader: Clarence Phillips.
Sept. 5-6-7, 1936 (Sat. Sun. Mon.)	-	Mt. Adams and vicinity Leader: Ray Treasher.
Sept. 27, 1936 (Sunday)	-	Mt. Hood buried forests and Little Crater Lake, etc. Leader: J. R. Collins.
Oct. 10-11, 1936 (Sat. & Sun.)	-	North and South sides of Lower Columbia River Leader: Claire Holdredge.
Oct. 25, 1936 (Sunday)	-	Eagle Creek Leader: Joseph Wimmer.

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SPECIAL NOTICE

This issue of the Bulletin is late -

Material submitted for publication was scarcely on the Editor's desk at the time we were to go to press.

We need more news items about activities of our members.

Joseph Wimmer and R. R. Poppleton are treading the "hot sands" of the Shrine Convention at Seattle this week.

Dr. Solon Shedd was a guest at the Thursday noonday luncheon of the Geological Society. Dr. Shedd was formerly State Geologist of Washington and head of the Department of Geology at Washington State College at Pullman. At present he is affiliated with Stanford University. He has an extensive series of publications on Washington Geology and has just completed and exceedingly fine bibliography of California Geology. He is also "author" of the relief map of Oregon on display in the Portland Public Library.

We quote the following from a letter received from Mr. Guy E. Mitchell, Librarian of Geological Survey at Washington, D. C.:

" In reply to your letter of June 17th I am very much obliged to you for sending the little bulletins of your very live young society. I am glad to have them, and assure you that I shall be glad to have future issues, and to keep the file of the same.
I hope you will send them."

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REPORT OF OUR FIELD TRIP ON JUNE 14TH

EAST FORK OF THE LEWIS RIVER

When Joe Wimmer says "seven o'clock", he means seven o'clock. Thus began our excursion into the little known area of the East Fork of the Lewis River, in

Washington. No detailed work has been done in this area and we were looking forward with considerable anticipation to what we might find.

Through Vancouver, to Battleground, and then towards Yacolt. Between Heisson and Moulton, Joe called the first stop to examine a road cut in heavy tuffaceous agglomerate. Certain portions had spheroidal weathering and it took close inspection to prove to many of us that the deposit was a tuffaceous sandstone and agglomerate instead of an igneous rock. Fragments of wood were visible, and a few fair sized chunks, and limbs were found. Secondary Crystals of what appeared to be gypsum were located, which on closer inspection proved to be zeolites, of a platy nature, probably belonging to the Phillipsite group. Mr. Holdredge introduced the subject of river terraces at this point. We could see several of them above the river level, remarkably well defined. It was pointed out that these terraces were continuous along the river and appeared as level benches which the eye could follow for considerable distance. Some of them were undoubtedly erosional. Some may have been caused by intracanyon lava flows, but they bear a critical relationship to the physiographic history of the area. Dr. Hodge pointed out a rock defended terrace to the group, and explained the origin of such a feature.

Another short stop was made a bit farther up the road, just before we left the Battleground-Yacolt highway. This place was the head of the Yacolt Valley. Mr. Holdredge wished us to make a note of this locality, which would be explained later.

Then someone said something about a placer mine and eyes began to glitter. Verily, all is not gold that glitters. A short, steep, slithering descent to the river level brought us to a placer mine which is about to begin operations. A high bar, extending probably 15 feet above river level has been thoroughly prospected and test pitted, and enough colors were found to prove to the owners that it would be feasible to install sluices and begin operations. Mr. Bishop explained the operation of the sluices and method of mining. We missed Vance and Simon, and there they were squatted at the edge of the river, industriously twirling gold pans, which they seemed to have produced from thin air. Excitement was high, when a few colors showed in the black sand, and it is easy to see how the lure of gold gets into the blood. There is something thrilling about it, even to the old-timers.

Back up at the cars, Mr. Holdredge called our attention to the Yacolt Valley which lay to our right. The valley fill appeared to match one of the terraces in the East Fork. That and other considerations led to the conclusion that at one time the East Fork flowed through the Yacolt country and thence to meet the North Fork. Something happened, which caused the East Fork to swing southward, abandon itsbroad flood plain, and cut a narrow defile in a gorge to the southward. This feature may be one of the critical points in solving the physiographic history of the area.

He also called our attention to Silver Star Peak with a gentle southward slope and steep northward slope, indicated southward dipping beds or flows. The peak, itself, is composed of andesite, so these "beds" are really southward dipping flows. Mr. Holdredge's investigations indicate that from the Washougal River to the North Fork of the Lewis River, these andesite flows and tuffs and agglomerates all appear to dip southward, under the Coriba surface and also under the Warrendale (Eagle Creek). Projecting these dipping beds give an estimate thickness of at least 20,000 feet, or nearly 4 miles for these early volcanics. This figure, however, should be used with caution as detailed investigation may show faulting which reproduces these beds.

The feature next on the docket was a deposit of "gravel" a short distance up the road. Here were large boulders, averaging a foot in diameter, composed of granatoid and fine grained rock, in an arkosic matrix, looking a great deal like a glacial deposit. A hurried examination showed that the boulders were deeply weathered, more so than any we had seen, or were to see during the day. No evidence of actual glaciation could be discerned. Dr. Hodge pointed out that this may correlate with some of the early stages of glacial outwash and probably had its origin farther up this valley.

Our leader continued on up the valley, to the Sunset Guard Station, where a halt was called. From here on we were going to do our geology, as geology should be done, on foot. Do you suppose that the jarring of heels on hard rock has some stimulating effect on the brain? The area from here on to the end of the trip was a maze of igneous rocks. We had noticed granatoid float along the stream and in the bars and were now going to meet it first hand. First of all, there was a dike of a dark, fine-grained igneous rock, cutting a lighter colored andesite (?), the dike beautifully exposed. Farther on was our first association with the coarser grained rock. A large outcrop with a tabular fracture was taken in hand. The rock was light colored and may be quartz-diorite or a kiorite, and some evidence of contact alteration was noted. It was suggested that this might be an intrusion and the group was asked to look particularly for evidence of contact alteration during the day.

As we dropped down into Slide Creek, the highway cut on our left showed an interesting succession of intrusions into an agglomerate, with plenty of evidence of contact alteration. We ate our lunch at Slide Creek, some of us sitting on a beautiful agglomerate, cut by dikes of andesite. These dikes seemed to occupy joint planes, and later we noted that the joint pattern actually did correspond to the dike pattern. It was in such an area where the word "dike" for this feature came into existence.

We had been told that there was a pegmatite nearby, but when we got to the locality, at the mouth of Slide Creek, we found no pegmatite. But we did find a beautiful porphyry. Large crystals of plagioclase feldspar, probably andesine, up to an inch across, were enclosed in an andesitic groundmass. This was a most unusual rock for this country. Dr. Hodge explained the origin of such a rock, that the feldspar crystals had grown to considerable size in the fluid melt, then some change came about and the fluid and the crystals (phenocrysts) were squeezed nearer the surface, where the liquid cooled rapidly, causing a fine groundmass. The outcrops close to the river were beautifully smoothed and potholed. When the party attempted to collect specimens, they discovered that Nature had different ideas. The rock was tough and resisting, and only with extreme diligence and mighty swinging hammers could any sort of specimens be obtained. A brief search was made for the contact with the agglomerate, but it happens that Slide Creek was looking for the same thing, and now nicely occupies the contact at this point.

From here on, the journey was entirely on foot. And the sun was hot. So was our enthusiasm. A succession of exposures gave glimpses of the granatoid rock, andesites, dikes, intrusions, agglomerates, all wrapped in one seemingly unsolvable puzzle. It is the kind of country that would be to a petrographer what a rich fossil locality is to the paleontologist. Excellent spheroidal weathering in the coarse grained rock was observed, so characteristic of this type of material. Segregations of darker minerals were pointed out at another spot. Farther on there was a striking example of low angle faulting. Considerable discussion arose as to what moved which way. The shear zone was plainly visible. Just beyond this area of faulting, was an exposure of banded tuff, portions of which were hardened to the condition known as hornfels. Many of the group were overheard to mention that they had read about dikes and thought they knew what they were, but now they knew they knew. These dikes could be traced down the near slope, into the road cut, in the bed of the East Fork, across the river and up the other side. Several isolate pedestals were erosionremmants of these dikes. Our exploration stopped at Little Creek, where we stopped for a brief rest in the cool shade, but no sooner were we comfortable than Joe began tooting that whistle and rousing the gang to action. The Mutiny of Little Creek was staged for a few moments, but we rolled out and followed our leader back toward the cars. A bright spot on the return trip was the appearance of several of our cars, driven by a few thoughtful wives who had not gone on the hike. These cars were quickly filled, and more than one sigh of relief went up as weight was removed from aching "dogs" and fevered brows were tucked in the cool, under cover of the car tops.

Thunder heads (cumulus clouds) had been in evidence all day, and by now the western sky was very black. Joining our cars at Slide Creek we started back, and made a short side trip to a granite quarry, where the rock had been quarried for structural purposes. Thunder rumbled and a few scattered drops of rain came pattering down. We hurried back to the cars and got under cover just as one of the most vicious thunder squalls struck us. The heavens seemed to dump millions of gallons of water on us, and we received some very good impressions of just what erosion really meant as the road became running streams of muddy water. Two more stops were planned, but were called off "on account of rain". We are still waiting for Mr. Holdredge's explanation of terraces at the head of Yacolt Valley.

We had seen a great variety of new features, a new country to most of us, and a country as yet unexplored geologically. A fertile field for an interested group. It is an easy country to get into, and nice to work from the geologist's standpoint because the recent "burn" has exposed many outcrops. Thanks again Joe Wimmer and Claire Holdredge for a well planned and organized trip.

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GEOLOGIST SEES OIL PROSPECTS IN WASHINGTON AND OREGON AREAS

Holdredge, Claire Parker   California Oil World - February, 1936

During the past four years the writer has been roaming the hills and valleys of the northwest, meeting here and there one of the few members of the geological fraternity. Many times the talk has turned to oil and the possibilities discussed pro and con. The northwest is large and the geology is highly variable and it is a large task to obtain a comprehensive idea of it. However, as the tangled skein is unraveled by the small handful of us who are making a serious attempt at it, definite ideas have taken shape.

As far as is known, no widespread search, no critical comprehensive survey of the northwest has been made by competent and experienced oil geologists in recent years. It is true that reconnaisances were made several years ago when the portion of the state that had been mapped and studied was very limited and when the deepest producing wells in the world were little more than half the depth of the deepest producer at the present time. In those days large portions of the country were remote from railroads and highways, could be reached only on foot or over the poorest roads, and were practically isolated for long periods each year.

Since then large areas have been studied and mapped largely in the interest of pure science and the results either published or on file in the libraries of various institutions and intermittently comparatively small areas have been more carefully examined by geologists in the employ of various oil companies. Occasionally, under the stimulus of large acreage and favorable terms, some serious and intelligent drilling has been done. However it seems safe to say that more drilling has been done in utterly hopeless locations in any of the large oil producing areas, each year since 1925, than has ever before been done altogether in the northwest.

Whenever the northwest has been discussed in oil circles in the past, the cry has been that there were too many volcanic intrusives and that the heat from them had destroyed the oil. This statement is only true of the granitic intrusives, most of which are Jurassic or older and there are wide areas so far from these as to have been entirely unaffected by them. As proof of this, Jurassic and older rocks in certain parts of Oregon yield an abundant and well preserved marine fauna.

The objection also is raised that much of the area unaffected by granitic rocks has been adversely affected by later intrusives. These later intrusives are all Tertiary in age. They are largely basic or near basic with a low melting point and very slow cooling. They are predominantly extrusives and the feeders, from my own observations as well as from those of others, are not only smaller but also fewer than is ordinarily claimed. Where the feeder dikes are exposed the alteration in adjacent rocks, both volcanics and sediments, rarely extends more than 100 ft. laterally and usually much less. Thus these dikes may be a blessing instead of a curse for they may form favorable structures for the accumulation of oil.

The question of source rocks arises, naturally, and can be answered affirmatively. The wide areas unaffected by the granitic intrusions are largely underlain by later Paleozoic and early and middle Mesozoic marine sediments known to contain petroliferous rocks in places. The cretaceous sea, from what we know of the paleogeography of that period, covered large portions of the northwest and while the known outcrops are perhaps largely marginal sandstones, it seems reasonable to assume that farther seaward finer grained sediments, high in organic matter, are present.

Favorable structures for the accumulation of oil are abundant in areas where other favorable conditions occur. Large anticlines can be traced for many miles and the strange thing is that the Tertiary intrusives seem to have a habit of avoiding the anticlines in favor of the synclines. Some of thse anticlines have been eroded so deeply that it seems likely that even pre-Jurassic marine sediments may be within reach of the drill. Structures of this sort are to be found in localities known to have been studiously avoided by the earlier workers in this area.

Most of the serious drilling attempts have been in areas underlain by marine Tertiary sediments in western Washington and none of these have been indifferently and unintelligently located and have been very shallow.

Now that the northwest is blessed with an excellent system of good highways and modern communication facilities, that the completion of the Bonneville and Grand Coulee projects promises to attract larger industrial development and a denser population, that a handful of serious workers have unraveled many of the facts of its geological environment, and that modern drilling and production methods have made it possible to explore for and produce oil from depths of more than two miles, the time appears to be ripe for a more careful and detailed study of the possibilities for commercial deposits of petroleum in this region.

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SADDLE MOUNTAIN

BY

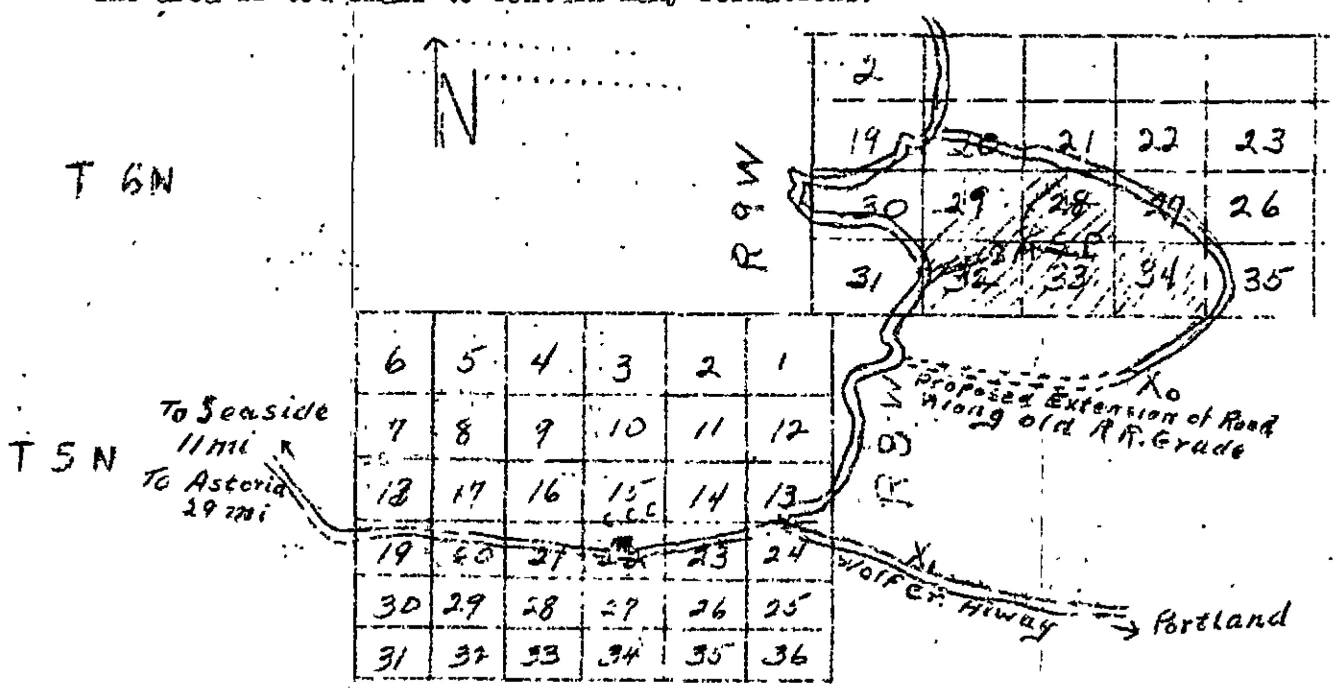
ROBERT LAYFIELD

The Park proper has poor exposures, few, highly weathered, very little structure showing. The only good bare rock is that of the mountain, a pile of basaltic breccia with palogonitic cementing cut by beautiful dikes that stand up 10 to 50 feet from differential erosion. They are from 3 to 10 or so feet in thickness. There are several trails up the mountain that cross and recross these dikes. Difficulty has been encountered in tracing the dikes from top to bottom of the mountain. A lookout station is at the top. On a beautiful clear day Rainier, St Helens, Adams, Hood, and Jefferson Mountains stand out perfectly. Three Sisters also can be seen with glasses.

Saddle Mt. is 3266 ft. next highest to Marys Pk. in the Coast Range. It is a 1600 ft. climb. Dana on the "Explorer" expedition called Saddle Mt. a volcanic neck. Washburne says the same, and I'm practically convinced that's right. Saddle and Humbug Mt. (few miles south) have been fissure flows under water with Saddle Mt. peak as the main center of extrusion. All around the mountain are mica clay shales and just plain yellow brown mica clay causing every inch of road in the area the necessity of having about 2 ft. of rock ballast.

In spots where I have marked on the sketch (X) are the only fossil exposures I've found. Xo A gray blue shale with few pelecypods and X1 a gray blue clay interbedded with basalt flows containing numerous foraminifera (about 6 or 7 different genera). I'm not sure of what their names are but from lithologic character and sandy layers at the top I'm suspecting it to be upper Astoria (Lower Miocene). Not sure yet but I expect the extrusions of Saddle Mt. to be Middle or Upper Miocene. Have found some erosional unconformities at the base of the basalts. I have not been able to cover enough country yet to make any guess as to regional diastrophism.

The area is too small to contain many formations.



EARTH HISTORY - CHRONOLOGY AND LIFE

As the term implies, Earth History deals with the evolution of Earth structures and organisms, that is, it is the history of the Earth (rocks, animals, and plants) arranged in chronological order.

Geologic time is measurable in hundreds of millions of years and during this vast lapse of time there has been an accumulation of rocks whose relative ages are revealed largely by the Law of Superposition. Many of the bedded or stratified sedimentary rocks contain the remains of animals and plants which lived at the time of the deposition of those rocks. Accordingly, the succession of life upon the Earth is revealed in the study of the fossils contained in the successive strata. These two principles, viz.: (1) succession of rocks, and (2) successions of fossils, form the basis upon which chronologic Earth History is built.

Since the beds of sedimentary deposits are built up layer by layer, each succeeding stratum is younger than the one just below and older than the one just above, unless severe deformation has destroyed the normal order. To the original and normal sequence of strata from older to younger, the term Stratigraphic Sequence is applied.

The relation of a bed of rock to the one above or the one below is known as its relative age. The age of a bed of rock may be considered from the point of view of the place it holds in the geologic time scale or from the point of view of its actual age in years. It has been found necessary to have a universal time scale for the rock formations of the entire Earth and accordingly its use is now standard by geologists in all countries. Just as there are convenient subdivisions of human history, so there are certain natural subdivisions of geologic history, or time, and the different kinds of rocks and rock structures can be referred to their respective geologic time positions. The equivalent subdivisions of the time scale and the rock scale are as follows:

TIME SCALE	ROCK SCALE
Era	Sequence
Period	System
Epoch	Series
Age	Group
Stage	Formation
Substage	Member

The geologic age of rocks is much more difficult to determine than their relative age. Fossils must be identified or, in the absence of fossils, the ages of the rocks can be determined only by correlation with other beds of which the geologic age has been established. There is no region known where a complete geologic section can be found. To offset this handicap, data are gathered from various places and then assembled in their true order so as to make a complete and accurate record. What is missing in one section, and represented by an erosional unconformity, may occur in another section. Beds may be overturned or faulted so that older rocks rest upon younger ones. Again through erosion a rock formation may be represented only by isolated patches many miles apart. Sometimes a formation varies greatly from place to place in its lithologic character, that is, in the mineral composition and texture as well as in external appearance. Such difficulties must be met constantly by the geologist, but the greatest aid in solving them usually is given by the fossils, if present in the rocks.

The following table with the divisions of geologic time is given for the convenience of the student. It presents, in tabulated form, the main subdivisions of geologic time. It is understood that complete agreement in both subdivisions and nomenclature has not yet been attained by geologists.

DIVISIONS OF GEOLOGIC TIME

Eras	Periods	Physical Features	Biologic Features	Ages	
CENOZOIC	Quaternary	Cascadian revolution Periodic glaciations	Dominance of man Extinction of large mammals	Age of modern seed plants	Age of mammals
	Tertiary	Great orogenic and volcanic activity	Beginning of man Culmination of mammals Rise of modern floras		
MESOZOIC	Cretaceous	Laramide revolution Widespread deposition of chalk	Extinction of dinosaurs, pterodactyls, toothed birds, and ammonites Expansion of flowering plants and modern insects		Age of reptiles and ammonites
	Jurassic	Widespread diastrophism and erosion	Culmination of ammonites Rise of toothed birds Expansion of primitive mammals	Age of ancient seed plants	
	Triassic	Palisade disturbance	Rise of dinosaurs, pterodactyls, marine reptiles, and primitive mammals Spread of cycads and conifers		
PALEOZOIC	Permian	Appalachian revolution Periodic and widespread glaciations in southern hemisphere Extensive salt deposits	Expansion of primitive insects and amphibians Rise of primitive reptiles Extinction of trilobites and Paleozoic corals		Age of amphibians
	Pennsylvanian	Warm, humid climate with extensive coal-making	Spread of amphibians Dominance of spore-bearing plants	Age of spore bearing plants	
	Mississippian	Local orogeny and diastrophism	Spread of ancient sharks Culmination of crinoids		
	Devonian	Acadian disturbance	Rise of land plants and first spread of forests Rise of fishes and amphibians		Age of fish
	Silurian	Caledonian revolution Extensive salt deposition	Rise of air-breathing invertebrates First known occurrence of land plants Abundant brachiopods and reef corals		Age of invertebrates

DIVISIONS OF GEOLOGIC TIME (Continued)

Eras	Periods	Physical Features	Biologic Features	Ages	
PALEOZOIC	Ordovician	Taconic disturbance Extensive marine transgression	Culmination of trilobites First appearance of fish-like invertebrates	Age of marine plants	Age of invertebrates
	Cambrian	Green Mountains disturbance	Rise of shell-bearing molluses Dominance of trilobites First abundant invertebrate fossils		
PROTEROZOIC	Keweenawan	Killarney revolution			Rise of invertebrates
	Huronian	Iron and copper deposits Glaciation	Primitive marine life		
ARCHEOZOIC	Timiskamingian	Laurentian revolution	Oldest known life or indirect evidence of life		
	Keewatin				

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LATE PLEISTOCENE TOPOGRAPHIC CORRELATIONS ON THE PACIFIC COAST

By Ira S. Allison, Corvallis, Oregon.

The Vashon glacial outwash deposits in Chehalis River Valley, Washington, and the Spokane deposits in Willamette, Walla Walla, Yakima and certain other valleys tributary to Columbia River, form extensive well developed paired terraces between which a later, lower surface of alluviation has been developed. The later surface, tentatively called the Chehalis surface, is typically a low terrace, not a recent floodplain, although parts of it are channeled by flood sloughs and are subject to destructive overflow. As the youthful soils (e.g. Chehalis soil series) lying on it do not show a good profile of weathering, they have been classed as Recent in soil surveys, but the deposits probably were originally valley-trains (or correlative filling in non-glaciated valleys) of a weak, late Pleistocene stage of glaciation. The Vashon and Spokane surfaces, both definitely glacial, belong to a stage of alluviation next older that the Chehalis surface, and are assigned to the same glacial stage.

The Vashon-Chehalis sequence of the Puget Sound area, the Spokane "late Wisconsin" glacial sequence of eastern Washington, and corresponding stages of alluviation along Columbia River and its tributaries resemble the strong-weak, Tahoe-Tioga sequence of glaciation in the Sierra Nevada of California. Similar terraces along certain California Streams may also be equivalent.

This late Pleistocene chronology, based on physiographic studies should be especially useful in dating mammalian fossils within its range.

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POSTULATED PENEPLANATION IN CENTRAL WASHINGTON

By John P. Buwalda, Pasadena, California

The Yakima region is underlain by Columbia River basalts and overlying Ellensburg sediments, folded together into east-west anticlinal ridges and much wider syniclinal valleys.

The geomorphic history as interpreted by George Otis Smith in Professional Paper 19 included post-Ellensburg folding, Pliocene peneplanation, and further folding creating present day (hence second generation) ridges and valleys. Supposed peneplanation of the Cascade Range was dated from the Yakima area.

Evidence presented for peneplanation consisted of smooth supposedly bevelled surfaces on crests and flanks of such basaltic ridges as Cleman Mountain and across both basalt and sediments at one locality, Kelly Hollow; and supposed intrenched meanders of Yakima River between Yakimaand Ellensburg.

The writer's interpretation is that the smooth basaltic crests and flanks mapped by Smith on Plate 5 are not bevelled but structural surfaces (dip slopes), locally lowered on the crests by recent stripping to an underlying basaltic layer. The supposed peneplane remnant at Kelly Hollow was cut across a small thickness of basalt in the present cycle by tributaries graded to the existing but slightly higher Wenas Creek. Smooth bevelling surfaces on Ellensburg sediments in valleys are roughly graded to present drainage lines and commonly meet basaltic dip slopes at sharp definite angles. The supposed meander pattern in Yakima Canyon may merely indicate structural control. If true meanders, they are as logically referable to the original surface of Ellensburg aggradation as to a postulated peneplane surface.

Present physiographic knowledge of the Yakima region points to a single cycle of post-lower Pliocene deformation and degradation, without peneplanation.

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TILTING OF GREAT LAKES SOUTHWARD

SCIENCE - Supplement, Science News Service v. 83, no. 2149, March 6, 1936. page "14".

Article is taken from the new issue of the Military Engineer by Captain H. V. Canan who says that the region about the Great Lakes is tilting about a "hinge line" which roughly is in the direction of 20 degreees west of north. This tilt is generally improving conditions in harbors on the American side of the Great Lakes. The action is material rather than merely of scientific interest and amounts to as much as 0.3 feet in some harbors. This uplift also affects the flow and the flow equations in the connecting rivers of the Great Lakes. Tilt has also been a factor in decreasing the available depths over the sills of the locks at Sault Ste. Marie, Michigan. Reports indicate that in 1860, North Bay, Wisconsin was an important harbor for schooner navigation. Adjoining a rock ledge, old ring bolts used for mooring these boats can still be found. Correcting the present charts for the stage of 1860, only about 3 feet of water would have been available. This loss of depth can only be attributed to earth tilt. In the future the danger of the lakes draining down the

St. Lawrence through failure of the outlet plugs, is not as great as is the draining above Niagara down the Mississippi system. But there is little danger of losing the vast investment by the United States and Canada on the Great Lakes. The generally accepted explanation for the land tilt on a line passing through the Great Lakes is that the land to the north, in Canada, is still rising from the enormous squeezing which it received during the last Ice Age.

(Treasher)

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Callaghan, Eugene and Buddington, A. F.

Metalliferous Mineral Deposits of the Cascade Range in Oregon: U. S. Geological Survey, unpublished manuscript.

There are 11 mineralized areas extending through the Western Cascades region of Tertiary volcanic rocks. Starting at the north these areas are: Cheney Creek area 14.5 miles S. W. of Mt. Hood, Clackamas County, North Santiam district in Clackamas and Marion Counties, the Quartzville district in Linn county, the Blue River district in Linn and Lane Counties, the Fall Creek and Oakridge areas and Bohemia district in Lane County, the Zinc area in Douglas County, and the Buzzard, Climax and Barron areas in Jackson County. The writers report native copper in Jackson County and manganese in the same county. The quicksilver deposits have been treated in another report. Six of the areas, North Santiam, Quartzville, Blue River, Bohemia, Buzzard and Barron have produced a total of about $1,000,000. The deposits are of probable Miocene age. Some of the veins are nearly a mile long. The vein matter is altered brecciated rock cemented with minor minerals. Most of the sulfides contain a little gold and silver, the recovery being made from weathered vein material. The Bohemia is the largest district, producing about 2|3 of the total output of this region. Some of the areas, as the Cheney Creek, are small and will probably not be mined to any extent. The native copper at the Grand Cove prospect occurs in a breccia between lava flows, only a small amount has been found. Areas other than the Bohemia are small producers and no great future is seen for them.

(Ray Treasher)

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Ross, Clyde, P.

The Geology and Ore Deposits of a Part of the Wallowa Mountains, Oregon: U. S. Geological Survey, unpublished manuscript.

A geologic map of this area, covering about 460 square miles, was made in 1921, covering the Wallowa Mountains near Cornucopia. The mines were examined in 1924. Permian lava and pyroclastic beds with sedimentary rocks of shallow water origin are found in the high mountains. On the Paleozoics, rests Upper Triassic limestones, unconformably. Younger Mesozoic strata of sedimentary origin overlie the Triassic. Intrusions of granodiorite have metamorphosed the stratified rocks and the ore deposits are related to these intrusions. Cretaceous age is suggested for the disturbance. The Columbia River basalt overlies the surrounding high mountains. The pre-tertiaries are folded and faulted, overturned fans folds are conspicuous. At Cornucopia, the ore deposits are mainly gold-quartz veins. The lode mines have produced about $4,000,000 from 1885 to 1924. There has been considerable placer mining on nearby streams. Some copper and other metals lie west of Cornucopia. At the Cornucopia it is suggested that additional ore bodies may be found at lower levels. The properties have been inactive with little commercial ore in sight. (Note: recently the Cornucopia has re-opened)

(Ray C. Treasher)

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Gilluly, James

Baker Quadrangle, Oregon: U. S. Geological Survey, unpublished manuscript.

The economic geology of this area is given in U. S. G. S. Bulletin 846-A by Gilluly, Reed and Park. This manuscript reported here contains nothing essential in addition. The 5 districts where mining has been carried on are: Keating district, copper and gold (described in Bulletin 830-A), the Virtue district, gold, antimony and tungsten, (see Bulletin 846-A, pp. 71-79), the Pleasant Valley district, manganese, (see Bulletin 725 by Pardee), the Baker district, gold, (see Bulletin 846-A, pp. 80-85), the Bridgeport District, gold placers on Burnt River. Information on these various districts can be obtained from the Bulletins mentioned.

(Ray C. Treasher)

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Moore, Bernard N.

Nonmetallic Mineral Resources of Eastern Oregon: U. S. Department of the Interior, Memorandum for the Press, Release for August 26, 1932.

This study was carried on in 1930 by Ralph W. Richards and Bernard N. Moore and continued in 1931 by Moore. This work was done in cooperation with the Oregon State Mining Board, and as a complete report can not be published for some time, the principal results are summarized, and location of the deposits is shown on the attached map. Among the minerals conspicuously lacking are gypsum and high-silica sands. The gypsum deposit opened at Gypsum passed into anhydrite and was abandoned. Asbestos was found on Pine Creek, Baker County, about 36 miles south of Baker which appears to be suitable for some uses. Diatomaceous earth is found at Terrebonne, and at Harper and in Otis Basin. Much of the best material in this district is controlled by the Pacific Diatom Co. These deposits show promise. Limestone is found in commercial quantities in eastern Oregon in Baker and Wallowa Counties. In some places it approximates marble. 11 deposits were visited and described. Total thickness is 500 feet. Describes occurrences near Enterprise and on Connor Creek in Baker County. Pumice occurs in large quantities in Deschutes and Klamath Counties. Two of these sheets had their origin in old Mt. Mazama. Newbery Crater accounts for another. The material from Newberry Crater is comparable to that imported from Italy. So far as known, no development of it has taken place. The map shows location of the areas and numbered localities.

(Ray C. Treasher)

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THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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LECTURES

Aug. 14, 1936 (Friday) - F. P. Keen, Entomologist, U. S. Forest Service - Climate during last 800 years as shown by tree rings.

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TRIPS

Aug. 8-9, 1936 (Sat. & Sun.) - Wheeler, Neakahnie Mountain and Arch Cape
Leader: Harry Jennison.

Aug. 23, 1936 (Sunday) - Upper Clackamas River
Leader: Clarence Phillips.

Sept. 5-6-7, 1936 (Sat. Sun. Mon.) - Mt. Adams and vicinity
Leader: Ray Treasher.

Sept. 27, 1936 (Sunday) - Mt. Hood buried forests and Little Crater Lake, etc.
Leader: J. R. Collins.

Oct. 10-11, 1936 (Sat. & Sun.) - North and South sides of Lower Columbia River
Leader: Claire Holdredge.

Oct. 25, 1936 (Sunday) - Eagle Creek
Leader: Joseph Wimmer.

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SOMEWHAT PERSONAL

A. D. Vance is spending a couple of weeks at Otter Rock hunting "pectens". We understand during the period of this vacation all Shell Oil Stations have been advised to watch their signs.

Dr. Bahrs is at Corvallis doing some work in the Zoology Department.

Louis E. Oberson is spending the summer at Mabton, Washington.

H. F. Travis is at Cannon Beach for the summer.

Miss Margaret Bowie is now on a two weeks trip to southeastern Alaska.

F. L. Davis addressed the Service Group at a dinner meeting in Hilaire's Restaurant on Monday evening July 13th. Geology of Oregon was the subject of his talk.

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The following was taken from the editorial page of the New York Times, June 7, 1936..........

GLASS BONES FROM MARROW

Experimentation is the very essense of science. Even the astrophysicists whose life work it is to tell us how remote stars are constituted cannot dispense with it. They create in terrestrial laboratories that probably prevails in the sun and on the planets, and make the necessary inferences.

If medicine is still in backward state it is because of the limitations imposed by living organisms. A rat cannot be picked apart like a watch and put together. What actually happens internally when a vitamin and hormone are administered, or how a degenerative disease progresses is largely a matter of conjecture. The methods of the physicist have been so dramatically successful that the physicians were bound to adopt them--in other words, to keep parts of the human body alive in glass and to study them in disease and health exactly as if they were the gears and rods of an engine. The latest and most dramatically successful advance in this direction is recorded in the Journal of the American Medical Association by Dr. Edwin E. Osgood, and Mr. Alfred N. Muscovitz. Thanks to a machine which reminds one faintly of Colonel Lindbergh's mechanical heart, but which is a combined artificial lung, kidney and circulatory system, it is possible to keep human marrow alive outside of the body to watch it grow as it is fed and to note the manner in which it perishes, when disease attacks it. No royal baby is more carefully nursed. It is fed with delicate food, it is bathed to rid it of wastes that would kill it; it thrives in an atmosphere of ideal purity and sterility. One can almost hear the applause of the engineers as they contemplate this ingenuity.

Medicine is an art as well as a science, the physicians have been proclaiming these many years. Thus do they unwittingly indict their calling. An art is too personal. But scientific precepts can be followed by an intelligent practicioner. Behind the so-called art of a fine diagnostician of clinician there is more science than is commonly admitted - the divination that springs only from knowledge and experience. So it was with bridge building and mechanical engineering once upon a time. When glass hearts an marrow growing apparatus have done their educational work, we shall have less of art and know more of processes that keep the body in health and what break it down in old age.

Already Dr. Osgood and Mr. Muscovitz see new fields of inquiry opening before them- more than any two men can explore in a life time.

What are the conditions under which cells thrive best? At what rate do different cells grow in the marrow? How does the marrow of old and young, of men and women, differ? What is the effect of cancer-producing agents on marrow? How is the coloring matter of blood formed? What is the mechanism whereby viruses destroy human tissue? Questions without number well up. When they are answered some of the mysticism that now encumbers pathology will be swept aside to join the "humors" and "distempers" of the eighteenth century, and medicine will take its place with the most scientific disciples.

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A BIBLIOGRAPHY OF OREGON'S GEOLOGY AND MINERAL RESOURCES

A bibliography of Oregon's Geology and Mineral resources, with Digests and Index, has been prepared for the Oregon State Planning Board, V. B. Stanbery, Consultant. The authors are Ray C. Treasher and Doctor E. T. Hodge and staff. This work was instigated by the Planning Board, as a result of requests for information on available literature pertaining to Oregon's resources.

The intent is to assemble under one cover all references to Oregon's underground resources. The authors are well qualified for this work. Mr. Treasher is a professionally trained geologist and mining engineer, with a considerable amount of published material, and has had experience as a bibliographer. Doctor Hodge, Professor of Economic Geology, Oregon State College, knows Oregon's geology as no other person in the United States. He has studied and published extensively on this subject.

The Bibliography will consist of about 600 pages, with between 2500-3000 references. This is nearly three times as large as any previously issued work, none of which contained extensive abstracts. Each reference will give the author, full title of the article, the publication in which it may be found, pages containing Oregon material, figures, maps, tables, analyses, etc., and the date of publication. It will also state in which library the reference may be found. This feature will save the investigator an immense amount of time, in that he will know right where to find it, without searching at length.

Each reference will be followed by a 150 word digest of the material contained in the article. The digest will be in the nature of a summary of the information, giving the reader an idea of what he may expect to find therein, and when space permits, the abstractor's opinion of salient points. As this abstracting has been done by geologists, the reader will know that it is an authoritative discussion.

The index has been carefully compiled. Each reference bears a number, to which the index refers. The digests have been carefully studied, and the salient points noted in the index under its number. The item "Gold" will indicate all references pertaining to gold in Oregon and will be further divided into several sub-heads. Each item, whether economic, geographic, historical, etc., will be listed and the index will be extensive and thorough.

The Bibliography will be, in effect, a textbook on Oregon geology, in which one can find brief, concise, and authoritative information. The mining engineer, the investor, professional geologist, engineer, will find it an invaluable handbook. The general public will at last have a book which they can use with confidence, to better acquaint themselves with Oregon's underground resources, minerals, oil, gas, rocks, geologic formations, fossils, mountains, volcanism, and will replace and extend many, previously issued, special bibliographies.

No project of this size and nature has ever been undertaken before. The State Planning Board is to be congratulated upon their judgment and foresight in carrying on this necessary activity, which will spread accurate information about Oregon's resources to the entire country, and in selecting men who are competent and trained for this particular work.

The Bibliography of Oregon's Geology and Mineral Resources will be available, in mimeographed form, about September first. Because of its size and the attendant cost of publication, a charge of $1.25 per copy, will be made. The edition will be limited to those who order their copies in advance. A post card, addressed to State Planning Board, Mr. V. D. Stanbery, Consultant, 811 Spalding Building, Portland, Oregon, attention of Ray C. Treasher, will insure the sender of a copy of this valuable work, if application is made at once.

The above is a press release to all newspapers. It is suggested that all members of our Society get their orders in at an early date for this valuable Bibliography.

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RECENT PUBLICATION

Dr. L. S. Cressman, Professor of Anthropology and Curator of the Oregon State Museum of Anthropology at the University of Oregon, has recently issued Information Bulletin No. 1 which is entitled "Bibliography of Publications on the Indians of Oregon. Notes on Methods of Excavation and Classification of Specimens".

This six page publication is of considerable value to collectors of Indian relics, students of pre-historic man in the Oregon country, and all who have an interest in the fasinating field of anthropology. There is an extensive bibliography of publications on the Indians of Oregon; a page and one half is devoted to Notes on Procedure in Excavating, which is of particular value to the amateur; and there are two and one half pages of data on the Classification of Arrow points and Other Stone Materials.

This bulletin is not for sale but a copy may be obtained by addressing Dr. L. S. Cressman, Curator, Oregon State Museum of Anthropology, University of Oregon, Eugene, Oregon enclosing a gift of ten cents in stamps to cover the cost of preparation and postage. If more than one copy is desired increase the amount of the gift accordingly.

There is a copy of this publication now in the files of the library of our Society and access to same may be had by contacting Mr. R. L. Baldwin, Librarian.

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EXHIBIT OF JUNE 26TH

The Exhibit Committee did not have a regular formal exhibit but our members presented an informal affair that was most interesting and quite varied in its geological scope and the extent of the area from which the various specimens were found.

Mrs. A. R. Carney exhibited one of the first vertebrates which she found in the north rim of the Grand Canyon in Arizona in what is known as the Kaibab formation.

Rose H. Jennings displayed two stalactites that she obtained from the Carlsbad Caverns of New Mexico, and four rose rocks or barite roses she found in Oklahoma.

Getting back to the Oregon Country Mr. Leo A. Bissonette exhibited a bit of backyard geology by showing an excellent example of a pecten that he found in his own backyard while clearing up some gravel and rocks.

As a result of this interesting exhibit it is hoped the Exhibition Committee will announce some meeting in the near future as a sort of an open house night for informal exhibits. It is very obvious that many members do not have sufficient material to give a complete exhibit but nevertheless there are a good many that have certain geological specimens that are of special interest that could be displayed if an opportunity presented itself.

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SCIENTISTS EXPLAIN LAKE'S BLUE

Water is Like That of Ocean

Crater Lake National Park, July 11. -

Scientific explanation of the puzzling deep blue color of Cater Lake waters is advanced by the Carnegie Institute, Washington, D. C., in a current bulletin, compiling the results of extensive research carried on for several seasons past.

"Why is Crater lake so blue?" is one of the most popular questions asked by park visitors. A number of theories had been hitherto offered, unsupported by definite proof.

Dr. Edison Pettit, member of the Mount Wilson Observatory staff of astronomers and an authority in the study of light, made laboratory analysis of Crater lake water samples for its purity and light conductivity, learning that the liquid is similar to seven years settled ocean water with a minimum amount of sediment. This amounted to 88 parts of solid matter in a million.

Dr. Pettit came to the conclusion that "in any event the predominant color of the lake is due to multiple scattering of light by the water molecules. Superimposed upon this is the reflection of sky, clouds and crater walls. On a clear day, with rippled surface, the reflecting phenomena is submerged by the scattered light. If the sky is overcast, the only light available is from the clouds, the color is predominantly grey.

"In a word, the blue of Crater lake and the blue of the sky are the result of the selective scattering of light rays which have been diverted from a straight course by molecules of water in one case and molecules of air in the other. Blue is made up of the shortest light waves, less than one fifty-thousandth of an inch in length, and it is these that are sent back to the observer, due to the extreme depth and purity of the lake water."

From the Oregon Journal of July 12th, 1936. It affords an explanation by a competent scientist of the much discussed phenomena of the blueness of the waters of Crater Lake. It is of interest to our Society in view of the scheduled trip next September to Turquoise Pool ("Little Crater Lake" on the Geological Survey map) where, to a less intense degree, a similar color effect of the water prevails.

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ROCKS

Introduction

The principal constituents of the outer shell or crust of the Earth are the rocks. Inasmuch as aggregates of minerals compose them, it is natural to find that, in appearance as well as in physical and chemical properties, there is wide variation among the rocks of the Earth. According to the manner in which they originated, all rocks may be placed in three major classes:

IGNEOUS ROCKS--those rocks which have solidified (cooled) from a molten condition. All other types of rocks are derived from igneous rocks.
SEDIMENTARY ROCKS--those rocks which have been formed by the settling of sediments, usually in a body of water.
METAMORPHIC ROCKS--those rocks which have been formed from I and II under the action of geologic processes acting within the Earth's crust.

Every rock carries within itself the evidence of its mode of origin. The recognition of these evidences and the ability to interpret them are of fundamental importance because thereby we are enabled to unravel the secrets of the constitution, the structure, and the history of the Earth's crust.

Characters used in Identifying Rocks

Just as certain physical properties are useful in the identification of minerals, likewise, in the case of rocks, satisfactory identification is accomplished by observing several outstanding physical features. The most important of these features are Structure, Texture, Hardness, and Fracture.

Structure refers to the larger features of rocks. Igneous rocks, having resulted from the cooling of magmas which are essentially homogeneous, are usually lacking in directional, primary structures due to an arrangement of their constituents and hence are said to have a MASSIVE STRUCTURE.

In contrast, sedimentary rocks having been deposited by the agency of some medium, such as water or wind, generally possess a LAYERED or LAMINATED STRUCTURE of rounded mineral grains according to the sorting of the constituents with respect to size and weight.

Metamorphic rocks, produced as the result of alteration of previously existing igneous and sedimentary rocks, are apt to have an IMPERFECTLY BANDED STRUCTURE when the original rock was igneous. This is due to the tendency of the constituents to become flattened and recrystallized under pressure with a resulting parallel or subparallel arrangement of the minerals. Metamorphic rocks which originally were sedimentary also possess a BANDED STRUCTURE IN VARYING DEGREE, according to the extent of the rearrangement of the mineral grains. Consequently, metamorphic rocks range in structure from faintly banded to perfectly banded, in which case the original minerals usually have recrystallized entirely.

The Texture of a rock refers to the size, the shape, and the arrangement of the mineral grains.

According to size, a rock has COARSE-GRAINED TEXTURE if the individual constituents be as large as peas; it has FINE-GRAINED TEXTURE if the grains be about the size of those in granulated sugar; and again, if the individual grains be too small to be seen by the naked eye, the rock is said to have an APHANITIC TEXTURE.

The relative size and arrangement of the individual grains are also of importance. This feature is called the Fabric of the rock by some geologists. Those rocks are said to be EVEN-GRAINED or EQUIGRANULAR in which all the constituents are approximately the same size. The rock is UNEVEN-GRAINED or INEQUIGRANULAR when the grains are of different sizes.

Certain textures are so distinctive that their recognition is of great help in the identification of rocks. An example is the texture of a granite, termed the GRANITIC TEXTURE, and is due to consolidation deep below the Earth's surface resulting in extremely slow cooling of the magma. As a result, the crystals start from many centers and continue to grow until they mutually intersect in an interlocking complex of comparatively even-sized grains. A GLASSY TEXTURE also proves that the rock is of igneous origin but that, in contrast to a granite. it was formed by the sudden solidification of molten rock matter because glasses are the result of the extremely rapid cooling of molten material. Many sedimentary rocks are composed of more or less rounded fragments of minerals. Such a texture is termed a CLASTIC TEXTURE.

Hardness is a useful property in distinguishing different rock types. Some limestones and shales, for example, are so fine grained that they resemble the much harder aphanitic igneous rocks. The test for hardness in such cases is conclusive.

Fracture refers to the manner in which rocks break. Coarse-grained rocks are apt to break with rough surfaces which are sharp and jagged in the case of igneous rocks and smoother in the case of sedimentary rocks composed of well-rounded grains. Glassy rocks break frequently with a conchoidal fracture. Shales tend to break into flat plates with a semi-conchoidal fracture. Many metamorphic rocks, especially the highlyschistose varieties, will break into thin slabs or flakes which have very sharp edges.

The Igneous Rocks

In accordance with physico-chemical laws, molten rock material, in cooling, will form a wide variety of rock types depending upon (1) the composition of the magma, and (2) upon the rate of cooling (whether at great depth, intermediate depth, shallow depth, or upon the surface). The second factor determines, in large part, the texture of the rock and upon this basis alone rocks may be divided into six major classes, as follows:

I. Even-granular--those rocks in which the minerals are about the same in size and can be identified either by the unaided eye or by a pocket lens.
II. Porphyritic -granular--those rocks in which certain large minerals, the phenocrysts (defined below), are scattered through the much smaller minerals which compose an even-granular groundmass. This is known as the PORPHYRITIC TEXTURE.
III. Porphyritic-aphanitic--those rocks in which the phenocrysts are set in an aphanitic groundmass.
IV. Aphanitic--those rocks in which none of the constituents are distinguishable.
V. Glassy--those rocks in which few or none of the constituents have crystallized.
VI. Fragmental--those rocks whose constituents are the angular and broken, or fragmental, products of volcanic eruptions.

In the above classification the first five classes are termed the massive rocks as contrasted with Class VI, the fragmental.

It will be noticed that in proceeding from Class I to Class V the number of easily recognizable constituents becomes less. In Class I, the main constituents can be distinguished by the naked eye as individual grains; in Class II, the phenocrysts can be distinguished readily but those of the groundmass less readily; in Class III, the phenocrysts alone are distinguishable; in Class IV and Class V, none of the constituents can be distinguished.

Each of the major classes is then subdivided on the basis of composition, that is, what kinds of minerals occur in the rock and also the proportions in which they occur. The actual rock names are given to these subdivisions. For example, if the rock be even-granular and be composed of feldspar, quartz, and generally also a dark mineral (usually biotite), it is a granite.

The following classification of igneous rocks is based upon the above principles.

Table III. The Igneous Rocks

	Major Classes (based on texture)	Subdivisions of Major Classes (based on mineral composition)			
		Light-colored Minerals Predominate (chiefly feldspar)		Dark Minerals Predominate	Dark Minerals entirely
VI	Fragmental	VOLCANIC TUFF AND BRECCIA			
V	Glassy	OBSIDIAN PITCHSTONE PUMICE		BASALT GLASS	
IV	Non-porphyritic, Aphanitic	FELSITE		BASALT	
III	Porphyritic, with aphanitic groundmass	RHYOLITE (contains phenocrysts of quartz)	ANDESITE		

	Major Classes (based on texture)	Subdivisions of Major Classes (based on mineral composition)			
		Light- colored Minerals Predominate (chiefly feldspar)		Dark Minerals Predominate	Dark Minerals entirely
II	Porphyritic-granular	GRANITE PORPHYRY (has quartz)	DIORITE PORPHYRY (no quartz)	GABBRO PORPHRYRY	
I	Even-granular (with grains interlocking)	GRANITE (has quartz)	DIORITE (no quartz)	GABBRO DOLERITE (grain size is intermediate between that of Basalt and Gabbro)	PERIDOTITE HORNBLENDITE PYROXENITE

The following instructions will prove helpful in using the table.

All rocks in the same horizontal column have the same texture. All rocks in the same vertical column (excepting Classes V and VI) have essentially the same chemical composition. However, in physical appearance there may be notable differences as in the case of a granite, for example, which differs somewhat from a granite porphyry and vastly from a rhyolite. These differences are textural and were brought about by different rates of cooling of magmas of identical composition. If a given magma cools slowly at depth below the Earth's crust, the individual crystals have time to grow and a granite results. Again, the same magma may be poured out on the surface of the Earth as a lava flow and the sudden chilling prevents the growth of the crystals, resulting in a rhyolite. The same explanation accounts for the formation of a diorite in depth and an andesite on the surface; for a gabbro in depth and a basalt on the surface. From the foregoing we draw the following principle: rhyolite is the extrusive equivalent of granite; andesite is the extrusive equivalent of diorite; and basalt is the extrusive equivalent of gabbro.

It will be observed that rocks which are light in color contain mostly light-colored minerals. Also, such rocks are light in weight. Again, those rocks which are made up mostly of darkcolored minerals (ferromagnesian minerals) are dark in color and heavy in weight. The range in weight (specific gravity) of igneous rocks is not large--about 2.67 for the average granite to 3.0 for gabbro--but after one has experience in examining rocks it is sufficient to serve as an aid in identification.

A few words of caution should be heeded in using the tables. In all the rock tables which you will use, you will notice that each rock has been placed in a separate compartment. In nature no rock variety is so sharply delimited from its neighbor and transitional varieties between granite and diorite, or between many rock types, are common. Hence no hard and fast boundaries (as in the table) set off any rock species, because all gradations occur. Further difficulties are presented by the finer-grained rocks, especially the aphanitic group. When the accurate identification of a rock becomes necessary, the petrographic microscope is used.

The table has been so arranged that the rocks will be found in the table in general agreement with their positions in the Earth's crust at the time they were formed. That is, the fragmental rocks were formed on top of the crust and occur in a similar position in the table; rocks such as granite, diorite, etc., were formed deep within the Earth and, accordingly, will be found at the bottom of the table; rocks formed at intermediate depths within the Earth will be found at intermediate positions in the table.

There are many varieties of igneous rocks but only the most common ones are included in this classification.

Description of the Igneous Rocks.

CLASS VI--FRAGMENTAL. Rocks of this type are the products of volcanic eruptions, usually explosive. At such times both hot and cold fragments are blown into the air and carried by the wind. The coarser material falls relatively near the volcano, but the finer may be carried great distances. When the finer material has been converted into rock it is known as VOLCANIC TUFF; the consolidated coarser material is known as VOLCANIC BRECCIA. These rocks have a wide distribution over the world and indicate former vulcanism.

CLASS V--GLASSY. When molten rock flows upon the surface of the Earth--lava flows, for example--the surface of the flow cools so rapidly that no crystals can form and hence the result is a glass.

OBSIDIAN--a brilliantly lustrous volcanic glass that is generally dark-colored or black, due to the uniform distribution throughout the glass of a relatively small amount of dark material.
PITCHSTONE--dark in color, like obsidian, but with a duller and more pitch-like luster.
PUMICE--a glassy form of lava which has a frothy structure due to expansion and bursting of steam bubbles (vesicles).
BASALT GLASS--a rare rock, formed only when a magma of the composition of basalt has cooled very rapidly.

CLASS IV--NONPORPHYRITIC, APHANITIC; AND CLASS III, PORPHYRITIC, WITH APHANITIC GROUNDMASS. The rocks of these types originated in general from volcanic flows in which rapid cooling occurred. They are characterized by the presence either of constituents too small to be distinguished (Class IV) or of porphyritic crystals set in a groundmass that is: (1) too fine-grained to be distinguished by the naked eye, or (2) partly or entirely glassy.

FELSITE--the name applied to light-colored rhyolites and andesites that are so fine-grained that they cannot be distinguished from each other.
RHYOLITE--the extrusive equivalent of granite. The phenocrysts are feldspar, quartz, and biotite (and rarely hornblende). The abundance of the phenocrysts varies widely. In color the rock ranges from white to gray, pink, red, and purple.
ANDESITE--the extrusive equivalent of diorite. The phenocrysts are striated feldspar (very common) and one or more dark minerals (hornblende, pyroxene, or biotite). Andesites are darker in color than rhyolites; dark gray is very common. These rocks are extremely abundant as the product of volcanoes that surround the Pacific Ocean and the name was derived from their widespread occurrence in the Andes Mountains of South America.
BASALT--the extrusive equivalent of gabbro. Many basalts have no phenocrysts but in others they are abundant and consist of feldspar, olivine, or pyroxene, or their combinations. Basalts are either

compact or vesicular. In the former case the phenocrysts are hard and have straight, clean-cut boundaries; in the latter case the boundaries of the vesicles are generally irregular, round, or elliptical and may be filled with some mineral such as calcite, chlorite, or quartz. These fillings are called amygdules and the rock is termed an amygdaloidal basalt. Basalts are by far the most common and widespread of the extrusive rocks.

DOLERITE--some basalts are so coarse-grained that the grains are recognizable and yet the rock is too fine-grained to be classed as a gabbro. The name dolerite is given to such varieties.

CLASS II--PORPHYRITIC-GRANULAR. In this class of rocks the phenocrysts are embedded in a groundmass so coars-grained that its component minerals can be recognized by the naked eye. In most porphyries the phenocrysts are abundant, comprising at least half the bulk of the rock. If the volume of the phenocrysts exceeds 75 per cent, the rock becomes classed as even-granular and is in ClassI. Porphyries are common as minor intrusive bodies such as dikes, sills, laccoliths, volcanic necks, and stocks. They rarely occur as batholiths.

GRANITE PORPHYRY--like granite in composition but differs from typical granite in having conspicuous crystals (phenocrysts) of feldspar, quartz, and biotite which are set in a granitic groundmass of finer average grain size than that of granite.

DIORITE PORPHYRY--like diorite in composition, but containing phenocrysts of striated feldspar.

CLASS I--EVEN-GRANULAR. The even grain size of these rocks is the result of slow cooling so that they were formed in deep-seated masses within the Earth where cooling of the molten rock material was a slow process and the individual grains had sufficient time to grow. Accordingly, these rocks are often called DEEP-SEATED or PLUTONIC ROCKS.

GRANITE--this important and widespread type of igneous rock is composed of quartz, feldspar (usually orthoclase), and generally of smaller amounts of either mica (biotite, as a rule) or hornblende or both.

The quartz grains vary in tint from colorless to smoky gray and usually can be recognized by their glassy luster and irregular fracture.

The feldspars are distinguishable easily because of their shiny (cleavage) surfaces and their opaque white, gray, or red color.

Mica may be either biotite or muscovite and may be told by its brilliant cleavage surfaces. Thin leaves, unless the grain be too small, may be separated easily with the knife point.

Hornblende occurs in green black, opaque grains or needles.

Other minerals such as pyrite or garnet, and other less common ones, may also be present.

The average granite contains 60 per cent of feldspar, 30 per cent of quartz, and 10 per cent of dark minerals. There are many varieties of granite based on color, texture, and composition. It is used widely as a building stone.

SYENITE--(not listed in the table) this rock may be described as a granite without quartz, or with very little quartz. It is not a common rock, although there are large masses of it in the Adirondack Mountains.

DIORITE--an equigranular igneous rock composed of feldspar and one or more dark minerals. The feldspar, chiefly plagioclase, is more abundant than the dark minerals which may be biotite, hornblende, or pyroxene, occurring either singly or together.

GABBRO--differs from diorite in that the dark minerals are more abundant than the feldspar. Pyroxene, hornblende, and olivine are the common dark minerals, occurring singly or together. Biotite is not common. Magnetite is often accessory. Because of the preponderance of dark minerals, gabbros are dark in color and relatively heavy in weight.

DOLERITE--this is a convenient term for the basic rocks that are intermediate in grain size between gabbros and basalts.

PERIDOTITE--This rock is composed entirely of dark minerals with olivine predominating. Peridotites are not common rocks but are important because they are the source of the ores of nickel, chromium, and platinum, and of the diamond.

Peridotite alters frequently to a dark-green rock, serpentine. In this alteration an appreciable amount of water combines with the peridotite minerals causing a large expansion of volume which in turn causes much internal movement. As a result the serpentine is traversed by innumerable smooth surfaces, known as "slickensides," along which the movement took place.

HORNBLENDITE AND PYROXENITE--these rocks are composed entirely of the minerals hornblende and pyroxene, respectively. They are not common.

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EARTHQUAKE

The Walla Walla section of the country made the headlines in a big way a short time ago. Below is a letter to Dr. Hodge from a resident of the Milton-Freewater section:

"Noticeing that you are very much interested in the earthquake in the Walla Walla Valley, so I thought I would tell you my experience in it and what happened around here in the Fruitvale-Umapine district.

I was awake but in bed as the shock came. Just before the shock there were hissing rushing noises something like a wind and still not like it, then the shock came in a rotary motion. The proof is here that it was a rotary motion for within a mile from here there are 4 brick flues that were broken loose even with the roof and turned one-quarter way round standing corner-ways with the house.

Then in the Umapine district large cracks appeared 3 to 4 inches wide, but at my place only small cracks, wide enough to stick a straw in them, appeared.

Then I was told that a number of persons saw a meteor fall which made it as light as day just before the shock.

Could it be that a meteor striking close by would cause the earthquake?

But then what would cause all the other smaller shakes that we are having which must be over 100 by this time? We have had 4 in the last 24 hours."

. . . . .

From a Walla Walla paper, July 21, 1936.

UMAPINE EXPERIENCES EIGHT MORE SHOCKS

Residents of the Umapine district report eight additional quakes there this morning, none of which did any further damage.

It is reported that last week's earth shocks formed a fissure which is six inches wide at the top and which an eight-foot pole could not reach at the bottom.

. . . . .

From the Morning Oregonian, July 17, 1936.

TREMOR CENTERS AT WALLA WALLA

Milton-Freewater Area Also Severely Shocked

Spokane, Washington, July 16 (AP)--A severe earth shock rattled the northwest and parts of the Pacific coast last night and early today, causing some damage in the inland northwest, where it was believed to center.

Many householders were awakened by the shock, which rattled dishes, pictures and windows over a wide area and demolished and damaged buildings in the Walla Walla, Wash.-Milton-Freewater, Ore., area, where the tremor was the heaviest.

Dr. C. F. Richter of the Carnegie Institution seismological laboratory at Pasadena, Cal., described the shock as probably the strongest earthquake in the United States since the Montana earthquake of October 31, 1935. This quake, one of a series, caused death and destruction in Helena and other Montana cities.

Canning Plant Damaged

A canning plant and a motor bus station were damaged in Milton-Freewater, the huge smokestack of the Milton union high school, a $200,000 plant, was cracked, a concrete dwelling at Umpqua, Oregon, nearby, was demolished. Dwelling house chimneys over a wide area were broken.

Residents of Milton-Freewater reported they felt 28 distinct shocks from 11:10 P.M. until 6:30 A.M.

A water main was broken at Spokane, cutting off the supply to a South Hill residential section for several hours. An artesian well on a ranch near Walla Walla, dry for three weeks, gushed with greater vigor than ever before.

The shock was felt in all of eastern Washington, much of north central Idaho, the northern tier of counties in Oregon and was recorded on seismographs at Spokane, Seattle, Vancouver, B. C.; Berkeley and Pasadena, California.

At Mt. St. Michael's scholasticate, the nearest seismograph to the reported epicenter, a perfect record was obtained. The first shock was recorded at 11:09.30, and it lasted about five minutes. No primary of secondary shocks were recored. The indicator was knocked off the recording paper by the violence of the first shock, but was returned by an automatic device.

The observer, Brother A. McNeill, said the center appeared to be "very near Spokane." At Vancouver, B. C., it was reported the center appeared to be about 350 miles east and south of east of that city. Dr. Richter at Pasadena said the shock was at a distance of 1250 miles.

. . . . . .

From the Morning Oregonian, July 21, 1936.

SCIENTIST VOICES VIEWS ON QUAKE

Tremor at Walla Walla Surprise to Hodge

The temor which rattled the Walla Walla valley last Wednesday may have been the tail-end of earth-crust shifts which started centuries ago--or, possibly the forerunner of more disturbances.

The tremor was a complete surprise to geologists, who never knew a live earth fault existed in the Blue mountains, Professor Edwin T. Hodge, teacher of economic geology at Oregon State college and consulting geologist in the United States army engineers' office here, said yesterday.

"I don't want to be sensational and predict more quakes will follow," Professor Hodge said.

First Quake for District

"It was the first quake ever reported from that district, but may have been part of an ancient earth movement which started 30,000,000 years ago.

"The shrinkage of the center of the earth causes the earth crust--which is from 30 to 50 miles thick--to wrinkle up into mountains, he explained. In places the rocks in the crust won't bend, and a break or a fault occurs.

" The earthquake was jerky slipping of the earth along the fault which evidently extends along a line parelleling the Blue mountains between Milton-Freewater, Oregon, and Walla Walla, Washington. Previous faults, now dead, have been found in the area.

No Occasion for Alarm

"It could be the forewarning of a serious shock to come, but engineers can construct earthquake-proof buildings if necessary, and there is no occasion for alarm.

"We had thought the Blue mountains, as well as other Oregon mountains, were 'full grown' or had ceased shifting.

"Oregon is practically free from quakes as compared with California and northern Washington. We have only one while they have 100."

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GEOLOGICAL SOCIETY'S TRIP TO THE BEACH AUGUST 8-9

We will drive to Manzanita Beach on Saturday as soon as we can get away. The distance by Astoria and Seaside is 152 miles and 137 miles by McMinnville and Tillamook.

This is not going to be a strenuous trip as there will be very little driving after reaching the beach. It will be an outing that the whole family can enjoy. There is a nice sandy beach where those who wish to can take a dip in the ocean and there is a small historical exhibit that is most interesting and there is plenty of geology that should keep us busy during the time that we have to devote to it.

On Saturday evening we will have a fire on the beach where there is plenty of fuel. If it should happen to rain there is a community house that we can have the use of.

There are modern cabins for those who want them, a hotel and a camp ground for those who have their own camping equipment.

Those who want cabins should make reservations beforehand.

Accomodations at Manzanita Beach

R. C. Hazeltine - Cottage Court--Can take 6--$1.50 to $3.00 Modern with fireplace.

Hotel - $1.00 a person per night. $1.50 with two to a bed.

West Inn - Miss A. Allen has 2 rooms - $1.00 a day.

R. W. Babbitt has 2 cottages no fireplace - $1.50 and $2.00.

These cottages have no bedding but do have dishes.

If anyone can not find accomodations from those mentioned write or phone - Ben Lane, Manzanita, Oregon. The phone rate from Portland after 8 P.M. is 25 cents.

Mrs. W. F. Cain, Nehalem, Oregon - $2.50 per day.

Neah-Kah-Nie Tavern, Nehalem, Oregon - $3.50 with two to a room (one bed).

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THE GEOLOGICAL NEWS LETTER

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of the

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LECTURES

Aug. 14, 1936(Friday) No meeting. Mr. Keen has been unexpectedly called east. Lecture postponed to a later date.

SPECIAL NOTICE - MARK THIS DATE!

Aug. 21, 1936(Friday) - Astronomical field night. Meet at home of A. V. Goddard, 1310 N. E. 49th Avenue, at 8 P.M. Short talks by Mr. Goddard and by Fred Ellis (G.S.O.C.) on star evolution, clusters, binaries, the planets, and moon features; examples to be studied through powerful telescopes. Jupiter, Saturn, and the moon will be in favorable phase. Last chance to see Peltier's comet! Bring binoculars. (Better review your Elements of Astronomy.)

Aug. 28, 1936 (Friday) - No Meeting.

TRIPS

Aug. 23, 1936 (Sunday). - Upper Clackamas River
Leader: Clarence Phillips.

Sept.5-6-7,1936(Sat.Sun.Mon.) - Mt. Adams and vicinity
Leader: Ray Treasher.

Sept. 27, 1936 (Sunday) - Mt. Hood buried forests and Little Crater Lake, etc.
Leader: J. R. Collins.

Oct. 10-11, 1936 (Sat.& Sun.)-North and South sides of Lower Columbia River
Leader: Claire Holdredge.

Oct. 25, 1936 (Sunday) - Eagle Creek
Leader: Joseph Wimmer.

EXTENSION COURSES IN GEOLOGY 1936-1937

Course Number	Title	Credit Hours	Term	Professor	Day	Room Number
G 201p	General Geology	2	Fall	Hodge	Wednesday	110
G 350p	Rocks and Minerals	2	Fall	Wilkinson	Tuesday	104
G 203p	Historical Geology	2	Winter	Hodge	Wednesday	110
G 301p	Geology of the Nat'l. Parks	2	Winter	Allison	Tuesday	104
G 352p	Geology of Oregon	2	Spring	Hodge	Wednesday	110
G 345p	Elements of Paleontology	2	Spring	Packard	Tuesday	104

We are in debt to Mrs. E. S. Taylor of Wynnewood, Pennsylvania for permission to publish in our Bulletin --

"THE LEGEND OF SPIRIT LAKE"

By Charles Fremont Taylor M. D.

(Written in July 1907, during a brief visit to the beautiful but at present not easily accessible place, being fifty miles from a railroad.)

T H E L E G E N D

of

S P I R I T L A K E

By
CHARLES FREMONT TAYLOR, M.D.

The second day "in" was Sunday--a perfect, peaceful day. We went to the lake; and with the white mountain before us, and its mirrored image in the depths of the lake, we rowed to Harmony Point to see the falls, named Independence Falls, perhaps because some one arrived there on Independence Day--a bad way to name an object of nature, for it is not descriptive nor appropriate in any way.

The lake with its surroundings, the wooded slopes, the falls, the white mountain yonder, the clear, cool, and bracing air, would make an ideal summer resort. Indeed, when the railroad that they are now working on is finished, the people will make this place of beauty a resort. I have seen many falls, but I cannot bring to mind any as pretty as these. They are not great, only a mountain rill, but for entirely undisturbed naturalness and wildness of setting I never saw their equal. The Minnehaha Falls, tho greater, are not to be compared for an instant; and the touch of the pen of a Longfellow would make these falls, as the Minnehaha, a place of pilgrimage--delightful pilgrimage. I never saw a place so beautiful that was so poor in history, legend, or story. It should have a literature; at least a story or legend. I talked with every one that I saw and got some poor fragments; but the possibilities of the region are great, so let us conjure up the spirit of Longfellow, and ask it to listen to the song of the falls and tell us the Legend of Spirit Lake.

The Legend of Spirit Lake

* * *

In the fastness of the forest
On the slope of Copper Mountain
Ran a brook of crystal clearness;
O'er a ledge it dasht its waters,
Dancing, prancing to the bottom.
On the left a snow-clad mountain
Rose in lone, majestic beauty.
All around were wooded hillsides;
In the midst of all lay sleeping,
Lay in quiet, peaceful slumber,
Lay a lake of limpid clearness.

All was quiet, dreamy quiet
But the leaping, dashing brooklet.
None could speak except the brooklet;
Tongue was it for all surroundings.
This its story, and its yearnings,
Told with frankness and deep feeling:

"Long we've been here, waiting, waiting,
Vainly waiting human footsteps;
Waiting, but the footsteps came not;

Campfires came not to the lake shore;
Plumed brave nor bashful maiden
Came within this charming basin.
To the west the warlike Kowlitz,
And the Yakima to the northward,
But they shunned the lake and mountain,
Shunned them as they would a demon.
Thus no voices came to cheer us,
Whoop nor laughter waked the echoes.

"Once a brave peeped o'er the mountain
Into our entrancing valley.
Joyously he hailed his comrades,
And they flockt into the basin;
Scene of beauty most entrancing:
Circling mountains; water plenty;
Deer and bear, and goats and fishes;
Stately trees for good canoes.
Came unto my dripping waters,
And for them I sang my sweetest.
Hard I tried to firmly hold them;
Happy I did wish to make them,
For I wisht them to dwell with us.
And unto the great white mountain
Turned their eyes in admiration.
See her in her robe of whiteness,
Always in her robe of whiteness,
Only when the tinge of sunset
Robes her in a golden glory.
Brave and maiden, women, children,
Turned their eyes unto the mountain;
Calm, serene, and all contented
Till some eye saw in the water
Spirit of the great white mountain.
'See! a ghost! an apparition!
Then a shriek and all confusion!
Left they all, the haunted mountain.
Ne'er returned they; for the story,
Story of the spirit mountain,
Plain to all within the lake depths,
Spread to all adjoining country,
And became a tribe tradition.
To this day an Indian will not
Set a foot upon the mountain;
For he fears the mountain specter
Always seen in Spirit Lake;
Bears in mind the old tradition--
Cannot brave the superstition."
Spake the rill of Copper Mountain,
Sang the falls of Spirit Lake.

"Thus until a lone prospector
Came to tap our rocks for metal,
We were left in desolation.
Welcome to the human footsteps;

We have been so weary waiting.
We have joy and health and comfort
If you will but come unto us.
See the mountain in her whiteness;
See her majesty and greatness;
See her in the golden sunset;
See her glisten in the moonlight;
See her likeness in the water.
Not a specter; bodes not danger;
Only beauty given double;
Double measure to attract you.
Gone the Yakima and the Kowlitz.
Come the pale face in great numbers
To the mountain, double mountain:
One of substance, one of spirit;
One of substance in the azure,
One of spirit in the water.
Bring the weary man of business;
Bring the heavy-burdened mother;
Bring the children with their prattle;
Bring the lover and the maiden;
Bring the invalids on stretchers
To the balsam of our woodlands;
Bring them all, whose hearts are heavy;
Bring them all, who worship nature;
Bring them to the magic mountain;
Make a shrine unto the mountain."
Spake the rill of Copper Mountain,
Sang the falls of Spirit Lake.

"Bring them in the chu chu wagon!
Hurry with the rails of iron;
Put the chu chu wagon on them;
Bring, oh bring, the people to us.
Bring the sad and the disheartened;
Bring the glad and happy, also;
Bring the laughter of the children;
Bring the sweetheart and the lover.
I will sing and dance or labor;
Only bring me human faces,
Upturned faces, eyes all sparkling;
Bring me them and I'll be happy."
Spake the rill of Copper Mountain,
Sang the falls of Spirit Lake.

"All these years I've sung and wasted,
Wasted songs of centuries
If you'll come and let me serve you
I will sing or dance or labor,
Turn your wheels of industry.
They have called me 'Independence,'
But I'm sure that's not my nature,
For I want to be of service;
I will sing or dance or labor,
Be an ornament or servant,

For I want to bring the people
From their cares and occupations.
Bring them from the heat of summer
To this place of restful coolness.
Hurry, then, the chu chu wagon;
Hurry, then, the track of iron;
Hurry, then, the water power.
Then the people gay and happy,
With new courage for life's burdens,
Will return unto their labors
After they have rested with us."
Spake the rill of Copper Mountain,
Sang the falls of Spirit Lake.

"Come and see the mountain Psyche;
Come and see in nature's mirror,
See her likeness in the water;
See her in the glowing sunset,
See her glisten in the moonlight.
White man calls her Mt. St. Helens,
She the queen, the mountain princess;
Come and make a shrine unto her.
She is robed in whiteness always,
And the lake is always crystal;
I will sing and work forever
If you'll bring me human faces,
Human footsteps, human voices,
Something human to inspire
Song or dance or toil eternal,
For we wish to send a message
To the spirit in the cloud land,
To the spirit in the star land;
We must render an accounting
Of our service here below.
Send the people to the mountain,
To the lake and to the mountain,
To the hills and rills and woodlands,
That the sick may breathe the balsam,
That the weary may be rested,
That the children may be healthful,
And that joy be universal.
Bring them from the heat of summer;
Bring them from their toil and labor;
Bring them soon and bring them often."
Spake the rill of Copper Mountain,
Sang the falls of Spirit Lake.

"I will sing and work forever
For the people, oh, the people;
Bring them to the snow-clad mountain,
To the mount of snow eternal,
To the lake of crystal clearness;
Show them in the water mirror
Picture of the great white mountain;
Mount of gold within the sunset,
Mount of silver in the moonlight;

Slopes of green down to the lake-shore,
Balsam in the breath of fir trees,
Shady nooks within the forest,
Winding paths upon the hillsides.
Tents should dot the circling lake shore,
Winged boats should cross its surface;
All for service of the people;
Of the beings who, immortal,
After death can bear our message
To the Spirit in the star land;
Bear the message of our labor,
Of our songs and of our yearnings,
To the land of the Great Spirit
Where must all give an accounting."
Spake the rill one Sabbath morning,
Sang the falls one peaceful Sabbath,
To the spirit, long departed,
Of the dearly loved Great Poet.

* * *

Before leaving I turned to the chief engineer and said: "Craftsman, spare these falls. In your schemes of water-power development, spare these falls. If you ever have to touch them, let it be after every other available source of power is exhausted. Let these falls be sacrificed last, if at all." He promised.

SPIRIT LAKE TRIP

It always rains on the Fourth of July and this year was no exception. However, the party got away and met officially in Castle Rock. Seven cars were in the caravan. Our first stop was on the Spirit Lake Highway, near what is known as the "Coal Bank Bridge" where we stopped to examine a road cut in supposed Eocene sediments.

These sediments showed indications of fresh or brackish water conditions and contained fragments of leaves and carbonized wood. We were told that just over the hill was a small coal prospect, and as the coal in western Washington is practically confined to the Cowlitz Series · Upper Eocene, the age of this material was so fixed. The terrace system was also studied. The top of these terraces at this point has an elevation of 500 feet. It was suggested that at one time, the Toutle River, continued on down through the Silver Lake valley and into the Cowlitz through a drainage channel now followed by the road. In this case, Silver Lake is a remnant of the old river bed and it now drains eastward instead of westward. The Toutle River, for some reason as yet undetermined, then decided to change its course and cut a gorge farther north in basic igneous rock. While all this examination was going on, the rains came and the floods descended and we hurried back to the cars before we were washed down into the river.

The next exposure was that of a devitrified tuff, highly colored, that laid between vertical walls of a more somber colored tuffaceous material. It was here that we caught several members of the party shooting firecrackers, although everyone knows that gunpowder smoke brings on rain. Mr. Richards showed his bravery by allowing one of the "poppers" to explode in his fingers, much to his surprise and our enjoyment.

A cliff exposing unusual platy structure next had our attention. At this point, the dark, felsitic igneous rock had a speroidal parting, not the small features found in exfoliation, but on a large scale. The areas measured as much as 40-50 feet across and careful study indicated that the platy parting was actually in a speroidal shape. It appeared that perhaps tongues of the igneous rock occupied deep ravines and that on cooling, the parting developed somewhat parallel to the cooling surfaces. Mr. Piper pointed out that this platy structure seemed characteristic of andesites, and that columnar structure appeared in basalt. On this basis, the exposure would be classed as an andesite, although it was decidedly dark colored. A short distance farther on we saw further evidence that the lava was in the form of a flow, as the old irregular surface could be seen. The andesite ? showed gradation from the dense, crystalline phase, into a more porous, tuffaceous phase. The sun came out brightly and we took advantage of it to eat our lunch.

At the junction of Green River with the Toutle River we made a brief stop to become familiar with the recent gravels which have been washed down the Toutle. The boulders consisted of pumaceous, light colored rock, full of tiny blow-holes, and many segregations were noted. A few hundred feet farther on we again stopped to examine another gravel deposit, of somewhat different material, weathered a great deal more, and composed of different pebbles. It was suggested that these two exposures might represent two stages of glacial outwash.

Still hoping for a glimpse of the mountain we continued our journey. Bridge difficulties forced us to cross the Toutle at the "Nine-Mile Bridge" to the old trail, which was a road by courtesy only. Five miles this side of Spirit Lake we stopped to look over a deposit of glacial outwash which extended fully a hundred feet above the present level of the river. This indicated that the original valley fill was considerably higher than at present.

We arrived at Spirit Lake about 3:30 and camp was made. Several parties stayed at the campground, and several went across the Lake to Harmony Falls. After dinner, through the courtesy of the Forest Service, all "hands" were taken across to Harmony Falls, where Jack Nelson, manager of the Harmony Falls Park had arranged a great bon fire. We had talks by Mr. Treasher and Mr. Piper on the geology of the area, summarizing the things we had seen during the day and were to see on Sunday. Leo Simon gave us his interesting talk on the flora of the district, with specimens. Jack Nelson entertained us with his very interesting account of the story of the "Spirit Lake Apes". Mr. Piper claimed the next day that Ken Phillips insisted on turning the tent inside out that night to make sure that no Apes were hidden under the beds. Jack told his story very convincingly and the evening was a pleasant close to the day.

Next morning, Sunday, we were held up for some time. Arrangements made with the Ranger for transportation across the lake fell through, as the Ranger could not spare the launch. So the genial Nelson came to our rescue and the trip went merrily on. Five of the party spent the day climbing Mt. St. Helens, and their account appears elsewhere in this issue. The remainder of the party hiked to Coe's Mine.

This is an abandoned "hope" of a group of mining men. A tunnel extends back some distance into the hillside and considerable mining equipment is still scattered around. The party collected many interesting specimens of crystallized minerals, the best formed being small pyrite cubes. Some copper carbonate was brought to light by two of the more venturesome members who went back to the "face" of the drift. Two others went up Coe Creek and discovered the exposure of the granite we expected to find. Time did not permit any extended examination. We hiked back to Harmony Falls, where we ate lunch, and again Manager, Mr. Nelson, took us back across the Lake to the Camp Ground. Many, many thanks to you, Jack Nelson. Your thoughtfulness and courtesy won you many friends.

One carload made the trip to Timberline. A climb was made to an elevation of about 5500 feet, well on the side of the Mountain. Notes were made on glacial deposits, lateral moraines, lava flows, pumice, and other characteristics of volcanic peaks. Most of the time, however, was spent in getting acquainted with the topography of the area to the northward. Occasional glimpses were had of Mt. Adams and we could locate the base of Mt. Rainier.

It was unfortunate that it was felt that so much ground had to be covered on this trip. Impressions came so fast and furiously that it was difficult to get one idea fixed, before more ideas came tumbling on top of them. Neither did Mr. Treasher produce his full moon Saturday night. However the calendar said it was there.

TO THE TOP OF MT. ST. HELENS

Five Members Make Ascent in the Clouds

By Carl Price Richards

Included in the program of the trip to Spirit Lake and Mr. St. Helens on July 4-5 was a side trip to timberline "to study the glacial deposits and recent volcanism, physiography and general features of this area". As timberline on Mt. St. Helens is only a little above 4000 feet, it was felt by some that such a trip should extend further up in order to get closer to the origin of some of the geological features. Accordingly, after the camp-fire session at Harmony Falls on the night of the 4th., five ambitious members of the party planned to carry out the suggestion.

The hour of 3:50 a.m. saw them extract themselves from their sleeping bags and cast dubious eyes to the sky for signs of the weather. Optimistically deciding it to be "promising", the cantaloup and coffee were duly consumed, bedrolls and tents packed into the cars and a start made on the three-mile drive to timberline at the maximum possible speed, 2½ milers per hour! (There being no traffic officers on duty at that hour, they arrived at their destination without a "ticket").

It was 6:30 when the party of five left their car and, surrounded by a thick white fog which restricted visibility to only a few hundred feet, set out for the upper regions. Fields of pumice were the first feature, light and loose, hence tiring to climb, so it was a relief to get on to the more solid lateral moraine of Forsyth Glacier and follow it up to a suitable point for getting down on to the glacier itself. Once on the snow, crampons and goggles were put on and antisunburn lotions applied, as the rest of the climb would be almost exclusively over snow or ice and, though still foggy, experience shows that the "burning rays" are little impeded by such a condition.

The picking of the best route was rendered difficult because of the continued restriction of visibility; only at rare intervals was it possible to see further than 2 or 3 hundred feet. The glacier was crossed on its lower reaches, passing some shallow and wide open crevasses, at the bottom of which the rock floor was bare. Crossing the next snow field on a steadily rising grade brought the party to the top of the "Little Lizard" and, continuing in much the same direction, they reached the "Big Lizard" after going around several fairly narrow crevasses, some 40 to 60 feet deep.

The sides of these crevasses presented a cross-section of the snow layers on the mountain and showed lines at various distances from one to six or eight feet apart. These lines do not necessarily indicate individual snowfalls, but rather intervals between occasions when the surface of the snow takes on a different nature due to a slight melting, or to being covered with a film of dust, thus distinguishing it from the adjacent layers.

The "Lizards" on Mt. St. Helens are aretes which take their name from their likeness, when viewed from a distance, to such reptiles sprawled up the side of the mountain. These aretes are covered with loose rock pushed up on them by the decending glacier and augmented by other rocks falling from the slopes higher up.

From this point the party followed a route "straight up", which means that they ascended the cone of the mountain along one of its "meridians". The average steepness of this slope can be measured on a photograph of the mountain taken from a distance and is about 33 degrees to the horizontal. In places, however, due to various local features, it is appreciably steeper, but never more than 40 degrees. Such a slope is just right for rocks to roll down and, indeed, on several occasions the party found it prudent to keep a watchfull eye on the fog bank above, out of the invisible depths of which came missles of various sizes and, hurtling past, disappeared into the fog below.

At about 9000 feet elevation much new snow was encountered which, being soft, made the going very difficult as, at each step, one sank up to the knees. To avoid this the party moved over to an arete and climbed the remaining distance to the crater rim over bare rock. At 1:45 p.m. the rim was reached and, rounding it, the party gazed into foggy nothingness! The top of St. Helens is a large snow field filling the crater and is about 2000 feet across. The highest point, where there is a cabin, is at the far, or southwest side. A course was set through the fog in the direction this was thought to be and, though only rising very gently, the soft snow made this last stretch quite tiring. It was a strange sensation too - on top of the mountain and yet seeing nothing but white -- white snow beneath and white fog above and all around -- nothing else! After a while a dark object loomed ahead, but proved to be only a pile of rocks. That was passed and disappeared. Soon another and another. Then a different looking object appeared; it was the cabin, not 200 feet away. It was just 2:00 p.m. when that was reached and, as the elevation is 9671 feet, just over a vertical mile had been climbed in 7½ hours; no records were broken -- neither for speed nor slowness, it was just a pleasant leisurely ascent.

A good lunch soon disappeared and then the summit register book of the Mazama Club was signed by each member of the party and a note added stating that this was the first official mountain climb of a party of the Geological Society of the Oregon Country. A few photographs were taken to record the occasion and, at 3 o'clock, the party left and started the descent, following much the same route by which they had come. With the fog still prevailing most of the way, caution was needed, and again no effort was made to break any records. Hence it was 6 p.m. when the car at timberline was reached by all five climbers in good condition -- a little tired perhaps, but also a little better acquainted with the geology and general nature of the upper regions of the mountain.

On a trip of this sort one cannot fail to be impressed with the forces at work tearing down the mountain. Evidences of falling rock were on every side. Water from melting snow and ice, loaded with rock "flour", poured from the glacier termini, while the slow movement of the ice masses themselves tear down and carry forward larger rock fragments. Confronted with such evidences of the processes of erosion, it does not take much imagination to see how in a short period of time, measured on the geological scale, this now young mountain will present a very different appearance.

The following, all members of the Society, comprised the party making this climb:- Raymond L. Baldwin, Louis Oberson, Kenneth N. Phillips, Arthur Piper, and Carl P. Richards. The last named acted as leader and guide, as he was the only one of the five who had climbed this mountain before. It was his eighth ascent.

The following facts concerning Mt. St. Helens and its relation to the neighbouring snow-capped peaks were compiled by the writer and appeared in the December 1927 issue of "Mazama".

	RAINIER	ADAMS	HOOD	ST. HELENS
Latitude	46-51-3	46-12-12	45-22-28	46-11-53
Longitude	121-45-27	121-29-24	121-41-42	122-11-26
Distance in Miles from Portland	102.0	76.7	51.2	53.7
Distance in miles from Rainier		46.7	101.0	49.7
Distance in miles from Adams			58.2	35.7
Distance in miles from Hood				61.2
Height above Sea Level in Feet	14,408	12,306	11,253	9,671
Area at 5,000 feet elevation Sq.Mls.	154.5	104.3	41.4	10.9
Volume above 5,000feet Cubic Miles	48.95	27.45	10.07	2.91
Volume - Rainier equals 1	1	.561	.206	.059
Volume - Adams equals 1	1.783	1	.367	.106
Volume - Hood equals 1	4.861	2.726	1	.289
Volume - St. Helens equals 1	16.821	9.433	3.460	1

IMPRESSIONS OF THE PHYSIOGRAPHY AND GEOLOGY OF THE SOUTHERN CASCADES, WASHINGTON

Ray C. Treasher

The southern Cascades area of Washington is the "forgotten land" of geology. The purpose is to here set forth a resume of existing ideas, add a few observed data, and point out some of the problems which need careful study for their solution.

The westside drainage is expressed by the master streams, Cowlitz, Toutle, and Lewis. These streams show evidence of a former deepening of their channels, subsequent filling with glacial outwash from Mt. Rainier, St. Helens and Adams, a partial re-excavation of the old channels, and some new cutting. South of the Lewis, the drainage pattern trends southwest, then to the south, illustrated by the Washougal, then Wind, Little White Salmon, White Salmon and Klickitat Rivers. East of the Klickitat, no major drainage enters the Columbia until the eastward flowing Yakima River is reached. All drainage in the area finds its way to the Columbia.

The Cowlitz officially begins a few miles east of the town of Packwood (marked "Lewis" on old maps) where three main tributaries join it. Ohanapecoch River, a glacial stream heading on the east side of Mt. Rainier, Summit Creek and Clear Fork heading in the Cascades. The canyons are steep and precipitous representing vigorous youth. Below Packwood is the "Big Bottom" area, the valley quickly changes from a youthful gorge to a wide, flat bottomed region, with the valley walls rising sharply from its edge. Below Randle the valley again widens, and at Toledo, its channel turns abruptly southward. These conditions suggest strongly that the valley was once deeper and has since been filled and choked with the glacial outwash. Below Mossy Rock, the river has cut deeply into this fill, the bottom of which is not exposed. The stream swung from side to side, and in places cut downward along the contact of the fill and the valley wall. As its main erosive power was downward, it frequently entrenched itself in the valley wall where it now flows instead of in the more easily eroded fill.

But why should the Cowlitz so abruptly change its westward direction near Toledo and flow southward instead of westward or northward? The gravel fill at this point has an elevation of from 450-500 feet and represents the divide between the Cowlitz and the Chehalis. It is not difficult to imagine that at one time, when the river was at this level, it flowed northward and joined the Chehalis which either flowed into Grays Harbor or may have continued northward to Puget Sound. South of Toledo there are well defined terraces at various levels, and one level is clearly expressed below Castle Rock with an elevation of 350'. With this thought kept in mind, the next stream is the Toutle.

The Toutle heads beyond Mt. St. Helens, flows past the north side of the mountain and out to the Cowlitz, near Castle Rock. The upper end of the river has been dammed by glacial outwash from Mt. St. Helens, producing the beautiful Spirit Lake. A few miles below this dam, we again find the same conditions as in the Cowlitz, the valley floor is wide and flat, the valley walls rising sharply. The gradient of the stream is high but there is so much material to move, and being added to its load that it has difficulty in establishing a channel. Tributary drainage plunges out of the walls and then struggles for miles along the edge of the fill before it can enter the main stream, giving further evidence of the valley fill.

Below the junction of the North and South Forks are some well developed terraces, the highest having an elevation of 500'. It is suggested that at one time the stream flowed into the Cowlitz via Silver Lake, the Lake being a remnant of the old Toutle channel. Silver Lake now drains eastward to join the Toutle above the Gorge. Then for some reason the Toutle abandoned this channel and cut a new trench through what is known as "The Gorge". No explanation can be offered here as to why this occured.

It is interesting to note that the elevation of Silver Lake and the adjacent valley fill is about 350' which might have some connection with the 350' terrace of the Cowlitz below Castle Rock.

The Lewis River(north fork)heads on the north side of Mt. Adams, flows mainly westward, receiving no sizable streams until the Muddy Fork is reached. This tributary heads north of Mt. St. Helens, flows southward and enters the Toutle through a sizable gorge. Farther down sizable tributaries enter from the south, Siouxon(pronounced Su'-sonn), and Canyon Creek. The East Fork does not join the North Fork until just before the Columbia is reached. The Lewis also has a well developed system of river terraces. Below the Muddy, the north side of the river is bordered by steep walls of glacial outwash, capped by lava, best exposed in Swift Creek and Pandemonium Creek, indicating that the stream was once several hundred feet higher than at present.

Some interesting discoveries were made during the construction of Ariel dam and have been recorded by Ira A. Williams. At the damsite, drilling showed an old gravel filled channel of the Lewis, extending down to -80', meaning 80' below sea level. The river is now excavating along that line. To the north and at a higher elevation, old channel was discovered, much broader and not nearly as deep. These channels are now submerged beneath the waters of Lake Merwin.

The definite information given by the drilling at Ariel, the indications in the Toutle and Cowlitz, all point to a former elevation of the area, and subsequent depression. These features may tie up in some manner with the submerged canyon of the Columbia and as it is the lower portions of these streams which show deepening, it may be that the hinge line was somewhore in the high Cascades, out in the Pacific or both.

Wind River, Little White Salmon, and White Salmon have also developed terraces. Some of these are caused by intracanyon flows. Other terraces may have been caused by these flows, or it may prove that they have some correlation with the terraces of the Cowlitz, Toutle and Lewis.

There are apparently many similarities between the geology of Oregon and Washington, which is one reason why we are interested in the "Oregon Country" rather than Oregon alone. The Eocene of southwestern Washington is expressed by marine and brackish water sediments, tuffaceous in part, containing coal seams. Weaver, Tegland and others have done considerable work on the marine phases of the Eocene Cowlitz Group, the Oligocen and Miocene sediments. Oligocene sediments do not seem to extend southward of Vader, which is west of Toledo, so we are concerned only with the Eocene.

Interbedded with these Eocene sediments are basic lava flows and agglomerates. They have not been definitely traced east of the Cowlitz River to any extent, altho recently Weaver suggests a broad synclinal Eocen basin under the present Cascades, similar to the synclinal basin indicated by Hodge for the Oregon Cascades. On top of these sediments, as we go eastward, are andesites and agglomerates, seeming to get more acidic as Mt.St.Helens is approached. No recognized Eagle Creek sediments have been located. Intruded into this mass, was the Tertiary granatoid batholith, now exposed in the Silver Star area, in Coe Cr. at Spirit Lake, on Goat

Mt., north of Green River, underlying Mt.Rainier, and at Snoqualmie Pass. This batholith has apparently had some bearing on the mineralization of the area.

Later, volcanic activity expressed itself in Mt.Adams, St.Helens and Mt. Rainier. These piles of andesitic lavas and pumaceous ejectamenta were built up on top of the old topography and a certain amount of activity is still evident.

There has been considerable effort to develop the mineral resources of the Mt.St.Helens area, without any great success, to date. Winchell and Zapfee examined the region in 1912 and 1913. They found that prospecting had proceeded vigorously but were greatly discouraged by what they observed. Winchell cited resons for his belief that the area was not promising and even went so far as to state that no experienced prospector would have tried to develop the area. There are sizable prospects on Green River, the principal mines being the Polar Star, Minnie Lee and Insurance. Near Spirit Lake considerable work was done on Coe's Mine, Lang's Mine, and on the Commonwealth Mine near Meta Lake. The latter property is about 6 miles from Spirit Lake and a road was started from both ends to truck out the ore. Ores are mainly copper, chalcopyrite being the principal mineral, of economic importance. Iron Pyrite is well developed, some sphalerite is seen in a few specimens. The Washington Geological Survey has recently reexamined the area and submitted a more favorable report. Some careful mine examination and a real mapping should be done however before any extended development is attempted. The entire history of mining north of the Columbia to the Cispus(Cowlitztributary) is rather discouraging, altho some interesting placers have been developed on McCoy Creek.

The geology of the Mt.St.Helens area itself, is rather interesting. Investigators such as Williamson, Jillson and Williams have recorded features from which the following deductions are drawn. The region southwest and south of St.Helens had considerable relief. The same period of glacial melting which is evident on other glacier fields filled the valleys with a deep deposit of glacial outwash, to a level a couple of hundred feet above the present Lewis River. Considerable time elapsed, enough to grow a forest with trees of 5' diameter. A period of lava flows followed, engulfing the forest and covering a large part of the glacial outwash. This lava flow was in comparatively recent times as vegetation on it is scrubby and scanty, known locally as the "jack pine flats". The lava extended down the canyon of the Kalama to the vicinity of the falls, dammed the drainage of the southwestward, forming Merrill Lake and the ephemeral Grass Lake which caused the Pandemonium Creek blow-out. In places, lava tubes were developed, resulting in lava caves of considerable size.

Merrill Lake has no visible outlet but is thought to drain into the Kalama. In this region are numerous tree casts, some horizontal, some vertical with the root casts well developed, and extending through the lava to the underlying gravels. Water runs along this contact and Williamson and Jillson both report hearing water trickling at the bottom of the tree wells, and the former claims he actually baled water out of them, making them wells in more than one sense of the word. Specimens of well charcoalized wood were obtained from these casts.

Above Ole Perterson's Ranch is the famous lava cave, 50' high and a mile long, an ancient underground lava channel. This lava is well exposed at Pandemonium Creek where it appears to be fresh enough to have been cooled yesterday.

On the east and north sides of St.Helens are thick deposits of pumice which buried a forest in the Spirit Lake vicinity. Here are tree casts of a type different from the Lake Merrill ones, formed by pumice packing around the trees, which have since rotted out. One of these casts is well preserved at the Spirit Lake Ranger Station. The area to the north and east is heavily blanketed with this pumice which reminds one of the Crater Lake deposits. When dry, this pumice gives the country the name of "the country where the rocks float".

Volcanism has been evident into historic times. The eruption of 1842-43 is one of the most authentic, the glow from the crater illuminating the country side for miles and depositing half an inch of ash at The Dalles. Another eruption is recounted with fairly reliable accuracy for 1853, with a light ash fall at The Dalles. There are many other instances, some of them quite recent, but their authenticity is somewhat questioned, as forest fires can produce ash falls, glows from behind the crater resembling eruptions, and heavy smoke clouds can look much like a dust explosion. There is plenty of evidence which may be accepted, showing historic activity of the volcano. There are one or two "hot spots" on the mountain side, one of which is reached from Butte Camp. At times, the crater gives off noxious gases. During construction of the lookout house, the construction crew of the U.S.Forest Service had to leave their tent in the crater in a blizzard because the fumes drove them from their shelter.

There is little readily discernable evidence to indicate that the glaciers on Mt. St.Helens ever extended much below present timber line. However, careful study may show such evidence buried under the present heavy mantle of outwash material.

In summary, it is suggested that prior to and during glaciation, deep canyons were excavated by the major streams. These canyons were partially filled during an epoch of rapid ice melting, when the streams carried great volumes of solid material. The westward side of the Cascade foothills were submerged at least 100' or more, which allowed a greater than normal valley fill to at least the present 500' elevation mark. At this time the Cowlitz may have flowed northward from Toledo, instead of southward, and it is thought by some that even the Columbia continued northward from Kelso-Longview along the Cowlitz channel, to Puget Sound; later being blocked off and spilling over the Coast range to form the present channel. The Toutle drained to the Cowlitz, via Silver Lake. The area has been mineralized by the intrusion of the Tertiary batholith, but to what extent, has never been carefully determined. Recent volcanic activity has modified local features, producing caves, tree casts, diverted drainage, the activity extending into historic times.

It represents a practically virgin field for the research and economic geologist, a region with scenic beauty second to none, recreation possibilities of the first class, and a possible producer of mineral wealth.

ON THE PERPLEXITY OF A GEOLOGIST SEEKING TO DESCRIBE HIS OBSERVATIONS DURING AN ASCENT OF FOG - BOUND MT. ST. HELENS

By Arthur M. Piper

When layman first brushes elbows with professional geologist, he is supposed to recoil in awe from that strange omniscient being whose X-ray eye, according to report, can penetrate the "bowesl of the earth" at will and read, its complex composition and formalities and technique such as accompany the surgeons probe and scalpel. But any member, of two weeks standing in the Geological Society of the Oregon Countryhas learned the stuff of which geologists are made and finds it strangely familiar: eyes that are quite human, merely shielded by a colossal "front". Being thus unmasked, a geologist in the Society is stripped of his favorite weapon, a convincing manner.

When that geologist ascends fog-bound St. Helens in the company of four witnesses, as described ably by Carl Richards in another paper, he is hard put to describe his observations in any manner, convincing or otherwise, for most of the time he could see exactly what his companions saw: "relatively" little and that little "of doubtful significance". But the Business Manager of the Geological

News Letter is insistent for space-filling comment(also he is one of the witnesses to the geologist's observation). Thus, let us "much ado about nothing", proceed to the summit of the Peak, and, as we descend, fogged in body and mind, make searching observations galore.

First, let us consider the rocks. The summit area includes a relatively flat snow field about a third of a mile across surrounded, on all sides except the southeast, by a line of small rock knobs. The highest knob, 9,671 feet above sea level, is at the southern edge of the snow field. In all these knobs the rock is alike: fine-textured felsitic andesite, containing scattered small feldspar laths, light lead-gray where fresh but with a mottled pinkish cast on weathered faces. Clearly it is an extrusive type, yet more compact than one might expect at the apex of a volcanic peak. Were the snow field absent, we probably would see this rock forming a thin serrate rim about a pit several hundred feet deep, by inference a crater pit modified in form by alpine glaciation.

From the rim, the route of descent, for about 3,500 feet in altitude, leads northeastward toward Spirit Lake down a slope of snow and glacial ice which is broken by several elongate arretes, rock ribs parallel to the general route. The one rib that was traversed, the Big Lizzard, appears to be largely a complex of dikes and discloses at least two noteworthy rock types: (1) dense lead-gray to black porphyritic andesite, in part of sub-granitoid texture, and (2) friable porphyritic andesite that comprises plentiful corroded feldspar crystals embedded in an inflated matrix. In color, the latter rock ranges from dark lead-gray to grayish maroon. Its most inflated facies are almost pumiceous. The general host rock is not exposed but from detritus it is inferred to comprise felsite such as forms the summit rim and light gray pumice. The rocks thus far described are inferred to form the central and older part of the peak. Tentatively, we may infer the pumice and felsite to be disposed in alternate conical shells centered about the initial crater, the dike rocks in subvertical radial ribs.

Other rocks, probably younger than those just described, occur on the north slope as much as 7,500 feet above sea level, or higher. To the east of the route of descent, a cliff exposes successive layers of dark extrusive rock and maroon ejectamenta. Detritus on the glacier suggests these to be glassy vesicular basalt and basaltic coria or clinker, respectively. Some of the basalt detritus has the ropy or pahoehoe texture. To resort again to tentative inferrence, these basic volcanics probably broke out on the flank of the peak long after the extrusion of andesite had ceased. Even so they long antedate the lavas that are reported to have erupted from the peak in historic time.

The lower slopes of the peak, below an altitude of about 6,000 feet, are heavily mantled with fragmental material. Along the route of descent down to about 5,000 feet this is largely coarse blocky glacial detritus forming lateral moraine at either margin of the glacier. Still lower, to and below timberline camp at about 4,000 feet altitude, the fragmental material away from the moraine appears to be wholly pumice such as forms the broad apron along the south and west margins of Spirit Lake. It is conjectural whether this apron of ejectamenta was placed largely by mud flow during volcanic eruptions or by outwash from glaciers since volcanism has ceased.

These rambling observations would not be complete without some comment on the carpet of coarsely-crystalline snow and plumes of ice crystals that covers the summit snow field, or on the glacier that descends the north slope of the peak, and afforded the route of ascent and descent. The characteristic features that make the study of an alpine glacier so fascinating all are well disclosed: fresh snow and neve grading into glacial ice with its peculiar bluish snow; crevasses as much as 75 feet deep and 10 feet or more across, alined across the direction of glacial advance and localized about sharp changes in gradient of the bedrock floor; craggy angular seracs where the ice tongue is sheared against a rock buttress; lateral moraines of typical heterogeneous composition; and the motely array of scattered boulders and glacial tables. At present the surface of the glacier is as much as 75 feet lower than the crest of the lateral moraines, indicating a commesurate thinning of the lower part of the ice tongue in recent time. Even so, it would not be surprising if the shrunken ice tongue were still several hundred feet thick on the higher slope of the peak.

Very likely the reader will wish to amplify these comments by seeing the ground himself. If so, may the caprice of fortune give him clear weather for the ascent.

In our daily newspapers there are many items of interest to a geological society. In this issue of our bulletin we are running a new column, edited by Mr. Schminky. In his column he will give condensed accounts of items which have appeared in recent issues of the newspapers. This idea was original with Mr. Schminky, if you like it and have items from out of town papers, turn them over to him so he can include them in his column and we can all enjoy them.

OUT OF THE DAILY PRESS

July 26

An article from Newberg, Oregon, states that a man swimming in the old Hoover swimming hole on Chehalem creek recovered a set of ox horns with a spread of more than three feet. What a find this would have been for some future geologist.

A newly discovered star has a diameter of only 4000 miles, yet it weighs 620 tons per cubic inch and has a gravity pull 3,400,000 times stronger than the earth, according to Dr. G. P. Kniper, of Mount Wilson Observatory. The compactness of this small body is explained as being due to the breaking down of the atom at extremely high temperatures - 28,000 degrees in this case.

July 27

Charles E. Stricklin, state engineer, is making a study of the flow of water in Dry Creek in northernUmatilla county. This was a dry stream until the recent earthquake. May we suggest a WPA earthquake for the drought area of the midwest?

H. R. Staats, former superintendent of the Jessie M. Honeyman state park, was quoted in an interesting article on the origin of the many freshwater lakes among the coast sand dunes, by the News-Telegram. The gist of Mr. Staats' theory is that the sand dunes block the natural direct flow of streams into the sea causing the lakes to form behind or between the dunes.

An editorial in the Journal headed "The New Oregon Crop" dealt with the value of a field survey of the mineral deposits of the Northwest inaugerated by Col. T. R. Robins, to furnish reliable information on the available economic mineral supply to prospective users of Bonneville power.

Robert E. Millard, local astrometer states that the rings of Saturn are again visible to small telescopes. During part of June and most of July they were edgewise to the earth, causing the plaet to appear to be pierced by a glowing needle. This phenomenon occurs only once every 15 years.

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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LECTURES

Sept. 11, 1936 (Friday) - Dr. Arthur C. Jones will address the Society on "The Uses of Minerals in Medicine". It will be very interesting to learn how the ingenuity of man has discovered and extracted medicinal substances from the crust of the earth.

Sept. 25, 1936 (Friday) - Mr. Donald K. MacKay will address the members of the Society on the "Geology of the Great Smoky National Park". We are glad to welcome Mr. MacKay to Portland. He is the resident Geologist for the National Park Service. He has recently spent considerable time in the region of the Great Smoky Mountains in Tennessee and North Carolina, where the Geological Field Work has just recently been completed. The lecture will be supplemented by very interesting slide illustrations.

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TRIPS

Sept.5-6-7,1936(Sat.Sun.Mon.)-Mt. Adams and vicinity
Leader: Ray Treasher.

Sept. 27, 1936 (Sunday) - Mr. Hood buried forests and Little Crater Lake,etc.
Leader: J. R. Collins.

Oct. 10-11, 1936(Sat. & Sun.)-North and South sides of Lower Columbia River
Leader: Claire Holdredge.

Oct. 25, 1936 (Sunday) - Eagle Creek
Leader: Joseph Wimmer.

Dr. David B. Charlton of Charlton Ford and Sanitary Laboratory and Professor G. W. Gleeson, Assistant Professor of Chemical Engineering at Oregon State College met with our luncheon club, Thursday August 6th.

Professor Gleeson gave us an interesting five minute talk on pollution in the Willamette River. He stated the river above Cottage Grove showed very little pollution. The water as it reaches Portland could well be defined as heavily polluted, although without the addition of the Portland wastes, the water would not be totally depleted of its dissolvdd oxygen.

A study of the bacterial condition of the river led to the conclusion that throughout the larger portion of the river within the Portland city boundaries, the bacterial count is exceedingly high at low-water periods. The condition in this respect appeared to be worse than in previous studies, Gleeson reported. If bathing in the river is considered unsafe anywhere above Portland, It would certainly be dangerous at Sellwood and all points below, he said.

Samples of water on which tests were made were gathered by Gleeson in cooperation with the city harbor patrol during the low water period in the fall of 1934. The critical period, he says, continues not more than about three months each year.

The test samples were taken at seven different stations from Sellwood north, at three different depths at each station, and on eight different dates. They showed the worst pollution existing between the Kerr-Gifford mill and the lower end of Swan island. Here for 2.7 miles the dissolved oxygen content reached zero. For 7.6 miles the dissolved oxygen was found to be less than 30 per cent of saturation, the limit of tolerance for sensitive fish.

It takes about 7½ days for the water of the river to pass from the Sellwood to the Multnomah channel during this period, Gleeson found.

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WITH DR. CHANEY IN EASTERN OREGON

"With earth's first clay they did the last man's knead,
And then of the last harvest sowed the seed.
Yea, the first morning of creation wrote
What the last dawn of reckoning shall read."

The last week in June, the writer and A. W. Hancock turned the leaves while Dr. Ralph W. Chaney and Carlton Condit, graduate student, read the fossil record in the rocks of Eastern Oregon.

It was about 5 P.M. June 24 that our party pulled into camp on a tributary to Pine Creek about one half mile north of the Oil Well east of the Clarno bridge. Without waiting to unload the camp equipment we climbed the hill to the seed fossil bed so well known to all members of the Society who took the 1935 Eastern Oregon trip. A few specimens of nut fossils were found and we returned to camp between 7 and 8 o'clock leaving our tools on location.

Canned hash bread and coffee tasted fine and we washed our dishes by flash light and unrolled our beds without even that much illumination. In bed the inequalities of the ground slowly eased themselves into our frames as we squirmed ourselves to sleep.

A few minutes later I heard Hancock fussing around the stove and looked at my watch. It was 3:15 A.M. At 4 o'clock we were on our way back to the seed fossil bed and before noon the four of us had cracked as many rocks as the Kelly

Butte gang can change from big ones to little ones in a week. An excellent collection of fossil seeds was secured for Dr. Chaney to study. This outcrop lies in the SE corner of Sec. 27 T. 7 S, R. 19 E., W. M. the rock is a fairly hard volcanic breccia, strike northeasterly 35 degrees. The formation is just below the red beds which divide the Clarno from the John Day.

After lunch in camp and a mid-day siesta. About 2 P.M., Hancock, Condit and I visited the leaf impression bed on the east side of the creek valley while Dr. Chaney caught up with his correspondence and then explored some of the side draws for new outcrops. One particularly fine cycad stem with complete leaves on one side and the stem end of the leaves in place on the other side was found. Dr. Chaney was much pleased with this specimen and did not trust it to the express company for shipment to Berkeley but carried it with him to Seattle.

This bed lies in the N. W. ¼ of Sec. 35 T. 7 S., R. 19 E. W.M.

Dr. Chaney said that the present cycads are found in the tropics and well up into Mexico. They are not particularly moist locality trees being found growing in the hills as well as the low lands.

Friday morning we were out of bed at 4 A.M. and after bacon, eggs and coffee we made another scouting expedition for leaf impressions.

About 10 o'clock camp was broken and we moved to Madras and Turk Irving's service station. No trip to Eastern Oregon after fossils is complete without a stop at Turk's. The Madras Virginian was ready as usual to act as guide. Dr. Chaney called his friend Phil Brogan at Bend on the 'phone and the Bend paper stopped its presses while its Editor started for Madras. By the time we had eaten dinner Phil Brogan was on hand and we drove to the leaf fossils on the new grade between Madras and Warm Springs Agency. Here specimens of Poplar, Box Elder, Maple and Wild Cherry leaves were secured.

Dr. Chaney pronounced this fossil flora to be the first of Pliocene age to be found in Oregon.

The Doctor's excitement was evident. Phil Brogan whose enthusiasm for the study of Oregon Geology is as great, if not as apparent as is that of Turk Irving's was visibly affected. Turk, in his excitement almost swallowed a chew of tobacco and was forced to stagger up the hill to the water jug. Dr. Chaney told us that his first order of business after taking the boat for Alaska on July 1st would be to write a paper on this Pliocene flora.

We were back in Madras before dark and after an excellent dinner in the resaurant adjoining Turk's servic station we spent the night in the hotel.

Saturday morning we were called by the clerk at 4 A.M. and before 5 o'clock we started under the guidance of Turk Irving for a new fossil bed near Grizzly. A rancher had tapped the stratum while digging a post hole. Dr. Chaney said the flora was from the Bridge Creek horizon, Oligoceneor lower Miocene in age.

The next stop was at Gray Butte where the bed visited by the Society on its Madras trip was inspected. Time was getting short for Dr. Chaney and after recording the location and collecting a few samples which the Doctor said was of Clarno Eocene age we returned to Madras. After packing several boxes of specimens for express shipment to Berkeley, Dr. Chaney and Carlton Condit left for Redmond and Mitchell then north to Ellensburg, Washington and Seattle.

Hancock and I decided that Gray Butte needed more investigating so we returned about noon and Hancock was fortunate enough to find and excellent Aralia leaf impression and a stem with four blossoms on it. I was lucky enough to find an interesting seed fossil not yet identified. About 1 mile squth was another new outcrop of fossil bearing shale which had been discovered by a friend of Turk Irving's. We visited it also. The flora was apparently of Bridge Creek age.

Saturday night we camped near a John Day Exposure not far from Gateway. The next morning being Sunday Hancock over slept and we didnt get out of bed until 5 o'clock A.M. After a hurried breakfast we hunted for a 3-toed horse without success until nearly noon and then headed for Portland by way of the Old Mecca Grade and the Warm Springs cut off.

We had spent four wonderful days in the fossil hunters paradise with an international authority on paleobotany who loves his work and who with his companion were as delightful comp companions as could be wished.

Hancock and I came home happy.

A. D. Vance.

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EXHIBIT OF JULY 10TH

A very timely exhibit was arranged by Mr. Arthur M. Piper in connection with Mr. Ray Treasher's interesting talk on the geology of Mt. St. Helens. This presentation consisted of some thirteen specimens of rock gathered on the recent hike on Mt. St. Helens and all were carefully cut to the desirable size for museum specimens. Also an item greatly appreciated by the Society were the cards included with each specimen which identified and explained the presentations. Included in the exhibit were:

Seven	specimens	of Porphyritic Andesite
Two	"	" Scoria
One	specimen	" Vesicular Glassy Basalt
"	"	" Basalt Pahoehoe
"	"	" Pumice
"	"	" Felsitic Andesite

Mr. A. W. Hancock also exhibited an extraordinary group of fossil leaves and flowers which he recently found in the Gray Buttes in central Oregon. There were nineteen flower and leave specimens on display and one of the leaves has been definitely identified by Dr. Ralph W. Chaney as an aralia. Of even greater interest was the fossil leave specimen from the Deschutes Canyon near Madras, as these leaves were the first of the Pliocene period ever found in Oregon. Dr. Chaney identified them as aspen. Two fine specimens of cycad leaves were displayed by Mr. Hancock which he discovered over in the Clarno district.

F. S. Olaine.

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All members of the Geological Society of the Oregon Country are of course familar with the "Engineering Geologist" (Dr. Hodge, Claire Holdredge, et al) and their important niche in both the geological and engineering worlds. However, our members may not be so familar with the term "geological engineer". This animal often clashes with the "engineering geologist" for, after all, each combines geology with engineering design and construction, one specializing in geology, the other in engineering. These spcies came together with locked arms and superlative compliments such as had never been witnessed since the settlement of the Oregon Country. The occasion was the sixty sixth Annual Covention of the American Society of Civil Engineers held July 15 to 18 at the Multnomah Hotel. The Portland Local Section were hosts and did they put on a real show for the nations engineers and the Societies geologists! The ladies were treated to skyline drives, tea parties, box luncheons, the Mt. Hood Loop, Cloud Cap Inn and a visit to the Grotto, while their husbands, sweethearts and sons feasted of knowledge on many technical subjects concerning the Oregon Country. All enjoyed a dance and the annual dinner where the Stevens, Riley team put on a stellar performance that few who attended will ever forget. J. C. Stevens, Vice President of the Geological Society of the Oregon Country, and past Director of Civil Engineering Society, Chairman of Hydraulic Research Committee and Nation consultant was Chairman of the convention and toastmaster of the evening. By the time the toastmaster had finished his oratorical introduction of Frank Branch Riley neither engeneer or geologist could think of any but kindest words towards his fellowman.

In old trouper fashion Frank Branch Riley then took the audience into nature with the birds, flowers, streams, trees, mountains and rocks with his fluent tongue and awe inspiring color pictures.

An all-day trip to Bonneville included a "fish fry" engineered by a native "tar heel" and served by Jack Luihn, Manager of Sealy Dressers, a trip on the dam catwalk over the rushing columbia and stops along the Columbia River Highway.

Other trips permitted visits to Grand Coulee and the Portland U. S. Engineer hydraulic laboratory where Bonneville models and a transparent wall dredge pump model were demonstrated.

Prominent members of the Geological Society serving among the host were:

J. C. Stevens	Convention Chairman
Geary Kimbrell	Finance Committee
Sam Murray	Finance Committee
Ray MacKenzie	Excursion and Publicity Committee
Ken Phillips	Excursion Committee
Jesse R. Henshaw	Registration and Publicity Committee
P. H. Bliss	Publicity Committee and City Editor of Convention Daily Bulletin
H. O. Westby	Ass't. in charge, Linnton Hydraulic Laboratory

Other members of Geological Society in attendance at the convention:

Dr. E. T. Hodge
L. E. Kurtichanof
C. P. Richards
Claire P. Holdredge
A. M. Piper
O. R. Bean, Honor Guest at banquet

(Ray MacKenzie)

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EXHIBIT OF JULY 24TH

Mr. A. W. Hancock, our genial and enthusiastic Exhibit Committee chairman, came to the rescue at this meeting with another of his own interesting exhibits when in the last minute one of our members was unable to attend with the exhibit planned.

By far the outstanding specimen was the first showing at one of our meetings of the now famous wonder of modern geological discovery, a leoite, which was named in honor of its discoverer Mr. Leo Simon. This was first found by Mr. Simon on the Warm Springs trip of last year. It is understood that Leo has under preparation a paper which he will soon present before our Society explaining the tremendous possibilities of Leoite to the commercial world, and of the numerous honors bestowed upon him since its discovery.

Also displayed were a group of nine spherulites found in the Deschutes Canyon below the Warm Springs Indian Reservation. From Iowa were three exceptionally specimens of crinoids.

F. S. Olaine

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MOLALLA TRIP - JULY 26TH

Coal, fossil leaves tuff, tuff agglomerates, andesites, clay, elephant teeth --these words tell a short story of a very enjoyable trip into the Molalla country, which according to Harry Clarke, trip leader, is pronounced MŌ' - lal - la. 16 cars left the meeting place at 6th and Yamhill and sped out over the Super-Highway ot Oregon City, then towards Molalla.

Our first stop was 24 miles out, between Oregon City and Molalla, which was called for the purpose of getting a generalized idea of the area. Dr. Hodge explained the Troutdale alluvial fill, over which we were to travel, and see exposed at various points. He pictured to us a condition requiring volcanoes which erupted ash and tuff streams carried this material away as quickly as it was ejected, and because they were clogged with the load, it was spread out in great alluvial fans. This condition continued, and the alluvial fans spread, coalescing, and forming a great piedmont alluvial fan which ultimately covered the entire area to the westward. The Portland Hills were probably nearly buried, and the material spread into the Tualatin Valley. Similar conditions prevailed from well into Washington, southward to Salem, producing the Troutdale formation. Intercalated andesite flows are numerous and probably came from local vents and are of local extent. The streams then cut rapidly into this easily eroded material, forming deep canyons which give the impression of great age and considerable erosion, but really are the result of a comparatively short time. The lateratic soils, deep red in color, have been classed as basaltic, when in reality they are decomposed andesites, which weather rapidly, the iron becoming dehydrated forming hematite, and giving these soils the characteristic reddish color.

The road cut at which we stopped presented some interesting features. Great rounded boulders were noticable. Dr. Hodge explained that the andesites weather rapidly along the joint planes, producing these rounded (exfoliated) boulders by hydration, and not by the action of running water. These rounded boulders may roll into a stream bed where they are re-placed by running water, giving the impression that they had travelled far and represented considerable fluviatile erosion. He pointed out that in our western streams we should be careful to not too hurriedly conclude that all rounded boulders are the work of the stream, - they may be the work of weathering. This particular outcrop was deeply weathered, so much so that our brief examination did not permit any definite conclusions. It may be that the boulders were blown from some volcano and came to rest in an ash bed. Conclusions were left to later investigators. A mile or so farther on we looked at an exposure of beautiful columns, horizontally as well as vertically jointed, appearing as if the rocks had been laid up by a stone mason (union labor, of course). Although andesites usually do not form such excellent columns, it was the opinion that this exposure probably represented andesite.

At Molalla we stopped to organize the party, allow some of the late risers to lay in a full supply of food, ice cream, candy bars, and local atmosphere. Then southward, and all too soon onto a gravel road, with its attendant dust. It was suggested that in the future, the lead car carry a calcium chloride sprinkler to lay the dust for the rest of the party. Harry called a halt adjacent to a logging railroad. We were to hike 1½ miles to an exposure of coal and fossil leaves. Please note that it was 1½ miles. Harry said so, although there is plenty of evidence which could be presented by others who trudged and skipped the ties that 3 miles would be a much fairer estimate. We first dug into a cut exposing platy andesite. This structure is more or less characteristic of the type of rock. Dr. Hodge explained that it contained crystals of andesine and oligoclase(plagioclase) feldspars, beautifully twinned, hornblende, augite, and chlorite, among others too microscopic to see under the ordinary glass. This rock makes poor road metal. It is soft, breaks poorly, and has sharp edges which can quickly damage tires. The outcrop had the appearance of a bedded deposit. Had weathering proceeded to considerable extent, it would have been difficult to positively identify it as an altered igneous rock, instead of a bedded sedimentary. Another warning to amateur geologist against making too hurried deductions about things they see.

And so up the track. Many exposures called for considerable discussion. The first cut called forth a debate as to its interpretation, Hodge, Mayfield, Holdredge and others contributing. Tuff concretions were located, many of them with hollow centers. Farther on, some excellent petrified wood. Our objective was a large cut which exposed a four foot bed of coal. A beautiful fault was observed on the westward end of the cut and an attempt was made to determine whether the movement was up, down, or horizontal, or a combination of all three. Mr. Holdredge suggested that the material appeared to be older than Troutdale, and that it might be Upper Eocene or Oligocene, correlating with the Cowlitz Group (Tejon of Upper Eocene) in Washington, or Eagle Creek (Warrendale) of Cascade Locks. Treasher located some fairly well preserved leaf fossils in the adjacent sediments and an examination of the rocks showed that it contained abundant mica and quartz. Members of the party scattered to dig out their quota of fossils, concretions, coal specimens, and as the pangs of hunger were calling so loudly that they were audible, it was decided that perhaps we should discontinue our investigations for the present. Dr. Hodge and Dr. Mayfield were laying plans to come back and examine this spot, so you may be sure that it was of decided interest and importance.

Food occupied our attention for some time, in the cool shade, a welcome relief from the unsheltered blazing sun which had begun to "bite " and redden arms and necks. Perhaps noses should also be mentioned but I am informed that the well dressed lady never has a red or shiny nose.

Harry then led us to a deposit of clay. A hunter, chasing some game stumbled onto this material, which was worked for some time. The clay was used by pottery plants in Vancouver and Portland, but financial difficulties forced them into inaction. The clay was reasonably free from grit, and gave the appearance of a bentonitic clay. Economic clay deposits were discussed for some time by Dr. Hodge and Dr. Mayfield, and plenty of specimens went into the "ditty" bags for home examination. The cool clay pit was quite an attraction but it was getting late so we went back through Molalla to Dryland where we saw an elephant tooth which had been found locally. A leg bone had also been unearthed, but crumbled when it was excavated. It was suggested that perhaps the museum committee could make arrangements to secure this valuable specimen for our museum.

The party broke up at this point and returned to Portland as their conscience and sense of direction dictated. The Society is indebted to Harry Clark for his well arranged trip to this interesting area, which permitted many new ideas to be presented and which will call for additional study. Dr. Hodge, Mayfield, and Mr. Holdredge, and others are also to be thanked for their contributions. Methinks we shall hear from this Molalla area anon.

(RCT)

DIAMONDS IN AFRICA

Diamonds were first mined in India in very early times. They were discovered in Brazil in the early part of the eighteenth century. They were discovered in South Africa in 1867. From that time until 1914 South Africa produced about 26 tons of diamonds. Diamonds are found in small quantities in various other parts of the world. They are found in the Ural Mountains and in the United States they are found in Georgia, North Carolina, Arkansas, California, Wisconsin, Colorado, Virginia, Idaho and Oregon. In Africa they are also found in Rhodesia, the Gold Coast, Belgian Congo, Angola and what was formerly German Southwest Africa.

Most occurrences of diamonds are secondary concentrations in stream gravels or other sedimentary deposits but they have been reported found in pegmatite veins in India and in peridotite in Arkansas. In South Africa they are found in large quantities in a brecciated peridotite but it is not clearly shown that they orinated in this rock. They may have been picked up from older formations penetrated by the intrusive peridotite.

The value of diamonds is due to their scarcity, luster and hardness. They are the hardest known substance and have a specific gravity of 3.5. They have the property of not being adhered to by water. They are like grease in that respect and it is possible to concentrate them through heavier minerals on this account for they will fall through water faster than minerals having a higher specific gravity because, not being adhered to by the water, the water offers less resistence to the passage of the diamond through it.

The largest stone ever found was the Cullinan weighing 3105 carats or about 1 1/3 pounds. It was cut into 105 stones the two largest of which weighed 516 and 309 carats respectively. They are the largest cut stones in existance. Other large stones are the Excelsior weighing 969 carats, the Jubilee weighing 634 carats and the Imperial weighing 457 carats.

Some of the most famous stones are the Kohinoor wighing 186 carats, the Orloff weighing 194 carats, the Regent or Pitt wighing 137 carats, the Florentine or the

Grand Duke of Tuscany weighing 133 carats, the Star of the South found in Brazil and weighing 254 carats, the green diamond of Dresden weighing 40 carats and the Deep Blue Hope Diamond from India weighing 44 carats.

Diamonds were discovered in Belgian Congo and Angola about 1906 by a prospecting party sent out by a syndicate headed by the King of Belgium and a few other Belgium capitalists and a group of Americans including Thomas F. Ryan, Daniel Guggenheim, Harry Payne Whitney, John Hays Hammond and others. Development followed and when it was found that there were commercial deposits production was started. The deposits were found to be both rich and extensive and have been a source of revenue to the owners.

The diamonds are found in the beds of the streams in gravels and in gravel terraces bordering these stream valleys. They are also found in old stream gravels at the base of the Lubilash Formation of Triassic age overlying Pre-Cambrian metamorphics. These Triassic streams came from the northwest and may have gotten the diamonds from the metamorphics or associated intrusives or from glacial deposits. The glaciation occurred in Pre-Cambrian time and in the late Carboniferous and the glaciers moved from a point near the Transvall to the northwest. The ice extended much farther to the northwest than the diamonds are now found. However the peridotite in which the diamonds occur in South Africa is Cretaceous in age and therefore later than any glaciation and cannot be the source of diamonds in Angola and Belgian Congo.

The country in which the diamonds occur is from 1000 to 1500 miles from the coast by the route which was available in 1923. It was reached by way of the Congo River and its tributary the Kasai River. Freight and passengers were transferred to a narrow gage railroad at the mouth of the Congo. This carried them over the mountainous country around the rapids in the Congo to Stanley Pool. Here they were transferred to river boats which carried them about 500 miles up the Congo and Kasai Rivers to Kjoko Punda where they were transferred to trucks or oxwagons. This made transportation slow and expensive.

The country was covered with tall grass and scrubby brush except along the streams where there were patches of jungle. It was a country of low rolling hills above which rose an occasional higher hill or monadanock. It received a heavy rainfall during the period between the latter part of September and the latter part of April and was dry the rest of the year. As a result of these rains the country was well watered and large streams crossed it from south to north every few miles. These streams had cut down through the Lubilash sediments and were entrenching themselves in the underlying metamorphics.

The country was inhabited by native negroes and from these people the labor for working the diamond deposits was recruited. These people were very much like our own southern negroes. They came as volunteer workmen but they expected the white man to look after their welfare, protect them, settle their disputes, feed them and to be fair and truthful with them. If he was neglectful of any of these duties they would not remain in his employ. If properly handled they made excellent workmen but it was necessary for the white engineer to properly organize them into crews and to give them constant supervision. They were paid monthly in colonial currency and the money was immediately spent for commodoties such as clothing and salt at the company stores. It was necessary for the white man to learn to speak the native language and to conduct his work in this language.

In opening up the deposits along the smaller streams the engineer found from two to six feet of overburden and from a few inches to three or four feet of gravel. The diamonds were all in the gravel. He built washing and concentrating plants in which he used trommels, mechanical pans, Hartz jigs and Joplin jigs. The concentrates from the mill were hand picked by trained diamond pickers. The diamonds were then classified, counted, weighed and every ten days sent in to headquarters by native messengers. There was one white engineer to each mine and he was required to buy and issue food, keep time on all his workmen, direct and oversee all mining operations, keep his own records of production, etc., make out reports at regular intervals, train and direct his own servants and look after the welfare of all natives employed on his mine. He must train his own blacksmiths and carpenters and must saw all his own lumber with hand operated whipsaws. If anything was broken he must devise some means of fixing it for it took many days to get supplies or parts from headquarters and many months to get even the smallest things from Europe. Therefore the engineer must be adaptable to conditions that were utterly foreign to him and must be extremely resourceful in order to be successful in his work.

The mines were widely scattered and often it was many miles to another mine or group of white men. At first one white man might be alone for months at a time with his mail coming only at intervals of three or four weeks but later, as more development took place and as the mines were enlarged there was usually from two to several white men at each group of mines and transportation facilities between the mines and the headquarters post were improved.

The climate was tropical but the mines were located at elevations of from 2000 to 3000 feet and the heat did not become excessive and the nights were usually cool enough to require a couple of blankets. While the days were not excessively hot yet there was rarely a day when the temperature did not get above 85 degrees and it was always necessary to wear a sun helmet to protect ones head from the tropical sun. Everyone who went there became infected with tropical malaria for it was impossible to prevent it but quinine, if used intelligently, usually kept the disease under control. Tse-tse flies, the carriers of the dreadful sleeping sickness were present and it was impossible to keep from being bitten by them but in the district where the mines were located less than one percent of the flies were infected and the chances of a white man getting the disease were correspondingly remote.

Each white man went out to Africa under a contract which required him to remain there two years. He was required to work very hard under trying conditions and with little or no amusement. Each man would produce from fifteen to twenty thousand carats during his term. The diamonds averaged about 10 stones to the carat and nothing was saved that was less than about one sixteenth of an inch in diameter. It was profitable to work ground that produced as low as one half a carat per cubic meter.

By Claire P. Holdredge

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METEORITES

By J. Wimmer

A meteor has been defined as a body of solid cosmic material, which coming from somewhere outside in space, enters the atmosphere of the earth and passes through it with such speed that the friction produced makes it incandescent.

Calculations show that they are visible at an average height of 61 miles. They are first seen at a height of 76 miles and vanish at a height of 51 miles. Their average speed being about 27 miles per second. When a meteor lands upon the earth's surface it is known as a Meteorite.

It is commonly believed that the temperature of a meteorite is extremely high when it strikes the earth's surface. This however is not the case. One meteorite observed immediately after it struck the earth's surface in the month of July in Wisconsin had a covering of frost on its surface.

We are indebted to Eli Thomson, the noted American Engineer and Inventor for the explanation of the temperature of meteorites that they are not hot but cold when they strike the earth.

His explanation is as follows: "If the velocity of a body is high as compared to that of the earth, for example 30 miles per second, the resistance offered by the air in front of it may be great enough to break it into fragments, while the high temperature given to the air compressed in front of it melts and vaporizes the outer surface of the meteor amd its fragments. Thus the meteor is subjected to a highly heated blast of strongly compressed air. Magnetic oxide of iron which is formed by this burning of the metal in the oxygen of the air, is more fusible than the iron, and is swept back from the rapidly moving meteor as fast as it is formed leaving a trail of incandescence behind the meteor.

The energy appearing as heat is not transmitted to the body of the meteor as such, but is dissipated in the air along with the oxide layer continuously formed.

Before the meteor enters our atmosphere it has the temperature of the surrounding space, that is absolute zero or -460 degrees Fah.

Its flight through the air lasts but a short time so that the heat generated on the outside, though intense, does not enter its interior."

Meteorites are classified as Siderites or Iron Meteorites, Aerolites or Stony Meteorites and Siderolites which consist of both iron and stone.

Analysis of many meteorites indicates that they vary from pure iron to pure stone, so that the above classification does not definitely differentiate between the various types.

Iron meteorites contain a considerable amount of nickel and upon being polished show the curious Widmanstatten lines.

Meteoric iron is soft but extremely tough and very difficult to cut.

It was due to the cutting of a meteorite at the Washington Navy Yard that the idea of using iron-nickel alloy in battleship armor had its inception.

So far only one death is attributed to meteorites; that was in 1827 in India. A case is on record where in 1847 a forty pound meteorite crashed through a dwelling in Bohemia frightening three sleeping occupants and demolishing a part of the dwelling.

The characteristic general appearance of an Aerolite is a thin black crust which covers it, glossy like varnish. It is largely composed of oxide of iron and is always strongly magnetic. The crusted surface usually exhibits pits and hollows. These cavities are explained by the burning out of certain more fusible substances during the meteors flight. Upon breaking the stone it is found to be comparatively fine grained and usually made up of crystalline lumps and globules and has a considerable amount of scattered iron throughout the mass in grains as large as bird shot.

Analysis of meteorites shows that twenty-seven of the chemical elements, including argon and helium have been found to be contained in them. Many of the minerals found in them resemble the terrestrial minerals of volcanic origin and some are peculiar and not found on the earth.

The Siderites are believed to have been ejected from the sun or from a star. This opinion is based upon the fact that these meteoric irons are usually, "soaked full," of occluded gases such as hydrogen, helium and carbon oxides. These gases could only have been absorbed by the iron under a hot and dense atmosphere saturated with them - a condition existing only on the sun or stars.

Among the many interesting and important discoveries of Geological significance in the Oregon Country is the Willamette Meteorite.

This meteorite was found near the town of Willamette in the autumn of 1902 by two woodsman, one of whom, Mr. Ellis Hughes, still lives in the immediate vicinity.

At the time that this meteorite was found it was considered as the third largest in the world and the largest to be found in the United States.

Its lenth was 10'-3½", breadth 6'-6" and height 4'-3". Its weight was 15½ tons.

Originally it was much larger as is evidenced by the large cavities due perhaps to terrestial erosion and solution as well as a large quantity of flaked material surrounding the body on the surface of the earth.

At the time of its discovery it was partially buried in the earth with its base uppermost. The projecting part being about 18 inches above the earth's surface. The apex of the truncated cone which it resembles was buried.

The total circumference of the base was 25'-4".

Cavities as large as 3' long and 10" to 15" across with an average depth of 16" were contained in the meteorite. Their widest opening was toward the apex of the cone, i.e. in the direction of flight.

It is said that this celestial visitor represents a fine example of a mass escaping fracture and dissipation. On the forward side there were hollows, pits and grooves, caused apparently by the frictional effect of the air as it entered our atmosphere.

In this connection it might be interesting to note that at a speed of 20 miles per second at a height of 10 miles, the pressure exerted on the forward face of the body would be approximately 3.5 tons per cubic inch. This pressure would easily tear away the softer material which in all probability filled the cavities of the Willamette Meteorite.

The exact location where it was found is in Clackamas County, T2S - R1E of Willamette Meridian Lat.45° 22'N - Long.122° 35' W. on a hillside, in a level area on the north side of, and 3 miles above the mouth of the Tualatin River on the land formerly owned by the Portland Land Company.

Mr. Hughes, assisted by his son moved the meteorite from its original spot to his own land approsimately three-quarters of a mile away. This operation began in August 1903 and took about three months of incessant toil.

After the meteorite was moved to its new location on Mr. Hughe's farm, replevin proceedings were instituted by the owners of the land upon which it was found. After considerable delay and much litigation the meteorite was bought by Mrs. William E. Dodge and 1906 presented to the American Museum of Natural

History, New York City where it now rests.

This meteorite belongs to the Octahedral group, division 56. The following are two analysis of its composition:

Iron	91.65	91.46
Nickel	7.88	8.30
Cobalt	0.21	---
Phosphorous	0.09	---

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OUT OF THE DAILY PRESS

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H. B. Shminky

August 2, 1936

A new machine ivented by Dr. Charles Snowden Piggott, of the Carnegie Institution, for the purpose of obtaining samples of earth from the ocean floor, may prove that sea level was at least 6000 feet lower than at present some five or ten million years ago.

Theoretically, if the continental shelves surrounding each of the continents have been submerged for long ages and have been receiving sediments from the water during that time, they should have a smooth, even surface with all the irregularities covered by a thick blanket of sands, muds and oozes.

Samples taken from our own continental shelf by Dr. Piggot's device, show harder, consolidated rocks, some of which are fairly old and some of which are coarse gravels whose presence was unsuspected in such depths and so far from shore.

"From this evidence," the Carnegie Institution reports, "many geologists now believe that the continental shelf and the continental slope were land areas only yesterday, geologically speaking. -- Oregon Daily Journal.

Dr. Hodge has told us repeatedly, that the Columbia River has a submerged channel some 6000 feet below sea level off the Oregon coast.-Editor.

August 4, 1936

Percy H. Bliss, head of the civil engineering department of the Oregon Institute of Technology, has been named as consulting engineer for the city of Taft's new sewer and disposal plant. Mr. Bliss also had chargeof building a water system for the same city. Mr. Bliss is a member of our Society.

Pelfier's comet is misbehaving. It lost its tail this morning. "No one knows what happened," Dr. Otto Struve, director of Yerkes observatory, said, in reporting the tail's disappearance. "The size of the tail should seem to be cut down as the comet approaches the earth, but it should not disappear altogether."

More earthquakes were reported from Milton-Freewater today. No damage was done.

August 5, 1936

One of the finest private libraries in the state on mining and geology will soon be added to the Oregon State college campus library, according to an article from Corvallis. This collection consists of more than 1000 bound volumes and several hundred unbound volumes, valued in excess of $2500., and was the property of the late Hiram Dryer McClaskey of Central Point. Mr. McClaskey was well known as an authority on gold, silver and quicksilver resources of the United States and the geology and mineral resources of the Philippine islands.

August 6, 1936

A 2300 mile horse trail from Canada to Mexico is to be completed by the CCC boys this summer according to the United States forest service. It will traverse the Cascade range through the Mt. Baker, Snoqualmie and Columbia National Forests and Rainier national park in Washington. In Oregon it will include the present skyline trail down the Cascades. In California it will follow the Cascades and the Sierras including Lassen, Yosemite and Sequoia national parks. What a geological trip this would make.

July 28, 1936

Cameron Baker and Sawyer Reed Brockunier, members of a U. S. geological crew making a survey of the mineral and oil strata in the Fort Belknap Indian reservation near Havre, Montana, lost their lives in a forest fire.

A tree, over three feet in diameter and about 65 feet in length has been floating upright in Crater Lake for the past six years. Rocks held by the roots when a landslide hurled the tree into the water, is given as the reason. About five feet of the top protrudes out of the water.

July 18, 1936

The Spectator

Earthquake tremors all around Oregon, but seldom more than a suggestion in Portland, as last Wednesday at 11 p.m. Reason, magmatic cushion underlying this area. Western Oregon is immune to TEMBLORS, as the Spanish term them. One advertising point we have not grabbed for promotion work. When the city gets Council Crest, a seismograph (earthquake recorder) must be installed as a scientific feature, a revenue producer. When quakes occur, we can tell approximately where they are, and advertise the fact that Portland does not have that "disease". Some civic-minded individual may resolve to sponsor the seismograph, as a memorial to his family, or himself.

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It just came to our attention that Portland University will give a course in Geology this year. We hope to have more to say about this course in our next Bulletin.

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"Start on the minute" Joe Wimmer for the next three weeks will be doing some work in the Blue Mountains in the vicinity of Baker. Knowing Joe as we do, we expect on his return, to hear something about geology of that country. He may even have a trip planned.

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MT. ADAMS TRIP - SEPTEMBER 5, 6, 7, 1936

Leave from south entrance to Evergreen Hotel, Vancouver, Washington, 9 A.M., Saturday, September 5th. Over North Bank Highway, through Camas and Stevenson, to Wind River. Stop here to look over gravel deposit. Up Wind River to Carson, turn right to road marked Government Mineral Springs. Stop at Wind River suspension bridge. Turn right from this highway to road marked Guler, Goose Lake. This road is rather narrow and winding. Two miles past Race Track Guard Station, stop to study Big Lava Bed. Stop at Goose Lake for lunch, and to see "fossil?" footprints and further study lava bed. Continue trip. Stop at Peterson Guard Station to inspect ice cave, and at Ice Caves Camp Ground. Near Guler, side trip to large lava cave used for a spud cellar. Camp at Guler. After dinner, a short trip through White Salmon valley.

Sunday, Sept. 6th, trip starts at 8 A.M. from Guler. Proceed to Peterson Guard Station, turn right to Twin Buttes area. If the fire weather permits, we will go to Lewis River, Leave the cars, and hike $\frac{1}{4}$-1 mile to fossil leaf beds. In case this trip is not allowed, will visit coal beds in vicinity of Steamboat lake. On way back, a stop will be made at Twin Buttes Lookout, to inspect the Lookout and secure an idea of the physiography of the country. Party will proceed back to Guler at their own pace, as some may wish to procure the famous Mt. Adams huckleberries. Camp at Guler.

Monday, Sept. 7th, start 9 A.M. To Trout Lake (town), turn left to Mt. Adams, bound for Bird Creek Meadows. Several stops will be made on the way to view features of interest. At Bird Creek Meadows, a study of glacial features, and a trip to the moraines. If feasible, those interested can hike 4 miles along timberline to Cold Creek camp and Morrison Creek. Others may drive around. At Morrison Creek, further study of Mt. Adams volcanism and glaciation. Return to Guler to pick up equipment. Thence to town of Underwood, and over North Bank Highway to Portland. A stop will be made to inspect the "submerged forest", soon to be covered by Bonneville pool.

Any parties interested may make their own arrangements to climb Mt. Adams, instead of taking the scheduled trips. Information can be obtained at Guler relative to the climb. There is a sulfur mine attempting to operate on the summit.

Accomodations may be obtained at Guler by writing J. E. Reynolds, Mt. Adams Lodge, Trout Lake, Washington. He has tent cabins, equipped with bedding, \$1.25 per night for two, or \$1.00 per night for one. There is a community kitchen for those who wish to prepare their own meals. It is suggested that cooking utensils be taken along. Food may be purchased at Trout Lake, 1 mile down the valley. Meals at the Lodge are 50¢ per each. Camping in the campground is 25¢ per car, per night. There is a free camp ground at Guler, but it is not recommended. Make your reservations early, as Labor Day is a big day for the Mt. Adams country.

Distance covered in the three days, from Portland and return should not exceed 400 miles, and will probably be nearer 300. Gas and oil can be obtained at Carson and at Guler.

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THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the
GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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LECTURES

Sept. 11, 1936 (Friday) - Dr. Arthur C. Jones will address the Society on "The Uses of Minerals in Medicine". It will be very interesting to learn how the ingenuity of man has discovered and extracted medicinal substances from the crust of the earth.

Sept. 25, 1936 (Friday) - Mr. Donald K. MacKay will address the members of the Society on the "Geology of the Great Smoky National Park". We are glad to welcome Mr. MacKay to Portland. He is the resident Geologist for the National Park Service. He has recently spent considerable time in the region of the Great Smoky Mountains in Tennessee and North Carolina, where the Geological Field Work has just recently been completed. The lecture will be supplemented by very interesting slide illustrations.

TRIPS

Sept. 27, 1936 (Sunday) - Mt. Hood buried forests and Little Crater Lake, etc.
Leader: J. R. Collins.

Oct. 10-11, 1936 (Sat. & Sun.) - North and South sides of Lower Columbia River.
Leader: Claire Holdredge.

Oct. 25, 1936 (Sunday) - Eagle Creek.
Leader: Joseph Wimmer.

OBJECTS OF THE SOCIETY

(1) To provide facilities for members of the Society to study geology, particularly the geology of the Oregon Country.

(2) The establishment and maintenance of a library and museum of geological works, maps and specimens.

(3) The encouragement of geological study among amateurs.

(4) The support and promotion of geologic investigation in the Oregon Country.

(5) The designation, preservation and interpretation of important geologic features of the Oregon Country.

(6) The development of the mental capacities of its members in the study of geology and the promotion of better acquaintance and closer association between those engaged in the above subjects.

CARAVAN AND TRAIL RULES

In the main our trips have gone along smoothly. The few hitches were perhaps due to new members of our Society not being able to follow the car ahead. We would suggest the committee having charge of stickers get a new supply so new members could have some and other members could replace the faded ones they now display on rear car window.

Below we note a few simple rules for caravan and trail, which if everyone follows, will tend to make trips more enjoyable:

Be at the starting place as promptly as possible; some of our trips require considerable driving and we must move out promptly if we are to cover the territory scouted.

Our trip leader of the day will be in the first car. The driver of the next car not only follows the car ahead but is directly responsible for the car following. If for any reason the car behind stops, the car ahead is supposed to stop to render assistance, if necessary - thus, when one stops all stop.

Arriving at the point of interest, the lead car drives far enough past the place where the lecture will be given so that cars in the center of the caravan will be at about the point where the lecture will be given.

When the lead car drives off the pavement and stops, all succeeding cars do likewise and park as near as possible, bumper to bumper.

In order that as little time as possible will be lost between the time the cars stop and the lecture begins, members should assemble as soon as possible.

At each lecture the approximate time allowed to explore the region will be stated - also, where our next stop will be made

A few brief rules of the trail - rules which are observed by all users of woodland trails - are given below in the order of their importance and should be followed as closely as possible.

1. Follow your leader; do not precede or abandon his guidance unless so instructed.

2. Follow the trail even though it is shorter to cut corners.

3. Do not drop refuse on or near trails.

4. Be careful of fires at all times.

5. Do not mar trees, pull up shrubs, flowers, etc.

If we keep to these simple rules for caravan and trails, we can look forward to some enjoyable and instructive trips this coming season.

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Dr. Edwin E. Osgood, Assistant Professor of Bio-Chemistry and Medicine, University of Oregon Medical School, Discoverer of the Method for Artificial Reproduction of Human Blood Cells, spoke over KOIN August 19th on Northwest Neighbor Program.

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WAS THERE AN EARTHQUAKE IN MILTON-FREEWATER AREA BEFORE THE RECENT SHAKE?

J. Tracy Barton, Attorney at Law, The Dalles, Oregon, thinks such an earthquake could be authenticated. He lived in that section from 1890 until 1910 and his Mother's family, the Shumways, still live there. If necessary for proof, he is very sure that any number of affidavits could be secured, showing that an earthquake occurred there at some time prior to 1895. He thinks it was in the '80s. His Mother, her two sisters, her Mother, and A. R. Shumway, his uncle, will, he is sure, have very clear memories of this. So far as he knows, there were no scientific agencies for the recording of such phenomena at the time of this quake.

He has often heard his family recount that the dishes were badly shaken on the shelves and some, he believes, fell to the floor, and pictures fell off the walls. One old man by the name of "Sam Vancil" thought a dog was under his bed and arose for the purpose of chasing it out.

He believes, therefore, that this is at least the second earthquake in that section within the memory of the present residents.

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LOCAL GEOLOGIST SEES NO NEED FOR ALARM OVER EARTH TREMORS

East Oregonian, August 5, 1936

By Major Jay T. Arneson, Pendleton Geologist.

Umatilla county residents need feel no undue concern over the frequent earth shocks that have been taking place in the east end of the county. It is not likely that any more severe shocks will be felt, although numerous minor shocks may be experienced due to settling after the original slip.

The trouble will be found, no doubt, somewhere in the triangle between Walla Walla, Weston and Tollgate. Somewhere in this region will be found a mountain standing upon a sloping film of volcanic ashor other porous material--a clear line of demarkation between separate lava flows. This porous material, becoming moistened by ground waters seeping into it forms an insecure base for the mass above.

During the past several years there has been a marked shortage of moisture, the water table in the rocks being dried up over large areas. This would permit of a slight settling and this settling, however slight, might cause a fracture sufficient to loosen a large mass of rock already resting in a strained position. This year there has been an abundance of moisture in the mountains and the water table has been replenished so that springs dried up for several years are again flowing.

Some of this water seeps far into the rocks, requiring weeks, or even months to reach its goal and it is some of this ground water, seeping through a dried up water vein which helped the loosened mass to slip thus causing the earthquake which disturbed Pendleton and most of Umatilla county on the night of July 15.

The many subsequent minor shocks that have been experienced are the result of a gradual settling of the loosened mass and will continue with diminishing intensity until the angle of repose has been reached.

Communities like Helix, Milton and Freewater, being built upon alluvial deposits, feel these disturbances more pronounced than do communities built upon more solid footings.

In similar fashion to that described above, a large side hill on upper McKay creek slid out in April, 1923, causing considerable excitement among residents of the vicinity. In this case the hill, standing on an insecure footing and being very steep, collapsed and slid outward leaving a crevass eight feet wide at the upper side of the movement. Many who visited the scene believed that it was the result of an explosion of gasses of some sort, but as a matter of fact, the peculiar odor present was due to friction, the rocks being scraped against one another under great pressure.

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NEAHKAHNIE BEACH TRIP

August 8-9, 1936

Thanks to the efforts of Mrs. Poppleton we had one of the best bonfire sessions that we have ever enjoyed.

Mrs Anderson and Mr. Alley who have lived in the Nehalem Valley for around fifty years gave interesting talks comparing the old days when they first came to the valley with the present. Then there were no stores nearer than Tillamook which was a three day journey there and back and now they drive down in less than an hour. They received their mail once a week by a carrier who traveled most of the way from Seaside on the beach and had many narrow escapes from storms and high tides.

When we arrived at Manzanita we heard of a petrified skull which a lady not far away had found and of course our curiosity was aroused as to its nature. We asked Mrs. Lane if it would be possible for us to see this skull. She very kindly phoned to the lady and asked her to bring her find to the meeting that night. Anthropologists Davis and Wade held a post-mortem over the "skull" and then pronounced it a conglomerate which had taken that odd shape; a decision that was very unpopular with the owner.

Wilson K. Pirry favored us with a very interesting talk about the coast Indians before the advent of the white man. He explained in detail how the Indians made their canoes that were so well balanced and so seaworthy that they would go out in them seventy five miles from land hunting whales. He also informed us that the famous clipper ships were patterned after these Indian canoes. He also gave an interesting account of the way Indians killed the whales and brought them to shore by using inflated bladders to keep the whale from sinking. He told of their burial customs and their superstitions in regard to the dead.

He pictured the early Coast Indians before the smallpox scourge of 1778 as being the finest type of Indian mentally and physically on the American continent, a race of people who constructed enormous houses several hundred feet long, who were masters of many arts and who were very wealthy from the standpoint of the Indian, a far different type from their degenerate descendants who acquired all the vices of the white people and none of their virtues.

Mrs. Poppleton told the story of the bees wax ship and the buried treasure on Neahkahnie Mountain and those of us who arrived early enough inspected the large chunks of beeswax in the Lane Realestate office and the rest of the historical exhibit there.

Colonel Travis told of the engineering difficulties in making the tunnel through Arch Cape and suggested that the engineers need plenty of moral support in order to make this tunnel as safe as a roadway tunnel should be.

Sunday morning we drove around Neahkahnie Mountain to the end of the road and then walked down to Short Sand Beach which has been donated by the owner to the state for a state park. We then climbed the steep cliff above the beach and hiked out to Falcon Point and then back to the cars and lunch by the cool spring that comes down from the mountain at this end of the road. We were favored by ideal weather during the whole stay at the beach. We missed Leo Simon's flower talk and we missed the professional geologists.

Harry Jennison

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FACETED PEBBLES

Wentworth, Chester K.

Chink-Faceting; a New Process of Pebble-Shaping; Journal of Geology, v. 33, pp. 260-267, 5 figs., 1 table, 1925.

Chink-faceting is a name here applied for the first time to the localized grinding of facets on the surfaces of pebbles and cobbles which are lodged in chinks of various shapes and sizes on rocky beaches. The pebbles are lodged in these crevices in such a way that they are free to move to and fro to a slight extent, but not to escape, under a continual action of the waves. The process takes place both between the boulders of a stable boulder beach and in cracks and grooves of the bed rock of projecting headlands, and developes pebbles of distinctive form. Gives example from Hawaii, #1772A, "The most remarkable facet on this pebble is concave, 35x18 mm. and with a depth of 4 mm.

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CRESCENT LAKE AND VICINITY

As a result of a three day trip some of the geological features of Crescent Lake and vicinity were noted by the writer. Crescent Lake lies just east of the summit of the Cascade Mountains in the drainage of the Deschutes River and at the foot of the southeast slope of Diamond Peak. It is 123 miles from Portland to Eugene, 44 miles from Eugene to Oakridge and from Oakridge to Crescent Lake it is 47 miles by way of the Middle Fork of the Willamette and about the same distance by way of Salt Creek. Both roads can be covered by automobile but both are forest roads most of the way and are therefore slow. However the return trip from Crescent Lake to Eugene by way of Salt Creek was made in a little over three hours.

From Eugene to the Simpson Creek on the Upper Middle Fork, a distance of about sixty nine miles, one sees many exposures of andesitic and basaltic lava and andesitic tuff and agglomerate. These are mostly of Oligocene and/or Miocene age but some may be as old as Eocene. The dip in general seems to be easterly and since the direction of travel is southeasterly it would seem that one would be coming continually onto younger and younger beds. If so there is a great thickness of Oligocene - Miocene rocks in this area most of which are volcanics.

About 10 miles from Eugene the road climbs to and follows a ridge called Pleasant Hill. This ridge is largely gravel and is probably the remnant of an old valley fill. Just after passing the village of Dexter, about 18 miles from Eugene, the road crosses another ridge between Lost Creek and the Willamette river where similar gravels are exposed in the road cut. As one follows the road on up the southwest side of the river other terrace deposits of gravel and sands are seen. Some of these contain angular material and may be of glacial origin. From 35 to 38 miles from Eugene the river flows through a narrow canyon, called Black Canyon, at the upper end of which is Point Lookout, a damsite investigated by the Corps of Engineers in their Willamette Valley Flood Control Survey. Above this the valley widens and forms an excellent storage basin behind any dam that might be built at Point Lookout. The road crosses the river about 40 miles from Eugene and therafter runs on the northeast side. Just below this bridge the North Fork River enters the Willamette while just above Oakridge Salmon, Salt, and Hills Creeks enter. All rise near the summit of the Cascades and flow westerly to their confluence with the Willamette. Oakridge lies in the broad valley of the Willamette above the Black Canyon. The valley has been partly filled with gravel and sand and some of the fill has been removed leaving some beautiful terraces. Above Hills Creek the valley becomes narrow again affording another damsite above which the valley is wider again. From Hills Creek to Simpson Creek there are only a few small streams entering the river from the east side and the river runs almost due north. Most of the rocks are andesitic flows and agglomerates which appear to dip easterly.

Above Simpson Creek much younger rocks are to be seen. They are lavas of the Cascade Andesite series. Here the slopes of the canyon walls are less steep but the valley bottom is narrower and the road begins to climb. It passes an occasional small marsh or dry lake bed, passes the Rogdon Ranch Ranger Station, crosses Swift Creek and Indigo Creek and at Emigrant Camp starts to climb tothe summit of the Cascades from an elevation of about 2700 feet. Indigo Creek is unique in that it is a good sized creek but all comes from the ground in a series of large springs a few hundred feet above the road. Its water is much colder than that of streams that have run over the ground for longer distances. From Emigrant Camp the climb is steady until the summit of the range is reached at an elevation of about 5400 feet. The road then follows across the summit passing Summit Lake and many small lakes and ponds. All of those appear to be of glacial origin and the entire topography appears to have the same origin. The Douglas fir of the western slope of the Cascades gives way to scrubby pines and other alpine forms.

There are no streams of any size and the surface of the ground is covered with volcanic ash with here and there a few rocks protruding through it. The summit is quite broad and it is not until one begins to approach Crescent Lake that any appreciable amount of elevation is lost.

Approaching the lake one can see a large valley on the left which seems to head at the east foot of Diamond Peak, which is due north of the point where the road crosses the summit about three or four miles, and run southeasterly and easterly. The road finally descends into this valley and on the descent a fine view of Crescent Lake is obtained. It lies in the lower end of the valley and is formed by the terminal moraine of the glacier that carved the valley. The valley in its entirety is horse shoe shaped with the open end to the north and thus the lake curves to the north for it occupies the eastern side of the horse shoe.

The road follows around the south and east sides of the lake to the outlet at the north end where there is a modern camp with several cabins and a lodge or hotel. East of the south end of the horse shoe is Odell Butte, a perfect cone and probably composed of cinders. On the inside of the horse shoe are Red Top Mountain and Lakeview Mountain, two peaks on a single mountain or double peaked mountain. This double mountain is a cinder pile modified by extrusive flows. One of the flows came down to the south and entered the upper end of the lake. A remnant of it forms an island in the lake near the upper end.

A boat trip was made up the lake to this island and some very extraordinary geological phenomena observed. The main part of the island is formed of a vesicular andesitic lava and the surface is clearly grooved by glacial action. The center of the island is capped by a 10 foot thickness of more porous and more basic lava which is a remnant of the flow from Red Top. The glacial striae on the underlying rock run under this flow while the top of the flow is also striated. It is quite clear that the flow occurred during the glaciation or during an interglacial epoc.

The same valley in which Crescent Lake lies extends farther to the northeast and is occupied by Davis Lake. This lake was formed by the valley geing dammed by a lava flow from Davis Peak which lies to the east of it. From the south end of the lake the course of the flow can be seen quite plainly. The outlet from the lake is beneath the lava and the water does not appear for perhaps a mile after it leaves the lake.

North of the Lake View and Red Top is Odell Lake. It lies in a valley that is similar in shape to that in which Crescent Lake lies but is curved in the opposite direction. The General relationship of these two valleys appears to be that of a glacier that was divided by Lakeview Mountain as the glacier descended from Diamond Peak. After uniting again east of Lakeview Mountain the glacier flowed northeasterly. Directly east of the north end of Crescent Lake is Royce Mountain and between it and Davis Mountain is Hammer Butte. Northeast of Odell Lake are Maklaka Mountain and Maiden Peak. Thus the ice which came around to the north of Lakeview Mountain was turned easterly by the two latter and made to join with that from the south side which was diverted northerly by Odell Butte. But some of the ice which came around the south side of Lakeview went out through the gap between Odell Butte and Royce Mountain and the outlet of Crescent Lake now flows out through that gap and joins the Little Deschutes. The outlet of Odell Lake runs into Davis Lake.

With respect to Crescent Lake it should be mentioned that just east of the island where the glacial striae are so well exposed there is said to be a deep, crater-like hole that is only two or three hundred feet in diameter and yet is several hundred feet deeper than the adjacent lake bottom. If this hole actually exists it is evidence of a volcanic blow-out since the glacier abandoned the valley. Most of the country around these lakes is covered with a three foot layer of volcanic ash and cinders beneath which are glacial deposits, some of which are beautifully exposed in road cuts, and these point to post-glacial volcanic activity in the region.

Leaving Crescent Lake to return to Oakridge by the Salt Creek route the road follows the glacial valley to the east end of Odell Lake, skirts the north shore of this lake and then crosses the summit and plunges steeply down the western slope of the Cascades. Soon after the summit is crossed the flora changes back to the Douglas fir type again, the volcanic ash and cinders disappear and much typical Cascade andesite is seen. About a mile from the road is Salt Creek Falls where this creek makes a long single drop. These falls were not visited but from what was seen of the geology of the region from the road it seems likely that the falls mark the point where the stream crosses the contact between the younger andesites and the older lavas and agglomerates of the western Cascades.

Only a small thickness of beds resembling the Columbia River Basalt were seen. A little was seen on the Upper Middle Fork of the Willamette just below Simpson Creek and some more was seen on Salt Creek not far below the falls.

Most of the territory traversed is covered by three U.S.G.S. Topographic Sheets. They are Waldo Lake, Diamond Lake and Maiden Peak.

Another feature of interest observed on the trip was Cow Horn Peak. This peak lies south of Diamond Peak and southeast of Crescent Lake. The "Cow Horn" itself seems to be a volcanic plug or neck. A deep canyon runs almost three fourths of the way around it and appears to have been caused by a blow-out around the north, east and south sides of the neck. On the west the top of the neck is the top of a slope coming up from the west. The neck is tilted so that it leans perceptibly to the southeast.

By Claire Holdredge

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RECREATION GUIDES ISSUED BY THE U. S. FOREST SERVICE

Many of our membership appear not to be aware of the exceedingly interesting recreational guides that are issued free to the public by the U. S. Forest Service. These may be obtained by calling at the Forest Service offices in the Post Office at Broadway and Glisan.

The following is a short summary of a typical guide, known as No. 33 - Fremont Recreation Area - Fremont National Forest. This pamphlet consists of eleven full size mimeograph pages plus a full page map. The map in itself is a picturesque story of the area containing in detail all roads, trails, lookout stations, camps, elevations, historical data, etc. Nine of the pages are replete with information as to the forest, forest servic stations, recreational features, forest camps and camp grounds, forest manners, fishing, all game and other animals and birds of the region are listed by name. However, of particular interest are the remarks on geology and archaeology which are quoted below in full.

GEOLOGY

The geological history and features of the country present many interesting problems calling for careful and unhurried study by a competent and well trained geologist to correctly interpret them. As a short and rough outline it may be said that millions of years ago, in the Miocene age, the country was covered by the great Columbia lava flow. Later by some cataclysmic subterranian action this thick lava crust was shattered and sections of it upheaved, tilted, or dropped down, forming many great fault scarps with corresponding depressions at their bases which later became lakes. Along the east shore of Lake Abert 25 miles north of Lakeview is the Abert Rim, rising a sheer 2000 feet and showing 800 feet of superimposed lavas layer upon layer. This is one of the largest exposed faults in the world. The Yellowstone Cutoff Highway hugs its base. In the succeeding geologic age, the Pliocene, the basins were filled with water, forming many large lakes.

Goose Lake for example was about 12 by 50 miles in area, and hundreds of feet deep. The climate at this time was very mild and many camels, rhinos, etc. roamed the country between the lakes. But the climate gradually became colder and drier and the lakes shrank or disappeared, and then the Pleistocene age crept on with its perpetual ice and snow mantling the highlands, and with local glaciers creeping into the valleys. Eventually, 10, or 20, or 30 thousand years ago, the ice was melting faster than it was formed, and a tremendous amount of water was poured into the lake basins, carrying with it an enormous amount of sand, gravel and crushed rock and filling the basins hundreds of feet deep--some of them to practically complete extinction of the lake. During the time of the ice the lava cap in many places was entirely removed and the original land surface exposed. In such locations, where it has been buried in the mud of lakes of some more ancient time, there is to be found much petrified wood of various species, some of it beautifully agatized, and even stumps still in place. Another interesting feature that should not be passed up is the numerous hot springs. Several of these are located along the highway within three miles of Lakeview. The best known and most spectacular is at the Hot Springs Hotel three miles north of town. This consists of several large crystal clear boiling springs, one of which is an active geyser shooting water and steam high into the air at intervals of about 50 seconds. These hot waters well up from unknown depths out of the great fault crack at the base of the escarpment bounding the Goose Lake on the east. A second hot spring and bathing pool is located two miles south of Lakeview, and a third on the highway 7 miles north of Paisley on the shore of Summer Lake.

There is evidence that the Lake Country has been growing progressively drier over a long period of time, with, of course, occasional ups and downs of precipitation.

Anyone interested in diversified and striking geological features may find much to occupy his time in this field.

ARCHAEOLOGY

Almost anywhere in the present dry valleys, around the shores of existing lakes, and around the rims of long since extinct lakes may be found in profusion the camping sites and stone and bone artifacts of a people who inhabited the country in great numbers and for a length of time quite probably spanning the period from the opening of the valleys following the recession of the ice up to but a few centuries ago. These people were hunters, subsisting on wild game and the myriads of water birds, together with wild roots such as Camas and Apaw that were plentiful in the swampy lands around the lakes. This people left a great many "writings" in the form of petroglyphs or, perhaps the most recent, pictographs, cut or painted on the rocks, which are not fully intelligible to us. So, far as now known these pictures tell no connected story, but serve merely to record the wanderings of the different bands or clans, or the exploits of individuals. Perhaps nowhere in the world have obsidian arrow points, spear heads, knives, etc., been found in such numbers or in such exquisite perfection of workmanship. At Lakeview, at Silver Lake, and at Fort Rock are to be seen collections running into thousands of perfect specimens picked up locally, in addition to innumerable smaller collections here and there. The Indians found here by the earliest white settlers did not possess this art and disclaimed any knowledge of the makers, merely attributing the relics hazily to "some other people." Skeletal remains, often found very well preserved in the dry sand dunes, seem to indicate two distinct types, one with a very low-browed brutish profile. Certain it is that many people passed this way. Who? Whence? When? Why? Where? All remain to be answered. The evidence is plentiful; the trail broad but dim with age. Along this line there is much of interest to be seen, whether by the layman with perhaps only a little knowledge on the subject; one of a scientific turn of mind accustomed to put two and two together; or one with sufficient scientific training knowledge, and background to enable him to make a systematic and scientific study of the problem before the evidence becomes still further obliterated by the mere "relic hunters."

By F. S. Olaine

NORTH PACIFIC COAST

From Coast and Geodetic Survey Bulletin

The SURVEYOR, A. M. Sobieralski, commanding, arrived at Dutch Harbor, Alaska, on May 17. Work on preparing the WILDCAT for launching was in progress as reported on May 19. It was planned to establish camps for field work as soon as weather conditions improved. En route from Seattle, Washington, a dead-reckoning line of soundings was carried along the fifty-eighth parallel, across the Gulf of Alaska.

The DISCOVERER, Jack Senior commanding, arrived at Dutch Harbor, Alaska, on May 21. The HELIANTHUS was launched and equipment in storage was taken aboard. The DISCOVERER proceeded to the working grounds eastward of Unimak Pass on May 28. A triangulation scheme around Sanak Islands and on the west shore of Ikatan Peninsula is to be established at the first of the season. Later the triangulation connection with Krenitzin Island scheme will be attempted.

The EXPLORER, G. C. Jones commanding, was engaged on combined surveys in upper sections of Puget Sound, Washington. These include Squaxin Island, Eld and Henderson Inlets, Dana Passage, and Tacoma Harbor. Two triangulation parties, two topographic parties and one hydrographic party were operated. The EXPLORER anchored in Peale Passage, a central location for the project.

The WESTDAHL, H. Arnold Karo commanding, completed surveys in a section of Gastineau Channel between Ready Bullion Creek and Douglas Bridge. On June 5 the WESTDAHL sailed for Haines, arriving June 6 to take up the triangulation of Chilcat Inlet in cooperation with the International Boundary Commission.

Robert W. Knox continued surveys of the lower reach of the Columbia River in the localities of Cape Disappointment, Aldrich Point, Oregon, and Longview, Washington.

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McArthur, Lewis A.

Putting the Snows of Mt. Hood to Work (Journal of Electricity, v. 50, no. 12, pp. 483 - 485, 5 pls., June 15, 1923) OrU OrCa

A description of the Powerdale plant of the Pacific Power and Light Company. Water from the glaciers of Mt. Hood is utilized to develop approximately 9,000 h. p. of energy. (RCT)

Mc Kitrick, William Ernest.

The Geology of the Suplee Paleozoic Series of Central Oregon: (Oregon State Agricultural College Thesis, 6 figs., 2 maps, January, 1934.) OrCa

Physiography; topography, physiographic subsections (North, Central, and South drainage). Structure; evidence for antilinol structure, folding, relationships, jointing and faulting. Stratigraphy; limestones, sandstones and grits, conglomerates and cherts, igneous. Economic geology; limestone and petroleum (possibility of using limestone in cement industry and as a fertilizer if transportation facilities were developed). The possibility of Petroleum is remote because of many joints through which the petroleum might leak out, and the lack of present evidence that such a condition did exist. Geologic history, summary, maps, and bibliography. (JVK)

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OUT OF THE DAILY PRESS
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H. B. Schminky

BURIED FOREST LOCATED

Giant Trees Swept Under Lava Flow - Bend, Oregon - Special to Oregonian, August 17, 1926.

Under lava flows which, untold ages ago capped the Crooked River country, a forest of giant trees, probably redwoods, has been found about two and a half miles south of Prineville, it was learned hereyesterday. One of the huge slabs of mineralized wood weighs several tons, and as reconstructed, was from a tree probably twenty feet in diameter. One of the most interesting remnants of the ancient forest is the stump of a big tree still in place. The land on which the petrified forest has been found is owned by Judge Brink of Prineville who plans some day to convert the forty-two acre tract into a park.

PREHISTORIC CITY FOUND IN DESERT

Anthopologist says Discovery Sensational - Lynch, Nebraska - AP to Oregonian, June 28, 1936.

Dr. Earl H. Bell, University of Nebraska anthropologist, said Friday he and eight students had unearthed near Lynch what probably was the largest prehistoric city in North America.

The primitive settlement, described By Dr. Bell as "one of the most sensational sites ever found in this country," was located beneath the sands of an ancient desert. The anthropologist said the discovery indicated a midwestern agricultural civilization flourished "possibly 4000 years ago."

The first excavations indicated the city was three miles long and a half mile wide, and large sections evidently were inhabited densely. Remains uncovered included carbonized ears of corn, large and small beans and squash. There also are pieces of pottery large enough to hold half a bushel of produce.

PETRIFIED TREE MAY PROVE FOREST STOOD IN REGION

Washington US - Oregon Daily Journal, June 28, 1936.

Discoveries, coupled with mysteries were disclosed in recent reports from Petrified Forest National Monument, Arizona, according to A. E. Demaray, acting director of the national park service.

Many scientists have long maintained the theory that these famous trees, changed by the slow alchemy of time and nature into logs of onyx, jasper and chalcedony, came to their final resting place in the eroded plateaus of Arizona only after drifting for long distances in the prehistoric seas.

Exception to this theory has recently been discovered by an excavation by CCC enrollees who brought to light the base of a tree apparently upright and in place where it grew in the Chinle shales millions of years ago. The tree trunk has been exposed for some 15 feet and gives every evidence that its root structure is still in place.

This supports the theory held by another school of scientific investigation that the trees grew in close proximity to the present petrified forest. Several other stumps with partial root structure and standing in an upright position have been located.

MASTODON TEETH FOUND IN TUNNEL

Yakima, Washington - Special to Oregonian, June 22, 1936.

The discovery of mastodon teeth in the Roza tunnel, 700 feet from the entrance, where the workmen have just struck basalt, is proving of great scientific interest.

Sheldon L. Glover, geologist at Washington State college, and Harold E. Culver, supervisor of geology, hastened to Yakima on receipt of a telegram from C. E. Crownover, engineer in charge of Roza construction.

The teeth are the only well-preserved animal remains ever found in the Ellensburg formation, which covers a large portion of the state. Glover took the teeth and a portion of the tusk to Pullman, where they will be soaked in oil and then shellacked to preserve them.

The teeth and bones were found embedded in clay, thought to be part of an old marsh where the mastodon had bogged down.

COLUMBIA DUNES TREASURE HOUSE

The Dalles, Oregon - AP to Oregonian, June 22, 1936.

Discoveries of antiquities in highway excavations led to the belief today that sand dunes of the Columbia gorge hold rich scientific treasures of relics devised by prehistoric people.

A varied collection of artifacts gathered by contractors building a new crossing over the Union Pacific railway on the Old Oregon Trail highway near Big Eddy reposed in maintenance quarters of the state highway department here.

The relics, many ruined by a heavy power scraper, were about five feet underground. The remains of an ancient camp fire was found along with a stone pot made in the form of a turtle and a number of rock bowls ornamented by etched or scalloped edges or by grooved lines extending vertically outside.

CITIZENS PETITION LAKE REFLOODING

Klamath Falls, Oregon - Special to Oregonian, July 26, 1936.

The Klamath County Chamber of Commerce directors have instructed a committee to define the chamber's attitude toward the Lower Klamath lake dust nuisance. Cliff A. Dunn heads the committee.

The action was taken after members of the Merrill Service club reported they had obtained hundreds of signers for a petition favoring flooding the lower lake to rid the district of the dust that billows up from that dry basin when the wind blows in certain directions. The Merrill petitions will be sent to members of congress.

Reflooding Issue Recurrent

Reflooding of Lower Klamath lake is a question that has come up repeatedly since the lake was drained for reclamation purposes many years ago. Lower Klamath was described by the late President Theodore Roosevelt as one of the world' greatest bird sanctuaries.

After draining the charge was made by conservationists and wild-life enthusiasts that it had proved worthless for agricultural purposes, in sharp contrast to nearby Tule lake, one of the richest basins in the country. Various problems, such as water sources, vested rights, etc., now are involved in the reflooding question.

REVIEWS

OREGON OUT OF DOORS

The Mazama Club of Portland has published interesting and informative brochures on two of Oregons greatest scenic and geologic wonders, viz., Mount Hood (1920) and Crater Lake (1922). Neither publication can be considered as recent; but both contain articles which should be of interest to many members of the Geological Society of the Oregon Country.

Mount Hood (121 pages, 19 plates); The geology of Mount Hood and its environs is discussed in simple, readable style by Ira A. Williams. William L. Finley's article on "Birds and Animals around Mount Hood," with 7 photographs, and M. W. Gorman's "Flora of Mount Hood," are valuable references for any one interested in those subjects. In "Mount Hood in Modern Times," Richard J. Grace sketches the history of the mountain from its discovery and naming by Lieutenant Broughton in 1792, to the organization of the Mazamas 102 years later, including the gory record of some early (fictitious) climbs. Other articles give Indian legends, origin of place names, and personal sketches of wellknown pioneer climbers.

Crater Lake (124 pages, 38 pleates): The general set-up of this little brochure is the same as that of the companion volume on Mount Hood. The character of the contribution can well be judged by a partial list of titles and authors:

National Park Status of Crater Lake	- Stephen T. Mather
Common Wild Flowers of Crater Lake National Park	- Albert R. Sweetser
Some Notes of the Geology of Crater Lake	- Ira A. Williams
Wild Life in Crater Lake Park	- Alex Sparrow
Place Names	- William G. Steel
Legends	- O. C. Applegate William G. Steel
Fish of Crater Lake	- Ben C. Sheldon
The Lady of the Woods	- Anne Shannon Monroe

The Mazamas have rendered a real service to Oregon nature lovers by collecting in these volumes a readable group of scientific articles by famous authors. Of special interest to members of the Society is the fact that the introduction for each was written by our fellow-member, Dr. W. D. Smith.

Anyone wishing to obtain copies of either see Kenneth N. Phillips.

K. N. P.

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Mc Adie, Alexander George.

Catalogue of Earthquakes on the Pacific Coast 1897-1906 (Smithsonian Miscellaneous Collections, v. 49, article 5, no. 1721, pp. 9,10,29,36,44, 1907) WaU OrP OrCa

P. 9, September 27, 1897 light shock at Olympia. P. 10, Dec. 6, 1897, slight shock at Forest Grove. P. 29, Dec. 2, 1902, Kerby, slight; Dec. 4, 1902, Hood R. P. 36, March 16, 1904, Seattle, intensity III; and in general over western Washington. P. 44, Jan. 2, 1906, Spokane, light shock.

(RCT)

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THE GEOLOGICAL NEWS LETTER

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LECTURES

Sept. 25, 1936 (Friday) - Mr. Donald K. Mackay will address the members of the Society on the "Geology of the Great Smoky National Park". We are glad to welcome Mr. Mackay to Portland. He is the resident Geologist for the National Park Service. He has recently spent considerable time in the region of the Great Smoky Mountains in Tennessee and North Carolina, where the Geological Field Work has just recently been completed. The lecture will be supplemented by very interesting slide illustrations.

Miss Isa Botten of the Beaumont School (Nature Study) will show exhibits obtained in her travels this summer.

Oct. 9, 1936 (Friday) - Mr. A. W. Hancock of the Society will give informally his "Observations on the Upper Deschutes".

Oct. 23, 1936 (Friday) - Mr. F. P. Keen of the Department of Entomology with the U. S. Forest Service will give an address on "Tree Rings as Indicative of Periods of Percipitation".

TRIPS

Sept. 27, 1936 (Sunday) - Mt. Hood buried forests and Little Crater Lake, etc.
Leader: J. R. Collins.

Oct. 10-11, 1936 (Sat. & Sun.) - North and South sides of Lower Columbia River.
Leader: Claire Holdredge.

Oct. 25, 1936 (Sunday) - Eagle Creek.
Leader: Joseph Wimmer.

M E M O R I A L

LAWRENCE A MCNARY lived a life of unselfishness and usefulness. He found a warm place in the hearts of his many friends. As an attorney he served the people of this community and state with ability and integrity. As a member of the Geological Society of the Oregon Country, he gave liberally of his time and talent in furthering the aims and purposes of the Society, and endeared himself to all members of the Society. Since the formation of the Society he has served as Historian, and rendered faithful service in that capacity, as well as taking an active interest in other affairs of the Society.

On August 26, 1936, Divine Providence, in its Infinite Wisdom, saw fit to take him from our midst. In his death, the Society has lost a most useful and beloved member, the community has lost a staunch and honorable citizen, his family a kind and loving husband and brother.

Of a happy disposition and ever ready to be of service to his friends, he endeared himself to many throughout the community.

BE IT THEREFORE RESOLVED THAT this Executive Committee of the Geological Society of the Oregon Country, on behalf of the Society, extends heartfelt sympathy to the members of his family in their bereavement, and orders that a copy of this Memorial Resolution be sent to them

MINERALS IN MEDICINE

Presented before the Geological Society of the Oregon Country October 11, 1936.

Substances which have strong tastes or odors have always attracted the attention of primitive man and he has been prone to think all such distasteful substances to be medicinal. Anything which has seemed sour, bitter, nauseant or queer has promptly been tried out for it's therapeutic effect on whatever disease happened to ail the family or friends of the self-appointed doctor. Through this "kill-or-cure" technic of experimentation mankind has learned a great deal about the medicinal value of certain minerals and their derivatives. Surgeons have found some minerals of use in the preparation of plasters, ointments for wounds, and antiseptic powders; the plaster of Paris cast is familiar to everyone in these days of automobiles and motorcycles. The diagnostician pours large amounts of barium sulphate mixture down the protesting digestive tracts of innumerable patients in order to learn by the x-ray what ails said viscera. The screen which he uses in the mysterious dark room is made of calcium tungstate ($Ca\ WO_4$) and barium platine-cyanide, which fluoresce under x-rays. The skin specialist has a whole series of mineral and metallic preparations with which to heal the itching skins which are presented to him. In brief, no physician could practice long without the help of minerals in medicine. This treatise must necessarily be incomplete because of the numbers of minerals used in medical treatment, and many derivatives must be omitted entirely. It has seemed best to approach the problem first from the historical viewpoint, then to treat of the minerals used today. An alphabetical or pharmacological catalogue would fall short of the mark set for this contribution, which is to interest the reader in the general relations of mineralogy to medicine.

Historical

Primitive man has been a nature worshipper the world over. He has personified rocks, hills and springs, and has attributed magical powers to almost every thing and substance on and within the earth. The belief in the medicinal virtues of many things followed most naturally. Substances which signified or pertained to a totem or god were used in a ritual way, and thus some of the minerals were found to be effective in treatment of disease through efforts of priests and medicine men. Pigments such as hematite, limonite, ochre, orpiment, cinnabar, malachite, realgar, stibnite and carbon might be claimed to have had medicinal value when daubed in appropriately horrible streaks and patterns over the bodies of dancing, howling medicine men, who have exorcised the 'demons' out of quailing patients from the dawn of mind down to the present day. Even Neanderthal man is said to have used earth containing oxide of iron in a ceremonial way, and Cro-magnon man of the later old stone age (Aurignacian time) must have attributed great religious and magical powers to pigments, which he mixed in profusion from colored earths. Medicine and magic were almost interchangeable terms in those far-off days, if we may judge from the ideas of the old stone age peoples of today; and psycho-therapy is far from out of vogue in this enlightened civilization of ours, though the practitioner now usually dispenses with the tom-tom and the paint.

Savage man was not entirely dependent on the tribal wizard for surcease from distress. He sought out some remedies for himself. Mineral springs, especially hot springs, became important places for the cave man, for they had the 'rheumatism' then as now, as proven by arthritic spurs and thickenings on ancient bones. Mud may have been smeared on an aging warrior's torso by his anxious mate, or some keen-witted priest may have originated the idea of mud packs, but muck from almost every bog in Europe has figured in the therapy of arthritis from the time of the Irish giants to the present day. It is probable that certain ions from the dissolved acids of mineral salts in the muds actually are absorbed in sufficient concentration to produce therapeutic results in some cases, and radon or other emamation products are also present in small amounts in some mineral springs which have been sources of mud from the old stone age to now.

Hot springs no doubt caused greater healing by virtue of their heat than through mineral solutes, of which more will be noted later. It is certain that all primitives value and guard saline springs, not only because a salt lick or spring is usually a good hunting location, but because they use the salts for medicinal and food value. It is certain that certain medicinal virtues of minerals were learned by the age-old trial and error methods of primitive man long before history began, and that this knowledge has been handed down encased in a mass of folk-lore and superstition which persists to this very day.

The Egyptians developed the use of minerals and metals in medicine to a wide extent through the efforts of the priesthood, and of physicians who were of priestly lineage. The ancient Ebers papyrus lists over seven hundred medicinal preparations, among which are mentioned salts and oxides of antimony, lead and copper. Kaolin and calcium carbonate were used internally for relief of intestinal complaints, and as powders for treatment of wounds and skin diseases. The noble metals were valued for their magical powers, as were precious gems, and were effective then as now. Someone has said that there is nothing which can relieve the melancholia of a spoiled young lady quite so well as a fine diamond bracelet!

Babylonian medicine was not so specialized as was that of Egypt, where there was a physician for each organ and part of the body. Instead, persons who were ill were taken out to the side of the highway, where passing travelers might tarry to suggest some remedy. The Greeks were more scientific, and the teachings of Hippocrates were a remarkable advance over the hazy notions of his contemporaries. Mineral waters, calcium carbonate, ferric oxide, magnesium sulphate and other salines were well known, and applied with quite modern ideas as to their actions. Iron was administered in the form of the oxide, secured by allowing a sword to rust in water which the patient was later caused to drink as a potion. This was supposed to convey the strength and keenness of the sword to the one who quaffed the rusty draught. Mercury was used as a purifier, and to confer quickness upon the recipient, tiny amounts of the metallic mercury being used. The latter metal was sacred to Hermes (the Mercury of the Latins), and each god was special deity ruling over some special drug, while Apollo was concerned with all healing. Aesculapius was his son, and was in active charge of medicine and physicians. The word pharmakon meant drug, also poison and poisoner, and it was used to refer to a purification process by means of some agent, person or animal used as a scapegoat. It is still an apt expression in some of it's ancient uses!

The Roman school of medicine was really a branch of the Greek school. Galen laid emphasis on herbal preparations rather than on minerals. He did, however, use ointments in which were included clays, powdered calcium carbonate, bone ashes, and mercury, iron and their oxides.

Mediaeval practices were largely superstitious, tinctured with blind following of fragmentary excerpts from the writings of Hippocrates, Galen and other authorities. The alchemists discovered the oxides of numerous metals in their search for means to transmute base metals into gold, and physicians adapted some of these to their use as drugs. Arsenic was introduced in this way, and loomed large as a handy and efficacious poison during the time of the Borgias. Phosphorus was also chiefly important as a poison, and lead likewise was popular because the slowness of it's action gave the poisoner time enough to remove suspicion from himself. Paracelsus, a clever super-mountebank of the early renaissance (1493 - 1541), popularized antimony in such a way that it was used by the profession for several centuries, to the great damage of innumerable trusting patients, to whom it did more harm than good. Mercury was used to the point of salivation and kidney damage in the treatment of syphilis, and sulphur was used extensively inside and out in the elementary form for 'purification' and as a powdered dressing on wounds. Rich people's children were treated for phthisic and rickets with pearls powdered and given in dilute wine or vinegar, but the children of the poor were dosed with pulverized shells from the sea shore. Many gems were administered in solution or powder form, as were mummy bones, because of their magical healing qualities, and one priest-physician lists sixty rocks which are important because of their marvelous healing properties. The names of these rocks unfortunately were not recorded, so we are at a loss to know which rocks are so efficacious.

The search after truth and the upset of tradition and authority in the fields of medical learning gradually led to adoption of the experimental method in this old art of healing, and science slowly replaced superstition following the renaissance. We have gradually learned something of the actions of drugs, though the science of pharmacology is still quite young. Minerals have perhaps come to occupy a less important place in medicine, but a surprising number are used as they occur in nature, while purified forms and synthetic derivatives are legion.

The mineral constituents of the human body may well be considered as a prelude to a discussion of mineral drugs. <u>Calcium</u> occurs in the bones chiefly as calcium carbonate and dicalcium phosphate, in almost the same proportions as these salts appear in apatite, and there is an average of over 1 kilogram (two and a third pounds) in an adult of 150 pounds. <u>Phosphorus</u> is an essential element of every cell, but 70 to 75 per cent occurs in the bone, and there are about 670 gm. of elementary phosphorus in the average adult body. It exists as salts or esters of orthophosphoric acid and is found in nucleic acid. Phosphorus in combination as $Na2HPO4$ (80%) and Na(or K)$H2PO4$ (20%) is a most important buffer in the blood, tending to maintain the acid-base balance within very close limits. <u>Magnesium</u> forms a small but important constituent of the body, chiefly found in the muscles in the proportion of 21 mgm. per 100 gm. of muscle, and a small amount in the bones as $Mg3(PO4)2$ and $MgCO3$. <u>Sodium</u> and <u>potassium</u> are, of course, essential elements, the sodium mainly dissolved in body fluids as the chloride, the potassium almost entirely combined in tissue cells. They play a part in maintenance of osmotic pressure, neutrality and irritability. Chlorine is chiefly in combination as sodium chloride, and is important in maintenance of osmotic equilibrium. <u>Sulphur</u> is most widely distributed in organic combination with proteins, is an essential part of the bile salts, and appears in the lipids of the central nervous system. It can only be utilized by the body when in combination in amino acids of protein. <u>Iron</u> is a small but highly important element in the body, only about 4.5 gm. in the adult, chiefly in organic combination in hemoglobin, the oxygen carrier of the blood. It is a buffer, is associated with cell growth, and excess iron is stored in the liver. <u>Iodine</u> is chiefly combined with protein in the secretion of the thyroid gland, thyroxin, and has to do with control of oxidations and body growth. Rare elements found in the body include manganese, which has to do with reproduction and lactation, copper, which may act as a catalyst, zinc, nickel, aluminum, cobalt, silicon, bromine and fluorine. A man is worth about ninety-two cents on the open market, if onere were to place values on the mineral constituents of his body. This statement may be disturbing to some, but it is really only another proof that the whole is greater than the sum of it's parts.

Medicinal Minerals

So many compounds and derivatives of minerals are used in medicine today that it is impossible to mention more than a few important ones. We will confine our attention mainly to minerals used as such, without details as to synthetic compounds or their pharmaceutical actions. Also, the technical applications of many mineral products in use in the clinical and histological laboratories would lead so far afield as to prohibit more than mention of some more important ones. Classification according to the chemical grouping of the periodic table lends itself better to our purpose than would a pharmacological list.

The alkalis occur in nature as halides, chiefly the chlorides or carbonates of sodium, potassium and lithium. Halite, or rock salt, may be considered as medicinal, since it enters into many pharmaceutical preparations, and is essential to the body. Many mineral waters contain salt in addition to sodium sulphate, and the latter is the chief active ingredient of certain popular mineral waters. It crystallizes as $Na2SO4.10H2O$, which is commonly known as Glauber's salt and to the mineralogist as mirabilite, and the physiological effect is too familiar to require comment. Lithium carbonate is said to be contained in "lithia" waters, which were popular during the past decades as "cures" for rheumatism and gouty disorders. Analyses show that there is very little lithium in these waters, but some firms add it, though the real medicinal effect of lithia water is a catharsis due to magnesium and calcium bicarbonates. Sodium carbonate is found in high concentration in some saline lake waters which are used for the treatment of arthritis as baths, and trona, which is the double salt $Na2CO3.Na HCO3.2H2O$, is a source of soda bicarbonate which figures as a most important alkalinizer and in the treatment of peptic ulcer, as well as for application to mucous membranes as a wash or gargle. Nitrates of both potassium and sodium are found free and are used to reduce blood pressure.

The alkaline earth group includes calcium, strontium and barium, as well as radium. Calcium chloride is present in many mineral waters, and has an action similar to Glauber's salts. Calcium carbonate, which occurs as calcite, limestone, marble and in shell conglomerates, is widely used in powder form as an ant-acid and for the relief of intestinal disturbances, while the surgeons occasionally use it as an ingredient in surgical dusting powders, and the dermatologist includes it in many drying, soothing lotions. It is injected intravenously as an aid to coagulation of blood in hemorrhage. Calcium sulphate is found in the form of anhydrite and gypsum, whichisthe hydrated form. Gypsum is partially dehydrated to make plaster of Paris, which is most essential in the making of plaster casts which are so popular in this age of automobiles. The calcium salt of lactic acid and di-calcium phosphate are of the utmost importance in medicine, but cannot be dealt with because of lack of space. Strontium minerals have no place in medicine.

Barium is chiefly important as an opaque medium with which the gastro-intestinal tract is visualized by the x-ray. Barite is the sulphate, and occurs quite widely. This, in purified form, is the salt used in roentgenology. Tons of barium sulphate are no doubt ingested daily by patients in offices and hospitals throughout the land, and this mineral looms large in importance to doctor and sufferer alike.

Radium is unique in the fact that it emits alpha (helium nuclei) and beta particles (electrons) and gamma rays, and that it continues to do so at the same rate, regardless of the chemical state of the element. Pitchblende or uraninite is the common mineral source of radium, carnotite and autunite are less important sources. A massive amount of the ore is necessary for the production of a tiny quantity of radium, which occurs in nature in the form of oxides and is dispensed commercially as the sulphate. The uses of radium in treatment of malignant and pre-malignant growths would form a long, romantic story in themselves, and all mankind may well thank the Curies for their contribution to science, and to the world. Radio-active waters have been claimed to be of great usefulness in the treatment of numerous diseases, particularly arthritis, and are widely used in Europe. The emanation, radon, is the active ingredient of such waters, and this loses its radio-activity in a short time, so these waters cannot be stored for any length of time. Baths and mud packs made with radon waters are used externally, and steam from the same water is introduced into heated rooms where patients inhale the emanation. Introduction of even very small amounts of the salts of radium into the system causes slow but intense pathological changes in the body, finally leading to death. The water from Warm Springs, Oregon, is mildly radioactive.

Magnesium, zinc and mercury are classified with the alkaline earth metals, and minerals containing them are widely used in medicine, though cadmium, of the same family, is not. Magnesium chloride is found in solution in many mineral waters of the saline type, and acts as a cathartic. It is anti-spasmodic, and is used in moist packs as a soothing application. Epsom salts are so called because they occur in the mineral springs of Epsom, England, and are found out of solution only in arid areas in old lake beds as the dry $MgSO^4.H2O$. The sulphate has the same uses as the chloride, and is also given by hypodermic for it's general relaxant effect on muscle and it's action as a mild anaesthetic. This use in obstetrical practice is becoming more general, and the spasms of spasmophilia and tetany may be relieved by the same method. Magnesite (MgCO3), the simple oxide, is used as such in powdered form along with soda in the treatment of peptic ulcer, because of it's highly anti-acid effect and also because it combats the constipating action of calcium carbonate which is also prescribed as an anti-acid. Hydrated magnesium oxide is the well-known and popular 'milk of magnesia'.

Zinc has a styptic or astringent effect on body cells, and is toxic in large amounts, though the action is slow. The carbonate is used in dusting powder on wounds or skin lesions, and it occurs as smithsonite. Zincite occurs with willemite; it is the oxide of zinc, which is used widely in ointments and lotions for it's mild astringent and germicidal effect on skin lesions. Calamine is a hydrated zinc silicate (H2Zn2SiO5) which is the chief ingredient of a standard lotion, calamine lotion; it is applied to many different types of irritative skin lesions. Zinc salts and steerates are well kown in hospital and nursery.

Mercury occurs as the free metal, hence may be mentioned as a mineral and it has wide-spread uses in medicine. It is incorporated in ointments for local germicidal and parasiticidal effect, and as an anti-syphilitic because it is absorbed through the skin. It is mixed with chalk as mistura cum cretae or gray powder to be given internally for laxative effect, but this use is not popular because of the danger of poisoning or kidney damage. The blue mass pill of former years was just a different preparation of metallic mercury. Mercurous chloride is calomel, a rather rare mineral, but a very common inclusion in the doctor's bag up to the past quarter century. The old dictum of "mercury followed by salts" was almost universally applied for almost every ailment which affected mankind over a period of three or four hundred years. Well may we thank the pharmacologists who have caused the abandonment of this violent catharsis as a routine! Cinnabar, the sulphide, was used by primitive man as a pigment, so it might be mentioned as a therapeutic mineral if used as a paint on the visage of the medicine man. It is, of course, the chief source of commercial mercury, and occurs in quite large deposits in the Oregon country. Mercury is combined in a large number of prepared phamaceuticals for both anti-syphilitic use and to produce increased urine production in some types of nephritis. The garish splashes of red color on abraded knees attest the popular use of mercury in combination with the aniline dye, eosin, as a germicide. Perhaps we are still in need of a touch of psychotherapy, as were our not-too-distant forbears of the paleolithic age, with their pots of ochre, hematite and cinnabar.

Copper, silver and gold! What a triad these form in the history of mankind! They were all prized by the Egyptians as having a most potent magical effect on many ailments, and were assigned to various gods whose deity was supposed to be resident in the metals. To Ra, the sun god, belonged the golden metal, and ancient men sought in the wilds of Siberia, the tropical jungles of south central Africa and the isles of barbarian Britain for this life-giving symbol of the great sun god. Silver was a symbol of the moon, and was considered a cure for lunacy down to the past century, since the moon (luna) was supposed to cause insanity. What was more logical than to reason that the lunar metal might bring back the fleeting reason?

Copper might be said to have figured in medicine first as the native metal in the form of a scalpel of sorts, with which the earliest surgeons performed such operations as incision of abscesses, removal of arrows from flesh wounds, and cutting for stone (cystotomy), which latter is known to have been done in early times. Malachite ($CuCO_3.Cu(OH)_2$) and azurite ($2CuCO_3.Cu(OH)_2$) were probably used by priest-physicians as pigments in Neolithic times, but have no modern use in medicine. The Arabians knew how to make the sulphate, blue vitriol, which they used as a caustic and emetic and which they introduced to Mediaeval Europe. Various soluble copper salts were used as poisons, to be given to the poisonee in wines, and were held in high favor among the feudal courts of middle Europe for many centuries as aids to political advancement, monetary gain, or domestic felicity!

Silver is germicidal in the elementary form, and is used finely divided in some ointments today. The silver salts, such as the nitrate, are excellent astringents and local germicides, to which most readers can attest. Various combinations of silver with proteins are widely used by all the medical profession, but patients are being warned against the long continued and indiscriminate internal use of any silver preparation because of the danger of permanent deposition of silver in the tissues. The patient turns slowly to a grayish tint, which is permanent through the action of light on the silver compounds in the skin. This condition is called argyrism.

Gold has lost it's magical properties, but it is still a healer for psychic ills of minor degree when administered in the form of rings, or bracelets. The noble metal occurs in some minerals as a purple colloid, called "the purple of Cassius", but is not recoverable in the colloid state. A gold colloid is used in the laboratory, however, as a test for certain diseases of the central nervous system, in a procedure named for it's originator, Lange; and gold salts are administered intravenously in the treatment of tuberculosis of the skin (lupus), and in some types of malignancy.

Boron and Aluminum, though widely distributed in nature, have minor places in medicine. Borax ($Na_2B_4O_7 \cdot 10H_2O$) is slightly bactericidal in solution, and is used in gargles and wound dressings. Since it has figured largely as a household cleanser, it might be said to be a fine preventive of disease. Boric acid (H_3BO_3) occurs in some hot springs as such, and is rightly popular as a mild astringent and germicide for eye infections of many types, as well as a solution for treatment of infected wounds or mucous surfaces. It occurs in crystalline form as sassolite in Tuscany.

Kaolinite, or fuller's earth, is coming into quite wide use for the treatment of some kinds of colitis and enteritis, and it is given in powder form internally. It is pure hydrous aluminum silicate, the final weathering product of feldspar, with which all good geologists are familiar. It is also used alone or with other medicaments, in wound dressings, either dry or as a mud. Other aluminum preparations are manufactured products, most notable of which is 'alum', the double salt potassium and aluminum sulphate. This was known to the ancients of India and is mentioned by Hippocrates as an excellent styptic to stop superficial bleeding. This is the "alumen" of Galen and all his successors of Roman, Arabian and Mediaeval schools of medicine. We still use this time-honored styptic to stop the blood from razor cuts, and as a wash and gargle.

Carbon, silicon, tin and lead are grouped together, but only tin and lead are important in medicine if we exclude the organic combinations of carbon. Carbon dioxide is by definition a mineral, though in a gaseous state, and in this connection it might be listed as one of the most important minerals. It is being used as a respiratory stimulant for new-born babes, post-operative patients and for cases of acute heart failure, in combination with oxygen in proportion of 5 to 10% CO_2 to 95 or 90% O_2. Carbonated spring waters occur naturally and have a place in medicine. The carbonate springs at Klickitat, Washington, produce large quantities of the gas, and the water has been used by the Indians for untold centuries. Carbon dioxide snow is applied to warts and other superficial growths, and causes destruction by freezing. The carbonates of various elements have been mentioned in connection with their cations

Silicates figure in medicine in a minor way. Clay and various muds have had formerly greater popularity than now. Talc and soapstones are chemically identical, $H_2Mg_3(SiO_3)_4$, and talcum powder has probably soothed the skin of every reader. Quartz is fused to make the burners of various mercury arc lamps which are used as sources of therapeutic ultra-violet light, since this light can not penetrate ordinary glasses.

Tin has never been used extensively in therapeutics, though the metal is given in powdered form as pills in the treatment of chronic furunculosis--i.e. boils. Stannous chloride is the active ingredient of the common styptic stick which has a place in almost every medicine cabinet.

Lead has been more important from the standpoint of toxicology than of therapy, though it has been used in medicine since prehistoric times. The Greeks knew the symptoms of lead poisoning, and Paul of Aegina warned against it. Lead pipes for conveying the water supply have caused poisoning in many instances, and the lead in paints is well known as the most prominent cause of the cramp-like pains which have come to be called "painter's colic". Babies have been known to develop these symptoms through a habit of chewing the lead paint from the edges of their cribs! Another hazard of the newly born is lead from nipple shields of this metal used less now than formerly to protect tender or excoriated nipples.

Cerrusite, the carbonate ($PbCO_3$) is rarely applied in a 10 per cent ointment. Colloidal lead is figuring in the treatment of cancer, being injected in colloidal form, to be followed by x-ray therapy; the results are sometimes brilliant but usually inconclusive.

Nitrogen has been mentioned in connection with the nitrates of sodium and potassium, and phosphorus with regard to the phosphates. Elementary phosphorus is a violent poison, and causes necrosis of the jaw and other bones, but the inorganic phosphates are utilized in the body, especially the calcium phosphate from phosphate rock. Arsenic is related chemically, and is chiefly important by reason of the many derivatives, though arsenous oxide is the active ingredient of Fowler's solution, still used as a tonic. Arsphenamine, commonly known as "606", and neo-arsphenamine are the most important drugs used in the treatment of syphilis, and both are complicated compounds with phenolated aniline dyes. Other similar drugs combat trypanosomeasis and tropical "sleeping sickness" of Africa. While arsenic is a protoplasmic poison in large amounts, it is a useful stimulant to growth in tiny doses, and especially affects the growth and texture of skin and hair. There is a peculiar addiction to arsenic among some workers in the mines of eastern Germany, who are called arsenic eaters.

Antimony is only of historical significance now, except in artificial combination with potassium and tartaric acid as tartar emetic (potassium antimonyl tartrate).

Bismuth occurs as the native metal, and is used only in combinations as bismuth subnitrate and subgallate in the treatment of diarrhoeal intestinal disorders.

Oxygen, sulfur, selenium and tellurium are grouped together in the periodic table, but oxygen has appeared as part of other metals, and selenium and tellurium are only important as occasional causes of poisoning. Sulfur has been widely used from prehistoric times and in many forms, particularly the native element, as well as sulfides and sulfates. In the elementary form it is perhaps most important as a specific remedy for scabies--i.e. the "seven year itch". It appears in many other ointments and lotions as a parasiticide and stimulant in certain skin diseases. The combination of sulfur and molasses is a bit out-moded now, but it had a long vogue as a spring tonic, and was no doubt efficacious as a stimulus to activity on the part of the intended victim to avoid the 'fatal' dose.

Sulfur dioxide fumes (SO_2) have been used as a fumigant for several centuries, and they are effective in destroying vermin and oxidizing odors, though they are not germicidal in any degree as ordinarily used. Sulfur candles are not used in large numbers now, for this reason.

Hydrogen sulfide (H_2S) gas is found in solution in sulfurous mineral waters, examples of which are the waters of Paso Robles Hot Springs, of Soda Springs near Forest Grove and numerous other places along both the Coast and Cascade ranges. Pharmaceutical virtues of this unpalatable gas are claimed to be large, the actual value is chiefly to test andstrengthen the fortitude of the partaker.

Sulfates have been mentioned in reference to numerous positive ions, are numerous because they are usually quite stable and as a rule not highly soluble. Many alkaloidal drugs are dispensed in the form of the sulphate salt because of the stability of this form.

Fluorine, chlorine, bromine and iodine have been mentioned in connection with potassium and sodium, while manganese is an important trace mineral in the body, and probably has a catalytic type of action. It occurs in nature as pyrolusite (MnO_2). Bromine is a most important sedative, found native as sodium bromide, while iodine occurs in the nitrate beds as sodium and potassium iodide (NaI, KI) and as sodium iodate ($NaIO_3$) with Chile saltpeter. The song which states that iodine helped to win the War is not all idle jest. It is still a most important antiseptic.

Iron stands alone in the group with cobalt, nickel and platinum as a useful medicinal. It occurs in elementary form rarely, is usually recovered from limonite ($Fe_2O_3 \cdot xH_2O$), hematite (Fe_2O_3) or pyrite (FeS_2) "fool's gold". The pure iron and a legion of it's combinations are used in the treatment of secondary anemia, and it has been shown that it is effective in the metallic form. Chalybeate waters contain iron as ferrous carbonate and are widely used in Europe, and many waters carry iron in solution in this region, but they are seldom used for medicinal purposes.

The hydrocarbons which occur as minerals include ozacerite, a paraffin chiefly found in Utah, and asphaltum, both of which find technical uses, the latter also appears as an irritant dressing for old wounds and skin infections. Petroleum is a source of the ubiquitous mineral oil, and of a great number of "coal tar derivatives", among which are numerous headache remedies, sedatives, antiseptics and dyes. Coal tar in crude form is often put up in ointments which disguise the looks but not the odor. Ichthyol is so named because it is said to be derived from fossil fish, and appears in shales which are rich in fish forms. It is widely used in dressings for ulcers and low-grade skin lesions.

The fossil bones of ancient mammals and reptiles which once roamed the mountains and plains of China and Mongolia are highly prized by the Chinese as having marvelous medicinal powers, since they are thought to be dragon bones. They are administered in powdered form for a large number of Oriental ills. This usage may explain some of the opposition to removal of paleontological specimens from China. We have seen that there may be more merit in the administration of such minerals than would appear at first sight. Certain it is that modern medicine could not be nearly so useful to mankind without the help of minerals in medicine.

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NOON LUNCHEON

The weekly noon luncheon of the Society is being well attended. Beginning Thursday, October 1, 1936, the Thursday noon meetings will be held at Hilaire's Restaurant, 622 S. W. Washington Street(between 6th and Broadway). Luncheon is served for 50¢. These meetings are informal, and afford the members and excellent opportunity of becoming better acquainted. Many matters of geological interest are discussed, and interesting exhibits are usually presented and examined. Persons attending may come or leave at their convenience. Members or friends of the Society are always welcome.

(Go to rear of restaurant and down stairs to meeting room)

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Dr. W. Claude Adams gave a talk before the Kiwanas Educational group last week-

Suggested the members study the topography of our region especially the formation along our highways - Pointing out the interesting geological features when showing their visitors some of the high lights in this region - eg. Fabled Bridge of the Gods, Lake of the Gods, Piors of the Bridge, Table Mt., [illegible] Point, Formations along Columbia Highway - The Greatest Monolith in the Country (Biddle Rock). Extinct Volcanic Cone - Mt. Tabor. And many other points of interest in this region.

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A. N. Piper was among those taking an important part in the Program of the 26th Annual Session of the Oregon Reclamation Congress at Vale, September 4th and 5th.

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DID YOU KNOW that rock crystal (clear quartz) was once thought to be ice? This idea persisted until the time of Agricola who determined that it was harder than ordinary ice ever became, and suggested that quartz was a "harder ice" than ordinarily known.

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GEOLOGIC TRIP, SEPTEMBER 27TH

MT. HOOD VICINITY

The caravan will leave 6th and Yamhill Sts., Sunday morning at 7:00 o'clock. It will proceed via the Hawthorne bridge, Division St. and thence out the highway toward Mt. Hood.

At a point approximately one mile east of Sandy we will stop to study the topography of the Western Cascades near Mt. Hood.

Next stop will be made at a point east of Cherryville to observe some old glacial terminal moraines; remnants of the glacial period.

The caravan will then proceed to Phlox Point on the Mt. Hood Timberline Road. A walk of about ½ mile will be made past the new Timberline Hotel site to a point on the edge of White River Canyon. The White River buried forest can be seen from here. It is interesting to note that a few of the stumps still standing, vary from 6 to 18 feet in circumference; much larger than the trees found growing near timberline today.

After returning to the cars, the party will proceed to Bennett's Pass on the Mt. Hood Loop Highway. Here it is intended that the caravan shall be condensed to as few cars as possible and then proceed on the road toward Bonney Butte. A drive of about a mile brings us to our point of interest, a dike which cuts across the mountain ridge and on which there are some very interesting ancient Indian carvings. What tribe is responsible for them? How old are they? They are the only carvings known in this part of the country.

A stop will be made at White River for lunch. could be Little Crater Lake.

After the appetites have been satisfied we will travel via Wapinitia Cut-off and Olallie Lake roads to Turquoise Pool. The origin of this lake is one of the mysteries of the Cascades. It is quite peculiar and different than other mountain lakes. Several persons who have seen it have expressed their opinions as to its origin, but it is still in question. Here is a geological problem for you to help solve.

By the time the problem of Turquoise Pool has been solved, it will be time to disband, and the party will proceed toward home via the Wapinitia Cut-off and Government Camp.

Approximate distance 165 miles.

Russell Collins - Leader.

THE GEOLOGICAL NEWS LETTER

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of the

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LECTURES

Oct. 9, 1936 (Friday) - Mr. A. W. Hancock, a member of our Society, will address the Society on "Observations of an Amateur Geologist in Oregon". Mr. Hancock has travelled extensively in Oregon, and is a very enthusiastic member of our Society. He will present a most interesting evening. He recently visited leaf-fossil beds near Madras, with Dr. Chaney of the University of California.

Oct. 23, 1936 (Friday) - Mr. F. P. Keen, entomologist with the U. S. Forest Service, will address the Society on "Tree Rings as Indicative of Periods of Precipitation". Mr. Keen has just completed an elaborate study of tree rings in Oregon, and will discuss precipitation periods in this state during the last 800 years or so. Come and find out when to carry an umbrella in Oregon.

Nov. 13, 1936 (Friday) - Mr. Robert Layfield, a member of the Society, will speak on the geology of "Saddle Mountain and vicinity". Mr. Layfield has recently spent considerable time in this part of the Coast Range in Clatsop County, and has made a report of his studies to the National Park Service of the Department of Interior. This is a portion of the state of which very little of the geology has been heretofore known.

TRIPS

Oct. 11, 1936 (Sunday) - Eagle Creek.
Leader: Joseph Wimmer.

The following resolution will be submitted to the members at the annual meeting on February 26, 1937. Any suggestions or possible changes should be presented to members of the Executive Committee.

BE IT RESOLVED that the By-laws of the Geological Society of the Oregon Country, be and the same hereby amended by adding thereto a new Article to be known as "Article XIII", which shall read as follows:

"ARTICLE XIII

CHAPTERS

Section 1. Formation and designation:

Ten (10) or more persons, who are interested in carrying out the objects and purposes of this Society, may petition the Society as herein provided, for a Charter from the Society, and if granted such persons may thereafter form a Chapter of the Society, subject however, to the Articles of Incorporation and By-laws of the Society. Chapters shall be designated by consecutive numbers, followed by the name of the city or town where the Chapter is located.

Section 2. Petition:

Petitions for the formation of Chapters, and the granting of a charter shall be addressed to the Society, and shall be signed by not less than ten (10) persons, as herein provided, and shall set forth, among other things, the location of the proposed Chapter, and the names and addresses of the charter members of the proposed Chapter.

Section 3. Charter:

If such petition be granted, the Society, shall issue a Charter certificate to such Chapter, in such form as may be authorized by the Executive Committee. Petitions for such charters for the formation of Chapters, shall be considered at the Annual Meeting of the Society.

Section 4. Dues and Membership:

Any Chapter of the Society shall have the right to fix the dues of such Chapter, provided however, that the minimum dues fixed by any Chapter, shall not be less than the dues fixed by the By-Laws of the Society. Each Chapter shall remit to the treasurer of the Society, not less than Two Dollars ($2.00) for each member on the rolls of such Chapter, such remittance to be made on or before the 1st day of April, of each year.

The Secretary of each Chapter shall report to the Secretary of the Society, on or before the 1st day of April, of each year, the names and addresses of the members in good standing in such Chapter as of March 1st of such year.

Section 5. By-laws:

Each Chapter and the members thereof, shall be governed by the By-laws of the Society, but each Chapter shall have the right to adopt any additional by-laws or regulations solely for the government of such individual Chapter, provided however, that such additional by-laws or regulations shall not conflict with the Articles of Incorporation of this Society, or the By-laws of this Society, or the Laws of the United States or of the State of Oregon, or any other state in which the Chapter might be situated.

Section 6. Revocation of Charter:

In the event that any Chapter shall fail or refuse to abide by the Articles of Incorporation or By-laws of this Society, or regulations promulgated by the Executive Committee, or violate any of the provisions of such Articles, By-laws or regulations, the Executive Committee may revoke the Charter of such Chapter, at any regular or special meeting of the Executive Committee, provided however, that at least (10) days notice in writing shall be given by the Secretary of the Society to the Secretary of such Chapter, by registered mail, notifying such Chapter of the time and place of such meeting of the Executive Committee. At such meeting any member or members of such Chapter may appear before the Executive Committee and show cause why such Charter should not be revoked.

The Charter of any Chapter may also be revoked by the Society at its annual meeting, by a three-fourths vote of the members of the Society."

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BONNEVILLE POWER AND A PACIFIC COAST IRON INDUSTRY

Doctor Edwin T. Hodge has had an article published in IRON AGE entitled "Bonneville Sets the Stage for a Pacific Coast Iron Industry" (Iron Age, v. 138, no. 10 pp. 46-47, 100-103, Sept. 3, 1936). This is the first of a series which will appear in Iron age, dealing with this subject. The first article gives data on markets, several tables, such as, a survey of iron and steel materials "imported" to the Coast area; summary of rail and water receipts and shipments from foreign and domestic sources; two forecasts of consumption demand; and the foreign iron and steel imports to the Pacific Coast. It is highly recommended to anyone interested in the economics dealing with the use of Bonneville power. It is possible that the power released will attract industries, which will considerably change the economic picture in the Oregon Country and students of this subject will welcome first-hand, authentic information. The publication may be consulted in the technical room of the Portland Public Library.

(RCT)

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Hodge, Edwin T.

Origin of the Washington Scablands - Abstract. (International Geologic Congress, 16 Session, 1933, V. 2,pp. 1105, 1936)

The phenomenal and unique geomorphic scabland forms unlike the rest of the arid West, resulted from glacial advances, partly into a closed basin and onto a basalt and lake-bed surface. The first advance produced two great united lakes, which spilled across the Cascade Range and then produced the integrated Columbia River from many ancestral streams. Ice lobes dammed the Columbia River and eroded Moses, Grand Coulee, and Rock Basin Lakes. Stagnant ice produced waterfalls, potholes, and kames. Ice jams produced scabland and anastomosing channels Melting ice produced loessal deposits, gravel plains, gravel terraces, and upstream bars. Recessional ice permitted the entrenchment and superposition of the Columbia Canyon. A second advance dammed the Columbia Canyon and produced great falls, recessed from the canyon where diverted water spilled into it. All three advances enhanced the scabland features and dispersed erratics by floating icebergs that reached the Willamette Valley. The third advance repeated the same effects, and the retreat of the ice left many stagnant ice features in the valleys entering the scabland area. The scablands and contiguous territory give no evidence of a catastrophic flood but resulted from glacial influences on a peculiar surface effective throughout the Pleistocene.

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UPPER CLACKAMAS TRIP

Ray Treasher

Clarence Phillips arranged one of the most interesting trips taken by the Geological Society of the Oregon Country on Sunday, August 23, into the Clackamas River Canyon. The party of 17 cars, 63 people, met at Estacada, then to the bottom of the Clackamas Canyon and by P.E.P. Co. speeders, up the river.

The trip enabled us to extend our observations in the Willamette Valley, into the Cascades, and gave us a cross-section view of the Western Cascades. This account is to chronicle the tour, describe some of the detail features. Mr. Phillips will present an article on the geology of the area.

Before we entered the canyon, we stopped to observe the erosion surface, the enormous piedmont fan extending out from the Cascades, which has been so ably described to us by Dr. Hodge. We left the surface at about 1900 feet elevation to descend to the bottom of the canyon.

The P.E.P. Co. speeders and trailers were of the "open-faced" variety, providing an unobstructed view in all directions, except downward. Leo Simon served in a very necessary capacity of brakeman for the advance unit, although he had difficulty in remembering to release the brake on up grades.

Our first impressions were of enormous flows of basalt extending to the top of the canyon. This material was true basalt, with excellent examples of columnar and brick-bat structure, vesicules filled with agate. The interval between flows was made plain by zones of soil and ash and a relative idea of the elapsed time between outpourings could be gained from them. Some of the columnar joint planes were curved, instead of the usual straight cracks usually observed.

The flows appeared to dip to the northwest at low angles and before long we began to see the formation underlying the basalt. It was a coarse sediment, or fine conglomerate and it was identified as Warrendale formation. There seemed to be no marked angular unconformity between the Warrendale and the basalt, so we inferred that the dip of the basalt is initial. Between the two formations is a thin layer of carbonaceous material approaching coal in quality, indicating considerable vegetation before volcanism.

One of our most interesting stops was at a buried petrified log standing upright in the lava, the base apparently extending into the Warrendale. The contact at the point was somewhat obscured, so we could not definitely determine whether root casts extended into the Warrendale. However, Mr. Hancock (?) found a small cast which gave indications of a root cast, so at least tentatively we assumed that the log was buried in situ.

It seemed strange that the outer surface of the tree showed little indication of charring, although there was a thin layer of carbonaceous material surrounding the bole. Some material similar to bark was also observed. It is not uncommon to find tree casts in lava, but to find the tree in place is rather unusual.

An excellent exposure was observed at the Power House of Warrendale (Eagle Creek) formation, and the overlying lava.

The trip from the Power House to the end of the line was beautiful, cut through heavy timber. Mr. Johnson came down from "Intake" to tell us something about the tunnel on which construction was started from the main fork to the Oak Grove fork of the Clackamas, and about the tunnel temperatures.

Back at the Power House, we received quite a thrill from our inspection of a cougar. It was thoroughly and completely dead, but a very interesting specimen. Mr. Baldwin wanted someone to take the dip and strike. It was a nice "kitty", like the saying about the "only good Indian". Personally, we like our felines of household size.

It had begun to sprinkle a wee bit as we started back, but no one seemed to mind. Leo Simon again presided at the brake, reefing back and forth, like a Volga Boatman. He didn't sing! Perhaps the "cat" had his voice.

It was a most enjoyable and worth while trip. Our knowledge of Willamette Valley conditions has received a distinct contribution. Thanks, Clarence, for an instructive and well planned trip.

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REPORT OF TRIP TO UPPER CLACKAMAS RIVER

Clarence D. Phillips

The party left Portland promptly at 8:00 A. M., and travelled to Estacada, where the caravan reassembled and journeyed over the crest of the plateau north of the Clackamas River, making only one stop to view the topography of the country. The party then descended into the gorge and transferrred to a speeder train. Attention of the group was called to a cinder cone or small volcanoe situated northwest of the ranger station.

In 1909, Mr. J. S. Diller, geologist with the United States Geological Survey, made a general reconnaissance of the western slope of the Cascade Range from Feather River in California to the Columbia. He made a special study of the Clackamas River in the vicinity of Cazadero and Camp 1½.

He reports that the plain lying along the western base of the Cascade Range at an altitude of about 1000 feet is traversed by the Clackamas River in a canyon, with moderately steep slopes of rock cliffs, soil and talus stretches, more gentle near the top, where there are land slides, and also at the bottom where there are local terraces capped with gravel.

The rocks of the canyon walls are of four forms, volcanic breccia, lava sheets, volcanic dikes, and terrace gravels. Of these volcanic breccias are by far the most abundant and important. Other excerpts from his report are as follows:

Occurrence of Volcanic Breccias

"The volcanic breccia is made up of unassorted angular fragments of lava andesite and basalt of various colors ranging in size from dust particles and grains of sand to large rock fragments many feet in diameter. This fragmental material was blown by explosive eruption from the volcanic craters higher up on the range and fell upon the mountain slopes where it became so saturated with water from the copious rains accompanying the eruptions that it flowed in great steaming sheets from the Cascade Range to the gentle slope of the plains, in much the same way as similar material flowed down the old stream channels on the western slope of the Sierra Nevada in California and covered the early and often rich deposits of auriferous gravels.

Nonfragmental Sheets of Lava

"Sheets of solid nonfragmental lava forming part of the bed rock and outcropping on the slopes of the canyon occur within and between the great sheets of volcanic breccia. Some of the lava sheets are basalt, others are andesite and they are usually less than 30 feet in thickness. The basalts are generally very porous and gray or dark. The andesites are often reddish and porphyritic with white crystals of feldspar. The depth to which the sheets of volcanic breccia and lava extend in the region cannot be readily determined, but it is certainly hundreds of feet, and may be, as it is along the Santiam and McKenzie river canyons, over 1000 feet in thickness.

Joint Cracks in the Rocks

"The dikes and sheets of lava in some places have a well developed columnar jointing which divides the rock into columns. In the case of the dikes the columns lie horizontally and extend across the dike. In the lava flow the columns are vertical, but in all cases the columnar joint cracks are limited to the dike or lava sheet and do not extend into the adjacent rock nor make an opening of great extent.

"There is, however, another set of joints, parallel joints the open cracks of which cut up through the volcanic breccias and sheets of lava about vertically in a direction approximately parallel to the course of the canyon. **Such joints may be of considerable extent and form important openings for the circulation of water**. It is especially significant that the dikes are approximately parallel to these joint cracks and suggest that these joint cracks may extend to great depths."

A stop was made at a place where logs and trees are buried under the lava showing evidences of vegetation between the periods of volcanic eruption.

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CRIPPLE CREEK KNOLL

In 1924, for engineering purposes, Mr. Ira A. Williams, geologist, (now deceased) made a special geological study of the knoll at Three Links, being the hill upon which the surge tank is situated. He reported as follows:

"The knoll is an in general conically shaped hill standing rather conspicuously somewhat separate from the adjacent northerly wall of the Clackamas River canyon. The river itself has very evidently been responsible in considerable part for the formation of the hill since the river runs at its base today, and its steeply sloping westerly side is similar in its general aspects to the far canyon wall that rises percipitously on the opposite side of the Clackamas River.

"It has also been shaped, without any doubt, very largely by glacial action in the not distant past by which the size, and to a great extent, the outlines of the present river canyon have been determined. Evidence of the effectiveness of the work of the glaciers is found in the presence of the moraines in various places, great heaps, ridges, mounds, benches, composed of the unassorted mixture of rock materials such as is characteristically carried and, as it melts, left by the ice and the resulting flow of water from it. About the knoll and upon its flanks is much of glacial detritus.

"The conical hill on which the surge tank stands is thus an erosion remnant, a fragment or small portion of the previous rock structure of the region which the combined action of glacial ice moving down from the summit of the Cascade Range, the flowing water of succeeding streams, and the weather has not yet quite worn down and carried away. That the rocks of which it is made were formerly continuous across the space now occupied by the open parts of the Clackamas River gorge is evident by the fact that the very same layers exist in the same relative positions in the walls of the gorge in all directions from it.

"Examination of the hill itself shows that at the top there is a capping of a variety of volcanic lava commonly known as basalt. This capping consists of a number of separate flows, how many has not been definitely ascertained, between each two of which there is a more or less uneven surface of contact which represents the interval of time following the settling into place and cooling and solidification of one flow of liquid hot lava and the coming on of the next succeeding one. The length of time between flows was sometimes great and again relatively short, so that at present we find in some instances evidences of considerable weathering and alteration and softening of the upper portions of some layers of the lava, even that a soil was formed on which there was time for plant growth to take place before all was covered over by the next succeeding flow.

"Again, flows of the basalt must have come relatively rapidly, each spreading out upon the top of the one before it, so soon that neither alteration, soil development nor plant growth could take place. The character of the contacts between flows, and the physical condition of the rock vary accordingly. In general, the poorer contacts and less substantial rock are found now wherever the flows were separated by the longer periods of time.

"Even casual examination of the hillside down which the penstock comes, where the beds are exposed from top to bottom, shows plainly that the size and shape of particle or 'fragment' varies from that of the largest of boulders to the finest grain of mud. And in gerneral there is an absence of the least sign of assortment, the most pulverulent of ash or clay filling in amongst the grains of sand, which, in turn, occupy the insterstices between the pebbles, and all bind together into oftentimes a firm and most substantial rock the angular chunks and broken blocks of varying types of lava. The whole base of the hill seems made up of this type of rock called, as a general term, volcanic breccia or agglomerate.

"It was formed here by the spread of voluminous mud-flows during times of most vigorous volcanic eruption at nearby higher elevations which carried along the loose materials in their path; added to, very largely in all likelihood, by the direct fall of great quantities of ash, cinder, pumice, bombs, sand and scoria that were being tossed into the air by we know not how many scores of these same tumultuously erupting volcanoes. The processes of time consolidated this agglomeration of fragments into a more or less solid rock as we now see it.'

"Careful examination of the uppermost of this fragmental portion of the hill, the very top ten, fifteen or twenty feet of thickness which comes immediately beneath the lower layer of the capping basalt and on which the latter rests, reveals at once a predominating difference in the make-up of this portion. It appears more like a shale or hardened clay and is free from any promiscuous admixture of boulders. Its texture ranges from extreme fineness above through one of granular or sandy feel, downward to where there are actually inter-bands and lenses of sand, coarse sand and fine pebbles; and these show the signs that the lower beds do not, of having been deposited or formed in water. The fine is separated from the coarse, and they are arranged in layers -- 'stratified' is the word -- as is characteristic of all water-borne sediments where we see them being put down today.

"It is notable again that the uppermost few feet of this topmost stratum, and which forms the contact with the overlying basalt, is gernerally of the most clayey nature, possessing to the feel a soapy smoothness when dampened. Along the immediate contact some carbonaceous matter appears and at this same horizon in adjacent localities, remains of former growing trees are found as though upon it there had been growing perhaps and was overwhelmed a mat of vegetation. In places, to the casual view, it would appear that portions of it rise into and conform to the irregularities of the underside of the superincumbent lava in a way to suggest a considerable degree of softness, when the lava came upon it. Perhaps the lava spread out on the water-filled bed or a swamp or across the borders of a shallow lake.

"At any rate, we find here, as the bearing material upon which rests the entire hard rock capping of the hill, an ashy clay which when wet is more or less plastic and workable and displays a notable slipperiness or soapiness to the feel. It is a common and essential characteristic of all clays that they shrink or decrease in volume on drying out, and conversely, expand or increase in volume when water is absorbed. This band or bed which is sufficiently clayey in nature to possess in a degree the essential properties of a clay, extends with very slight doubt beneath the entire hill. Its outcropping edges have been exposed for an indefinitely long time about a goodly proportion of the circumference of the hill, particularly to the north and west sides, to whatsoever of influences, or changes of conditions, such exposure may have brought to bear upon it." *

The above excerpts are taken from a private report of Mr. Williams, the report having been made after a complete and careful study of the structures of this immediate hill. His report however, indicates in a general way, what structures may be found in the surrounding region.

*The material discussed by Mr. Williams is a part of the Warrendale formation - Editor.

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TEMPERATURES

It is interesting to note the variations in temperatures in the Upper Clackamas region. In the winter time the hills in this vicinity are covered with several feet of snow. In the summer the days are warm and the nights are cool. The temperature of the water in the Clackamas River and the Oak Grove Fork of the same river is a maximum of 42 degrees Fahrenheit in the summer, at the surface of the stream.

Austin Hot Springs are situated immediately adjacent to the main fork of the Clackamas River, several miles south of the mouth of the Oak Grove Fork. The spring on the west side of the river has a temperature of 170 degrees Fahrenheit, and the spring on the East side of the River pulls the mercury up to 180 degrees Fahrenheit.

During the construction of the Big Bottom Tunnel through the ridge lying east of Oak Grove Butte, temperatures were taken at each point indicated below by drilling a two-inch diameter hole for a distance of six feet horizontally in the side wall of the tunnel and inserting and sealing a thermometer which was left sealed in the hole for the length of time noted. Tunnel driving was suspended in 1932, after the tunnel had been driven 3636.5 feet. Construction operations were confined to penetration from the northerly portal (Station 195+60) and proceeded to station 159+23.5. (each full number represents 100 feet of penetration):

Station	Date	Temperature Centigrade	Temperature Fahrenheit	Length of Time Thermometer Inserted
181+75	10|16|31	24°	75.2°	60 Minutes
	11|20|31	24°	75.2°	60 "
	12|10|31	23°	73.4°	5 "
	1|30|32	24°	75.2°	10 "
175+00	11|20|31	(Spring water -25° Centigrade -77° Fahrenheit)		
170+00	12|10|31	27°	80.6°	10 Minutes
	1|30|32	26°	78.8°	10 "
160+00	1|30|32	29°	84.2°	10 "

It was estimated by the engineers, from the above data, that a maximum temperature of 92 degrees Fahrenheit, would occur somewhere near the point of maximum cover of 1500 feet, had construction of the tunnel been completed. These facts seem to indicate that there is considerable residual heat left in the rocks forming these hills.

The above temperatures might well be compared with the temperatures in other tunnels in various parts of the world. Mr. W. L. Sharp, engineer, has kindly furnished us the following information:

The Cascade Tunnel of the Great Northern Railway located east of Seattle is 7.8 miles in length. It has a maximum cover or distance below ground surface of over 3000 feet, yet the maximum rock temperature encountered was 75 degrees Fahrenheit.

In the St. Gotthard Tunnel located in the Alps, the highest rock temperature recorded was 87 degrees Fahrenheit under a rock cover of 5,577 feet.

In the Simplon Tunnel, also in the Alps, the greatest rock cover was 7,218 feet and temperatures to a maximum of 132 degrees Fahrenheit were recorded.

The Shandaken Tunnel forms a part of the Catskill Water Supply System of New York City. It is 18.1 miles long and the cover varies from 200 to 2200 feet. It is stated that - "During driving the temperature in different parts of the tunnel remained almost constant at 59 degrees Fahrenheit."

The Moffat Tunnel, 6 miles in length, through the Continental Divide west of Denver, showed a rock temperature at a point 1000 feet in from the east portal of 60 degrees Fahrenheit and 68 degrees Fahrenheit at a point 8000 feet in from the portal where the cover was 1400 feet. At the west portal there was little increase of temperature with the greater cover probably due to the cooling effect of descending ground waters.

The foregoing information has only been collected and abstracted by the writer, and only covers portions of the country covered by the trip.

OTHER POINTS OF INTEREST

As many as four deer were sighted by members of the party. After seeing so many geologists, the deer naturally scampered for the high hills and deep woods.

After seeing the cougar at Three Links, some wisecracker immediately observed: "We have seen Three Lynx and two cougars."

The tongues of the geo-fishermen hung out when they saw those baskets full of fish.

Franklin Davis, the inventor and manufacturer of synthetic agates. All he needs is a good piece of basalt and a bunch of green grapes. Wonderful specimens are produced.

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NITRATE DEPOSITS OF THE UNITED STATES

(A review of U. S. G. S. Bull. 838, 1932: cost, $0.40)

Until very recent years, the United States has imported most of its saltpeter(potassium or sodium nitrate) from the natural deposits of Chile, with smaller imports of the artificial nitrate produced from organic wastes in India. During and since the World War, efforts have been made to locate natural deposits of suitable grade and size for commercial development. within the United States. The known or reported deposits are described in Bulletin 838, U.S.G.S., published in 1932.

There are 3 principal types of nitrate deposits known as cave, caliche, and playa deposits. All of these types are largely or wholly formed by the action of certain nitrifying bacteria upon decomposing protein in the presence of oxygen. A dry climate is favorable for their development and concentration; but some small deposits are known in Pennsylvania, Indiana, and other humid states.

Cave deposits are formed in caves, ledges, in slight recesses, on cliffs, or wherever there may be some protection from the weather. They may be highly pure, but are usually very local, and the depth may be a bare coating.

Caliche deposits are confined to arid regions. They occur as suface blankets, lying usually on gentle slopes without regard to the attitude of the underlying clayey beds, which may have any degree of inclination. These blankets are usually from a few inches to a foot or more in thickness; they may vary rapidly from place to place in depth and in quality.

Playa deposits are found in the clay just under the dry surface of some dry lake beds. The waters of inland lakes with no outlet also contain some nitrates; but in these waters and in playas, the salts are not sufficiently concentrated to be of commercial value.

Accompanying the report are maps showing the location of known or reported deposits of nitrates in United States. The prospects are largely concentrated in aride regions, particularly in the Panhandle country of Texas, the Death Valley region of California, in eastern oregon, and in eastern Idaho. All of them are essentially of a surficial nature, and few of the fields have in sight more than a few hundred tons of nitrate of commercial quality. The conclusion is reached that the known deposits in the United States have little or no commercial value, a conclusion which seems to be shared by the private concerns which have spent many thousands of dollars in prospecting for nitrate. K.N.P.

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NOTES ON THE GEOLOGY OF THE MT. ADAMS TRIP

Ray Treasher and Claire Holdredge

The principal areas investigated on this trip were: The Columbia Gorge at Mt. Pleasant, the Wind River Canyon, the Great Lava Bed, the Upper Lewis River canyon, and the south side of Mt. Adams.

The first stop was made on Mt. Pleasant, at the "half bridge" on the North Bank highway. Upstream, the cliffs on the Oregon shore were noticeable, rising steeply to about 3500 feet and then levelling off in a plateau. The Washington side was different, a gradual slope away from the River, finally ending in a series of cliffs. This is the famous landslide area. Above the "half bridge" are gravels lying on an eroded andesite surface, probably Satsop or Troutdale formation. Westward these gravels are exposed in road cuts, well sorted and containing lenses of silt and fine sand.

Leaving Carson, we went up the Wind River valley, a broad, flat floor, with sharp right angled turns in the road jumping out from behind every bush and telephone pole. Ahead of us appeared what seemed to be a dryland suspension bridge built for one-way traffic, but that was alright, we were going only one way.

A rather breath taking sight greeted us as we rumbled across the bridge, a span of 500 plus feet over a canyon 256 feet deep. In explanation, it appears that at one time the Valley was a deep cut river course which was filled with lava, 500 feet elevation at the Columbia River to 1000 feet at its upper end. The river cut down through this lava fill only to have its efforts thwarted by a second filling. Again the river went to work and we saw the result today. Bunker Hill and Big Huckleberry Ridge are composed of Warrendale (Eagle Creek), so one can say that the surface on which the lava poured out was Warrendale. Origin of the lava was probably Trout Creek Hill in T. 4 N., R. 7 E. (Allen, John Eliot, "Contributions to the Structure, Stratigraphy, and Petrography of the Lower Columbia River Gorge", U. of Oreg. thesis, June, 1932).

The next feature studied was the Great Lava Bed, in the northcentral part of Mt. Hood quadrangle. Our first contact with this flow was about 1 mile east of Race Track Guard Station. To reconstruct the picture, let us imagine a normal mountain river valley between Big and Little Huckleberry Mountains. Then came an outpouring of andesitic lava, filling the valley with its firey flood. The surface soon cooled, forming a thick crust which was broken and fissured by the surgings of the molten mass. A new crust formed, to be heaved and tossed again. As the mass cooled, these broken blocks were left in a jumbled mass, slabs as large as a house tilted on edge. Pressure ridges formed near the edge of the flow, so that the area is well nigh impassible. Cooling continued until the molten material was confined to underground channels. Then as the supply of magma was shut off, these channels or tubes, remained. The roof caved in, in places, and thus the lava caves were formed.

Vegetation took root and a flora similar to that on the surrounding hills developed on the lava, mountain hemlock, pine, white fir and some Douglas fir, but distinctly younger than the surrounding hills. An age of from 100-200years was estimated for the trees, plus the time it would take for them to root and become established. Allen suggested "The Crater" as the point of origin for the lava, but it is felt that more careful study should be given this point.

Goose Lake is a lava dammed stream. The road is built right at the edge of the flow, so this feature was well exposed. Until recently, the lake lost a fair portion of its water by late summer, but now the level is much higher. Within the past 3 or 4 years, the foot and hand prints have been covered during the entire season, the conclusion is that the lake basin is sealing itself with silt.

The famous foot and hand prints occur here, now submerged, but a few years ago exposed on the east shore of the lake. The Indian legend relates that a maiden jumped from Lemei Rock, landing on the still soft lava on the shore of Goose Lake, leaving the impression of her hands and feet. At this rate, and considering the shock of the hot lava, her next stop must have been Portland. Dr. J. Harlan Betz visited the spot and concluded that the prints were chiseled in the rock, because: The vesicules inside the prints are not flattened as they would have been had the impressions been made while the rock was still plastic; that the prints are flat throughout, not deepened at the heel, and toe and finger as would have happened had someone jumped thereon; therefore the prints were chiseled in the rock. Thus we see how the ancient art of "chiseling" developed. It seems a shame, however, to spoil the legend.

We traveled on a lava surface all the way to Guler. The topographic map would lead one to believe that this lava is a part of the Great Lava Bed flow. It is similar in mineral content but two conditions lead us to consider another possibility. The trees growing over this area are much larger, some 3 and 4 foot firs and pines. Still more conclusive; and apparent alignment of lava caves points to an origin in the East Crater or Lemei Rock area.

The ice caves form an interesting feature. We visited one of them at Ice Caves Forest Camp. Here is one of the old lava channels with the top broken in. Ice has formed in it and was still plainly visible on Labor Day. An explanation of the ice formation is that of a descending circulation, a gradual cooling of the cave walls until ice forms. In summer, as it attempts to melt, it absorbs heat according to the principle of the latent heat of melting, lowering the temperature and maintaining a certain amount of ice throughout the year. The Forest Guard at Peterson Guard Station uses one of these as a refrigerator, and we are told that in the 1880's that ice was taken from the caves near Guler and shipped to Portland.

The road northward from Peterson rises over the shoulder of Peterson Ridge. The vesicular lava flow soon gives way to andesite, which is the familiar country rock for a time. The area to Twin Buttes has been heavily burned, and has grown up to huckleberry bush and young tree reproduction. The view was fairly unobstructed, allowing one to "see out". To the west was the Cascade Divide, expressed by Lemei Rock, Bird Mt., Sawtooth Mt., Twin Buttes, and Steamboat Mt. To the east was the gigantic pile of Mt. Adams.

A short distance north of Cultus Creek Forest Camp was an unusual exposure of andesite, the rock piled in enormous scree slopes. Considerable argument arose as to the formation of these piles of broken andesite, ranging from glacial deposits to frost action. It was finally decided, as a tentative conclusion, that the brittle andesite may have been heaved from below, or shattered by earthquakes. When exposed, weathering and frost action broke the mass into huge chunks.

At Twin Buttes, the road to Randle was taken, out past Steamboat Mountain, to the Lewis River at Big Springs Creek. (The U. S. G. S. quadrangle shows the stream to be No Name Creek. However the most recent Columbia National Forest map shows No Name flowing into Big Springs Creek, which in turn flows into the Lewis.

Ranger Langfield identified the stream as Big Springs) Very few outcrops were noticed. However the ground showed scattered boulders of andesite, slightly better rounded than sub-angular, and deeply weathered. One opinion was that they were glacially deposited, another that they resulted from normal weathering. At the crossing of the main fork of Swampy Creek was an excellent exposure of sand and silt, pointed out by Ranger Langfield. Here was a mess. Smaoo spots of fine silt and clay, beautifully stratified. Areas of subangular sand and gravel with no structure. Huge boulders weighing tons. It was finally decided that here was evidence of glaciation, not glacial outwash, but glacial till. Covering this till was a layer of coarse sand, probably blown out of some "sand crater".

The area over which we had been travelling was fairly flat with a gradual downward slope. Then the road jumped over the "breaks" of Lewis River into the inner canyon. Well fractured andesite was exposed here, and at the falls of Big Springs Creek, and older lava, probably Eocene, dipped southeastward. We can imagine therefore, the early Lewis River excavating a broad deep valley, to an elevation of 3500 feet or thereabouts. Glaciers filled the valley and left their till, disappeared, and the Lewis River began cutting headward. A deep narrow gorge developed in the andesite and older, more resistant rocks.

A visit was paid to the Forest Service Lookout at West Twin Buttes. A road has been built almost to the summit of this 4731 foot peak, and a marvelous view of the entire area was had. The gentle west and east slopes breaking away from the Sawtooth-Bird Mt. range indicated andesite flows spreading out from those sources. Many mountain meadows indicated depressions in the flows or perhaps glaciation. Insufficient evidence permitted no definite conclusion on this point.

Labor Day presented us with a perfect specimen of ideal mountain weather for our trip to Bird Creek Meadows. Crossing Trout Creek, we had an excellent view of the upper White Salmon Valley and the peculiar piles of rock. The old White Salmon Valley was probably dammed by a lava flow, forming a lake, in which were deposited gravels and silts forming a fairly level valley floor. Then slabs of ice from the glaciers floated into the lake, dropping their load thither and yon. Finally the lake was drained, leaving Trout Lake as its remnant, the rich farming land and the annoying piles of rock. Early settlers on the east side of the Valley had to remove quantities of gravel which had been deposited on top of the valley silts, indicating a fairly recent glacial wash over the floor.

At the crossing of Bird Creek, we found a type of andesite which was to become quite familiar before the day was over. An extremely platy rock with abrupt variation to a non-laminated phase. Time did not permit a thorough inspection.

Evidences of glaciation were plentiful at Bird Creek Meadows. Bosses of rock were fluted and scratched by glacial ice in textbook fashion, until they became so common as to remain unnoticed. The big thrill came when the trail led us to the rim of Hellroaring Canyon, which has truly earned its name. 500 feet deep on the south side, 1000 feet on the north side, headed by glacial moraine material over which milky colored glacial streams dropped in utter confusion. Above it all towered the ice slopes around "The Castle". Downstream, the creek rushed to join the Klickitat in its 1500 foot gorge.

The hillside on which we stood was composed mainly of a minutely fractured vitrophyre, which was easily eroded. To reconstruct the scene, we imagined glacial ice filling the valley, gouging deeper into bed rock and spilling fingers of ice over the edge. Ice eroded the canyon to a level now represented by Bench Lake and then disappeared. The fingers of ice over the canyon rim left "cols" as evidence of their existence. Hellroaring Creek then began its heavy erosive work, deepening near the Klickitat, extending this deepening back through glacial till and solid rock, and is now cutting on the andesite which dams the lower end of Hellroaring Meadows. In a few eons it will have remade Hellroaring Canyon into a steep walled gorge, removing most of the evidence of glacial ice, while the volcanic cone of Little Mt. Adams watches in silent wonder.

(RCT)

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The items in this article were reported to me at different times during the trip by means of the grapevine route and I can do nothing but take them at their face value. It was Mr. Davis' idea that I write this so if you don't like it, see him.

My memory is rather hazy on the first afternoon's travels as I had not been asked to keep any such record. I do remember however that on checking up at our first stop, Carson City, we found one car had gone astray--to set your minds at rest the lost car was not Mr. Davis'. A rule was passed then and there that no car was to turn off on another road until the driver of the car following saw what he was going to do. This proved to be a tremendous help and kept the party intact for the rest of the trip. The credit for this suggestion goes to Tracy Wade and Mr. Davis.

At our campfire Saturday night Mr. Phillips took charge of the program and carried it off in fine shape. Dr. Adams was asked to give the opening lecture and he very modestly admitted that Mt. Adams was named after him and amid the applause of the group he gave the history of how it occured. The other lectures that evening were of real value and hence have no place in this article.

The next morning the expedition got off to a fine start. We were told the night before to be at the gas station at 8:00 next morning and to be ready to start. The leader had failed however to count on the station man's sleeping abilities and it took us until 8:30 to wake him up sufficiently to understand that we were waiting for gas. We did not leave until quite a while after 9:00.

Within ten miles our leader missed his road and we spent about thirty minutes trying to find it and then after finding it abandoned the idea of taking it and went back to the ice caves. As a matter of record it was noted that Leo Simon and not Mr. Davis was the last one out of the cave and we very nearly went off and left him. At this point Mr. Phillips called our attention to the yellow jackets that were everywhere and warned us very solemnly to be careful. It seems he tried to lecture to some of them on geology and they, being very ignorant, resented his audacity and backed it up very pointedly.

Another matter that we settled for the rest of the trip was that of politics. This subject was considered highly unsuitable for a Geologic trip and was strictly tabooed. This measure was passed as an express favor to Mr. Davis.

At Peterson Ranger Station thirty-six of us registered to enter the National Forest. There we were introduced to Mr. Langfield, the District Ranger of Mt. Adams country, and his wife who were our guests for the day.

It seems we had a Sherlock Holmes with us and one of our most baffling mysteries was solved. I am not permitted to reveal the proper name for the great detective but his deductions set our minds at rest for the rest of the day so we could study Geology. He discovered that Mr. Davis was carrying a bag of prunes and informed us that we were to excuse his conduct for the rest of the day as he was full of prunes. The other item worthy of mention on this day's journey was while we were stopped on the lava beds. We were parked on the edge of a cliff that opened out on a beautiful view of Mt. Adams. Just back of us were huckleberries in great profusion and the time was almost twelve o'clock. Four of our leading geologists, namely Mr. Holdredge, Mr. Treasher, Mr. Phillips and Leo Simon, disagreed on the kind of rocks here and how it came to be there. The argument waxed strong and the rest of us retired across the road to the berry grounds and proceeded to fill up. We don't know yet how the argument was settled.

That evening while the rest of us were over at the fire the "Four Sleeping Beauties", having nothing better to do, filled Leo Simon's bed with rocks. Leo discovered the trouble a few hours later and hurriedly called in Dr. Cooper who, after a thorough examination, decided they must be Gall stones put there to lull Leo to sleep. Excitement subsided and everyone was able to get a good nights sleep.

Monday brought some very startling facts to the attention of the Society. For one thing it was discovered that Carl Richards and Leo Simon had long been nursing a desire to become traffic cops and when on Monday an opportunity came to show this ability they did not hesitate to show it. Just ask them.

While on route to Bird Creek Meadows we stopped at one of the numerous little streams that crossed the road to see the Quaking Aspen trees, the only ones in Washington that grow at such high altitude. Leo Simon was asked during the course of his lecture on these trees to explain the sticky gummy substance that covered the leaves of these trees. He admitted he was unqualified to tell us and referred us to Dr. Adams. Dr. Adams very calmly and deliberately examined the leaves in question and informed us that they belonged to the Wrigley family. He then retired to a safe distance.

On this third day too a new kind of disease broke out among the ranks of the members. There had been very little mention the first two days of that knawing thing called "Nunatacks", but the third day it broke out in earnest. Everyone suffered from them -- even Ray Treasher, who had proudly stated he was immune from them. We discovered that the best cure for these attacks was lunch.

By the way for the information of the Society if you want anyone to be the center of your snapshots just apply to Mr. Davis. He is very accomodating. We wonder why?

And so the party broke up Monday afternoon and reluctantly turned their heads for home. It had been a wonderful trip as all who were on it will tell you, and those that missed it will have something to regret for the rest of their lives.

Eleanor Hann

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Those who attended Doctor Hodge's first lecture noticed that he has a new approach for the teaching of his General Geology course. In the first place, all of his illustrations are drawn from Oregon or adjacent localities. Thus, the student acquires knowledge of Oregon geology while at the same time, he is learning his principles. Secondly, he is making a practice of summarizing and interpreting the week's news as occurs in newspapers and scientific publications.

CALIFORNIA BEACHES WALK INTO THE OCEAN

Beaches move in mysterious ways. They're here today and gone tomorrow -- or, as many California places have seen, here yesterday and gone today. So the California Beaches Association has come into being to save the beaches from erosion and other malevolent forces. It's a problem that concerns every coast county from Del Norte to San Diego, and, in the long run, the whole west.

California has 1,000 miles of coastline and less than 75 miles of beachland satisfactory for public enjoyment. The strange, and for the most part unstudied, movements of the Pacific undermine highways and buildings until what was once far from the water is wet; they pick up beaches and lay them down where no one can enjoy them but Davy Jones.

To beat erosion, man must understand these mysterious movements. That's what the Beaches Association is setting out to do. The trail of understanding is being blazed in some directions by harbor studies of the War Department and by Scripps Institute oceanographers at La Jolla. One of the ways of studying beach erosion is building beach models that reproduce all the varied forces of waves, tides, and currents, and watching what they do to the beaches, and building protective structures, and watching what they do. Seawalls, breakwaters, jetties, and groins are some of the structures that have been tried; groins (series of spurs projecting from the shore) promise to come closest to the answer. But the problem is supercomplex, for even a groin, if it's imperfectly designed, can spoil rather than save a beach.

But erosion is only one of the things that endanger the beautiful white sand and water playgrounds of California's coast. Ship dumping and inadequate sewage disposal often disfigure those beaches that nature leaves uneroded. The movement is one to protect all the beaches against all of these forces, to rescue native shorewater shellfish (the Pismo clam, for instance) that are threatened with extinction, to aid in the creation of more beach state parks, to make the beaches more accessible and attractive, to preserve the natural beauty of the shores themselves.

People interested in following and speeding the Save-the-Beaches movement should send their names to the California Beaches Association, 357 So. Hill, Los Angeles.

(Taken from the Sunset Magazine of July, 1936)

FIELD TRIP OCTOBER 11, 1936-EAGLE CREEK-COLUMBIA RIVER GORGE

Leader: Joe Wimmer

On October 11, 1936 we will visit the Eagle Creek district on the Columbia River approximately 45 miles east of Portland.

This area which is one of the outstanding recreational areas, is under constant developement by the U. S. Forest Service. It has many fine trails, picnic grounds and a large parking area at the entrance where we will meet at 9:30 A.M.

We will leave Portland, 5th & Yamhill Streets at 8 A.M. and travel via Columbia River Highway (not in caravan formation) to the Park entrance where we will leave our cars.

We will proceed afoot over the new trail to the High Bridge Camp Ground a distance of 4 miles. This is an easy trail.

On the trail we will have an opportunity to see the famous Punch Bowl, numerous falls and fossil beds lying below the basalt.

The Eagle Creek and other formations will be discussed enroute as well as the flora of this region.

It is suggested that warm clothing be worn.

The Forest Service has requested that we do not disturb the fossil beds and please be careful of fires.

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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LECTURES

Nov. 13, 1936 (Friday) - Mr. Robert Layfield, a member of the Society, will speak on the geology of "Saddle Mountain and vicinity." Mr. Layfield has recently spent considerable time in this part of the Coast Range in Clatsop County, and has made a report of his studies to the National Park Service of the Department of Interior. This is a portion of the state of which very little of the geology has been heretofore known.

Nov. 27, 1936 (Friday) - J. C. Stevens, a member of the Society, will address the on "The Colorado River Basin." Mr. Stevens has made special studies in this vicinity, and has a wealth of information not only covering the geology of the region, but also the hydrology, paleontology and anthropology.

Dec. 11, 1936 (Friday) - Dr. L. S. Cressman, head of the Department of Anthropology at the University of Oregon, will address the Society on "Indian Writings and Their Interpretation." This will be a most interesting meeting.

TRIPS

Oct. 24-25, 1936 (Sat. & Sun.) Hunting fossils in Clarno Section.
Leader: A. W. Hancock.

The Executive Committee has fixed the date of the Annual Meeting of the Society, as the evening of Friday, February 26, 1937.

In accordance with the By-laws of the Society the following nominating committee has been appointed:

Mr. Franklin I. Davis - Chairman
Mr. Amza Barr
Miss Constance Endres
Miss Glenna Teeters
Mr. Carl Richards

If you have any suggestions to offer this committee, communicate them to the chairman of the committee. The nominating committee will make its report on or before the 15th of December, 1936.

The following committee has been appointed to arrange for the Annual Meeting and banquet on the evening of Friday, February 26, 1937:

Mr. Kenneth N. Phillips - Chairman
Miss Eva Catlin
Mrs. Elizabeth Barr
Mr. Thomas Carney
Dr. Arthur C. Jones
Mrs. Iren Poppleton
Mrs. Nan Kurtichanoff
Dr. & Mrs. Edwin E. Osgood
Mr. & Mrs. Francis S. Olaine
Mr. Leslie P. Newell

Any suggestions for the Annual Meeting and banquet should be communicated to the chairman of this committee.

The following committee has been appointed to consider the possibility and advisability of a summer camp trip for the Society, for the duration of one week, during the summer of 1937:

Mr. Joseph Wimmer - Chairman
Dr. Arthur C. Jones
Mr. Russell Collins
Mr. Tracy Wade
Mr. Chester Wheeler
Mr. Franklin Davis
Miss Lillian Neff

This committee will make its recommendations to the Executive Committee. Any suggestions relative to such a camp trip should be made to the chairman of the above committee.

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MAJOR OIL COMPANIES TAKE OPTIONS ON SITES

(Morning Oregonian - August 30, 1936)

Chehalis, Washington, August 29 (Special) - Reliable reports coming into Chehalis state that two oil companies are surveying and testing for oil between Randle and Packwood, 60 miles east of Chehalis, in the Big Bottom Country.

The report says options have been taken on several properties.

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THE PREHISTORIC FORESTS OF OREGON

Dr. Ethel I. Sanborn

Paleobotanically, Oregon is a wealthy state, remains of the ancient forests having been secured from locations ranging from the Pacific coast to the Idaho line, in the north from along the Columbia and in the south from southern Harney county and in the vicinity of Ashland.

Before we take up the discussion of these forests I feel that it will be of interest to consider briefly the beginnings of the collection and study of fossil plants in our state as they are recorded in the reports of the early explorers.

James D. Dana, geologist and mineralogist with the Wilkes Exploring Expedition in 1838-42, reported plant remains from near Astoria. These included a fir, Abies robusta Dana, and "algae of calcareous type." Dana believed these to be of the "late Tertiary of the Pacific Coast." Since no fossil plants have since been secured in this vicinity of Oregon, it is doubtful whether Dana collected his plant specimens within the boundary of the state.

In 1842-43, Fremont's Exploring party made collections of rock materials from near Cascade Locks and from the Deschutes Valley. Some of these when studied were recorded as "containing plant impressions." The report of this expedition figures a full page illustration of diatoms from the Deschutes Valley. The location of Cascade Locks is now known as the Eagle Creek location.

Condon in 1862 discovered the plant beds at Bridge Creek in the John Day Basin. Nearly twenty years elapsed before much attention was given to these plant bearing deposits, when in 1880 a small collection was sent to Lesquereux. At this time it seems that Lesquereux did not realize that the John Day Basin of Oregon and the Auriferous Gravels of California were not of practically the same location.

In 1900, a party from the University of California, under the leadership of Dr. John C. Merriam worked out the stratigraphic relations of the John Day Basin and made some plant collections. In 1901 Knowlton went into the field with Merriam and in 1902 published his paper, The Fossil Flora of the John Day Basin, Oregon. This is U. S. Geol. Surv. Bull. 204. For the next 25 years this was the authority on the flora of this region.

LeConte, from the University of California, while making a study of the Cascades in 1871 and 1872, discovered plant-bearing beds near the mouth of Moffitt Creek, one and one-half miles east of Warrendale. Among the leaves he collected were those of an oak and a conifer with wood of the same. LeConte was accompanied by Condon on both of his trips.

In 1872, Aurelius Todd, a mining engineer, discovered beds and made collections of Jurassic plants near the summit of Buck Mountain. Buck Mountain is in Douglas County, 8 miles west of Riddle. What became of Todd's collections we do not know; but in 1885, Ward of the U. S. Geol. Surv. received a single specimen of his collection, and in 1893 two others. In 1895 Diller was sent into this region to map it and his party evidently spent considerable time about Buck Mountain. They located several other outcrops bearing the plant impressions along Thompson Creek at the base of the mountain and as well at Nechols Station south of Riddle. The same flora was discovered along Elk Creek in Curry County.

During this time Diller located other plant bearing localities in Oregon, among them the Comstock beds in the railroad cut north of Comstock.

From this time on, if new fossil plant beds were found there was not much written or recorded about them and it was not until 1920 when Chaney's paper on Eagle Creek Flora was published that the study of the ancient forest began to receive due consideration.

I. MESOZOIC

1. Jurassic

The oldest forests that are found in Oregon are those of the Jurassic, which as previously stated were discovered by Aurelius Todd on Buck Mountain in 1872. The party with Diller in 1895 made large collections from the beds of this location and from Nichols Station and Elk Creek, Curry County. The floras from the Douglas County and Curry County beds yielded a flora of 78 species. That from Elk Creek consisted of 20 species only one of which was not found in the collections from the Buck Mountain localities.

The forests of this time consisted of many ferns, some of them giant broad leafed types, some tree ferns. Others would have undoubtedly been somewhat familiar to us as there were representatives of the genus Polypodium, to which our Licorce fern belongs and of Adiantum, our maiden-hair.

The cycads were well represented; not by the present day forms but by the Bennettitales, the Mesozoic cycads which were the direct ancestor of our modern cycads.

Four species of Ginkgo have been described, indicating that this must have been the most abundant gymnosperm. Some of the leaves figured are very similar to those of the living Ginkgo biloba. Other gymnosperms were of the genus Araucaria, to which the Monkey-puzzle tree belongs, and of Taxus, to which the Yew belongs.

Of the lower plants, a liverwort, Marchantities sewardi resembling our common liverwort, Marchantia Polymorpha, was described.

If we may judge the climate of the Jurassic, with its tree ferns and cycads by that of the regions in which these plants grow to-day, we will see that it must have been very warm. At present the great cycad regions are the West Indies and Mexico of the western hemisphere and south Africa and Australia of the eastern. While tree ferns are found only in tropical regions of both hemispheres.

Could we have visited Riddle at the time the Jurassic forest was flourishing we might have felt it quite monotonous as all the vegetation would have been green, there having been no flowering plants. Still the various shades of green of the ferns, cycads and Ginkgo may have been very pleasing.

2. Cretaceous

A Cretaceous flora of approximately ten species was collected by the Diller party from the Cow Creek Valley near Riddle. This, like the Jurassic, consisted of ferns, and cycads with the leaf of an angiosperm which has been referred tentatively to the genus Populus, as Populus? ricei.

No new locations have yet been found that have yielded other Mesozoic floras. Nor had we known of any one who had visited the Buck Mountain plant beds, until last summer when a party from Roseburg while camping nearby met one of the early residents who told them about the plant beds and took them in. These Roseburg people have this summer secured some specimens for us and for Dr. Chaney. We feel that we are most fortunate to have this collection and hope to show them to any members of the Society when in Corvallis.

II. CENOZOIC

1. Eocene

From the fossil floras which have been studied we feel that we have a very good picture of the Eocene forests which covered so large a part of the state. These are (1) the Lower Clarno of the John Day Basin, (2) the Arago from near Riverton, Coos County, (3) the Comstock, Douglas County, (4) West Branch Creek near Mitchell, Wheeler County, (5) Pilot Rock south of Pendleton, Umatilla County, and (6) Jasper, south of Eugene, Lane County.

Of these, the Lower Clarno and the Comstock have been most fully studied, very little having been done with the Pilot Rock and the Jasper; Dr. Chaney is at present working on the West Branch. The Arago was studied by Knowlton most of the determinations being given tentatively. But from his list its closeness to the Comstock is apparent, and the West Branch has several species in common with the Comstock. One of the conspicuous species common to these three is Aralia Angustiloba.

The most abundant species of the Comstock is Cinnamomum dilleri which has its nearest living equivalent in the cinnamon tree of the Indomalayian region. This species is found in the Clarno and West Branch floras. There are representatives of Magnolia, Astronium, Lonchocarpus, Pteridospermum, Diospyros, Polythalia, Trochodendroides, and Persea. These are of genera which are now found largely in the warm temperate to subtropical regions of the world, indicating for Oregon during the Eocene a warm moist climate very much like that of the modern Panama. The nearest living equivalents of many of the plants named above are to be found in Central America and Panama.

There are a few ferns found in these floras but a scarcity of any gymosperm remains.

2. Oligocene

It is difficult to really draw the line definitely as to which are Eocene and which Oligocene floras. So perhaps more detailed study of larger collections from the various plant-bearing localities may make some changes in the reference to the periods to which some of the fossil floras have been assigned. For example the Jasper now believed to be Eocene in age may be of a later era, and the Scio listed below as Oligocene, may prove to be Upper Eocene. There are a few species common to the Comstock and Goshen, and the Scio has plants which are closely related to some of both.

Oligocene floras, as now referred, have been secured from (1) near Goshen, 7½ miles south of Eugene, Lane County, and (2) From Franklin Butte, 2½ miles southeast of Scio, Linn County.

Of these the Goshen has been the most completely studied, the Scio now being under study. The Goshen flora of 49 species indicates a subtropical climate; it is one of many large leaves, thick in texture, with entire margins and many leaves with longer or shorter dripping points. There are some leaves in the Scio collections with these same characteristics, but more which seem to indicate a forest of a somewhat more temperate range.

In the first mentioned were leaves of a large oak (Quercus), the leaves having a length of 12 inches or more, Figs (Ficus) fully as large, many leaves of several genera of the Laurel family (Lauraceae), a family now represented on the Pacific Coast by a single species Umbellularia californica, our Oregon myrtle, the wood of which is used so extensively for souvenirs. Among the genera represented are Tetracera, Meliosma, Aristolochia, Allophylus, Astronium, genera found in the low latitudes and warmer parts of both the eastern and western hemispheres. No conifers were found in the goshen collections, while Sequoia is fairly common in the Scio.

3. Upper Oligocene-Lower Miocene

Fossil floras secured from four locations, which at first were tentatively referred to the Oligocene, and now thought to be possibly nearer the Miocene, are referred as indicated above. These floras are (1) the Bridge Creek of the John Day Basin, (2) the Crooked River from east of Prineville and the (3) Eagle Creek from near Warrendale, and (4) the Ashland from several locations near Ashland. The first was studied by Knowlton and since by Chaney who has made the studies of the Crooked River and the Eagle Creek. Only preliminary studies have as yet been made of the Ashland, but enough to indicate its likeness to the others in this list. There is a general similarity in the floras of all, showing a vegetation much like that of the redwood region of California to-day, a warm temperate with possibly an annual rainfall of about 40 inches. The ancient forest of this time consisted of redwood (Sequoia), and alder in abundance with maples, oaks, elm, ash, walnut dogwood, madrone, Oregon myrtle, willow -- all genera with which we are familiar in our Pacific coast forests to-day. A few specimens of Ginkgo have been found in the Eagle Creek and Ashland beds showing that this genus had held over since Jurassic times.

4. Upper Miocene

Floras of this period include (1) the Mascall which has been secured from locations at Van Horn's ranch in the John Day Basin, near Austin and Tipton in eastern Oregon; (2) the Payette from eastern Oregon and adjoining Idaho (which by some writers is considered as Mascall); (3) the Trout Creek collected in southern Harney county; (4) a small flora from the Dalles beds near the Dalles and (5) the Empire from along the coast near Empire, Coos County.

The Dalles flora as stated is small and has not been recently studied, while that from near Empire has been given only preliminary study. The Mascall and the Trout Creek floras have been fully studied. The Mascall by knowlton, later by Chaney; the Trout Creek by MacGinitie. These evidently flourished when the climate was somewhat drier than during the time of the Bridge Creek and Crooked River, -- during a cool temperate period which differed considerably from the climate of these regions to-day; a climate which was more like that of the modern coastal section of Oregon.

At that time there were forests made up of alder, maple, birch, ash, madrone, poplar, walnut, oak, roses, hydranges, pond lilies, skunk cabbage, and among the gymnosperms, pines, spruces, and Douglas fir. The redwood seem to have disappeared, perhaps it was too dry and too cool -- since the time of the Oligocene-Lower Miocene period. We can not but be impressed by the similarity of the plant remains of this time with those now growing in western Oregon.

It was during the Miocene times that the large deposits of Diatomaceous earth were accumulated in eastern and southern Oregon. The valves of the diatoms of these beds are very close to those found here to-day.

5. Pliocene

No fossil flora of this age has been studied in Oregon, but as you know some because you were with Dr. Chaney on his trip to eastern Oregon in June, and others through the newspaper reports and the interesting article by one of our members in the Society Bulletin for August 25, a plant bed yielding a Pliocene flora was visited and a collection made of Pliocene plants from near Madras. We will all be anxiously awaiting publication describing this flora.

6. Pleistocene

We are lacking any really authentic record of plants of this age from Oregon beds. A flora, commonly referred to as the Satsop, which was collected from the banks of Buck Creek, a tributary of the Sandy River, has been designated tentatively as Pleistocene. The trees represented by the specimens collected were very close to living species and included oak, willow, redwood, plants which indicate a moderate climate.

A few leaf specimens of apparently the same type have been secured from a creek bank near Gresham.

SUMMARY

1. The oldest known forests of Oregon are the Jurassic and Cretaceous periods of the Mesozoic. These are found in Douglas and Curry Counties, and consist of both herbaceous and tree ferns, cycads and gymnosperms as Ginkgo, Araucaria and Taxus. These are representatives of ferns, cycads and gymnosperms whose nearest living equivalents are now found in subtropical regions.

2. Warm temperate to subtropical Eocene forests are known extending somewhat diagonally from the Arago in Coos County to the Comstock in Douglas County and on to the West Branch near Mitchell, Wheeler County, with the Lower Clarno north and the Pilot Rock near Pendleton.

3. The Oligocene forest about Goshen was somewhat more tropical than that of the Eocene of Comstock, indicating a vegetation quite like that of Panama today. The Scio is of approximately the same time with a more temperate aspect.

4. The Upper Oligocene-Lower Miocene forests which are found largely east of the Cascades, resemble those of the present redwood section of California, there being many redwoods and alders.

5. Upper Miocene vegetation is found in eastern Oregon, the Mascall of the John Day Basin, the Payette of eastern Oregon and the Trout Creek from southern Harney County. The forests of this time show considerable resemblance to those of our Oregon coast to-day.

6. Of the later forests, the Pliocene and Pleistocene, there has not been sufficient collections to give us much information. The ancient forest seem to prove that Oregon in the past has been a subtropical to tropical land and since the Lower Oligocene has been gradually becoming cooler.

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PERSONAL

Submitted by Miss Poppleton

Eva Catlin has been acting as Councellor at Camp Willapa near Nahcotta, Washington during the summer. "The Mother of Many Kids."

Dr. Lazelle Spent two weeks at the Rabbit Hole in Nevada, taking nobody's dust. Also a week in Colorado. He recommends the usual remedies for snake bite and what have you.

Jane Hurst reports two weeks at Britenbush Lake. She says that fifteen lakes were visited on one days trip, but was bewildered as to their cause.

Mella White had an extended vacation tour. Points visited were: 1. Malheur, Oregon, refuge for migratory wild birds in the Blitzen Valley; 2. Hunter's Hot Springs near Lakeview; 3. Modoc Lava Beds, a National Monument in northern California; 4. Shasta Springs Resort, northern California; 5. Nature School, DeLake, Oregon; 6. Jubilee at Vancouver, B. C.; 7. Mt. Baker National Forest and Lodge, Washington; 8. Whitman Centennial, Walla Walla; 9. Yakima Park and Sunrise Lodge, Mt. Rainier National Park; 10. Mt. Adams; 11. climbed Mt. Hood (south side) August 30th.

Russell Collins spent his vacation studying the geology of the Oregon coast south of Newport.

J. C. Stevens left Thursday night, October 15, for Washington D. C. by aeroplane. He is Drainage Basin Consultant for the National Resources Committee for the Colorado River Basin and was called back in connection with the Report he is preparing on the water resources of that Basin.

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FOSSIL SEEKER CLAIMS ALASKA ONCE TROPICAL

(Morning Oregonian - July 21, 1936)

Ketchikan, Alaska, July 21 (AP) - Charles Henry Harrison, 67, a fossil hobbyist, returned from the Alaska peninsula today with proof, he said, that Alaskan climate was once tropical. Among his findings were what he called petrified snails.

He said he would show his exhibits to Dr. Ales Hrdlicka, Smithsonian institution, who is now in western Alaska.

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EXOTIC ANCIENT FORESTS OF WASHINGTON

(By GEORGE F. BECK)

(From the University of Washington Forest Club Quarterly, Spring 1936. Because of the wide interest of the matters treated in this paper a rule which has been quite uniformly followed by Northwest Science is broken in printing an article which has appeared in another publication. Another article from Mr. Beck dealing with his work on the paleontology of Central Washington is promised for either the November or the December issue. -- Editor's Note.)

Five years ago we began our study of the Ginkgo Petrified Forest in Central Washington. This in reality is a series of forests occurring at various horizons in the Yakima (and Wenas?) basalts throughout a vertical range of some two thousand feet, and in a belt 150 miles long and 50 miles wide centering at Vantage on the Columbia River. Here a particular horizon 800 feet more or less down in the Yakima basalts and extending over an area six miles in diameter serves as the type forest for our study. While this particular horizon has received the greater part of our attention, the other forests and horizons have not been neglected. This type forest is called the Vantage Forest, and the pillow lavas in which the logs have been buried together with the underlying sediments are here designated Lake Vantage. Hereafter the term Ginkgo Forest will be understood to relate to the whole series, and the Vantage Forest restricted to the one horizon or episode in the series. The whole group is understood to be upper Miocene in age.

What first impresses one as remarkable in this series of forests is the abundance of tree and forest types and the difficulty of association either of these with the present trees and forests of Washington. David Douglas, pioneer naturalist of the Pacific Northwest, encountered what he recognized as petrified trees at Bonneville 110 years ago and conservatively assumed them to be a conifer and hardwood derived from the existing forests. I. C. Russell, in a geological reconnaissance of forty-five years ago, noted the prevalence of petrified trees in Central Washington, and after having sections made announced the discovery of pine and Oak.

When I began my study of the petrified forests of Central Washington I was not acquainted with the published work of either of these men, but like them, I assumed that just a few types closely related to our present Washington trees were all that was involved. To my consternation it soon became apparent that an intimate acquaintance with the forest trees of the whole of temperate North America was necessary to any understanding of these ancient forests, and that a hardly less intimate knowledge of the forests and trees of the whole northern hemisphere would be required for the final interpretation of all the materials collected.

Fossil leaves of an equivalent late Tertiary Age had long been known to paleobotanical authorities and two schools of opinion and thought had arisen. Those who have had under examination the Miocene leaves of Central Oregon and southward have been inclined to interpret these ancient forests as fundamentally redwood in character, that is, with the trees of the modern redwood forests already in a dominant role. Those who have worked with the Miocene leaves of Eastern Washington have seen in them the forests of the eastern United States with the trees of the Atlantic seaboard in the position of dominance. In both the north and south divisions of this great Inland Basin there has been recognized a more or less conspicuous Asiatic representation. We shall call these respectively the California, the Atlantic, and the Asiatic elements of these old forests with which we are concerned. Naturally, the reader will be as anxious as was I to see to what extent the petrified forests reflect any or all of these elements.

We began collecting with the preconceived opinion that if the petrified trees were not Washington in character they would at least carry a dominant California element. When we could find no conspicuous Washington element we began in earnest to search for Unbellularia, Torreya, Castanopsis, live oak, and such redwood border trees as Aesculus. These have persistently refused to appear and to our embarrassment the genera recognized impress one with their suggestion of Eastern American types. Turning to the list of Miocene leaves which had been interpreted as Eastern in character, we were at once challenged to account for the failure of such genera as Castanea, Liriodendron, Magnolia, Salix, Tilia, Aesculus, Alnus, Carpinus, Ostrya, etc., to appear among the woods. Practically all of the genera above listed have been recognized in the Miocene leaf beds.

After five years of field work and the examination of specimens which must represent thousands of individual trees and dozens of forests, we have come to the conclusion that we can reconcile the wood lists with those of the two diverse leaf lists and the two latter with each other. This is offered merely as a hypothesis upon which future field work and laboratory study will be based under the assumption that a year or two of work will prove or disprove the theory. Whatever checking we have done in the few months since the hypothesis came to mind has tended strongly to increase our faith in the following solution of the problem.

Our fist step was to grant that the trees and forests which grow on the succeeding lava flows were likely to contrast in character with those which grew on the surrounding uplands serving as the catch-basin walls into which the lavas had been poured. It was conceivable that the proportion of leaves from these two contrasting areas would differ from the proportion of logs derived from the same areas. We assumed that each lava surface would present such little contrast in slope, soil, moisture, etc., that the forest which it bore would be practically uniform excepting as the various stages of a single sere(xerosere?)might be represented. This was a step in the right direction but not far enough. Through the work of Dr. Fuller of the University of Washington, we became conscious of the prevalence of pillow lavas in the basalts of Central Washington, and as a result it has become apparent that our various forest consistently, if not exclusively, occur in pillow zones. This means that the logs preserved were associated with standing water at the time that the lava overwhelmed them.

We had already recognized two extremes among the forest types. One dominantly Sequoian(Tasodium and, or Sequoia-a redwood forest?), and the other largely Picean (spruce, and, or tamarack-the Atlantic forest?) with of course a great many hardwood trees, mostly in forest of a transitional character. It was hardly possible that such a rariety of trees(75 or more genera)could have grown originally within the few square miles in which they are now found as fossils, and in fact, many of the logs are prostrate and devoid of bark as though rafted in from a considerable distance. This feature led to the conclusion that many of the trees must be "extra-lava," by which we mean that they must be foreign to the lava in which they are now found and may have been rooted miles away in a strongly contrasted habitat.

Pursuing the study along this line it became apparent that the Sequoian forests are those which were rooted and buried in situ, and that the Picean forests are in all cases prostrate logs, members of rafts which may come from an indefinite distance. Later we became convinced that many of the Sequoian trees are in fact Taxodium and we began to visualize upon the succeeding lava flows wide-spread swamp forests such as may today be found in the Dismal Swamp area of the Atlantic seaboard. Associated with the Swamp Cypress occur those trees which one would expect in a swamp area of varying depth and acid content: white cedar, water ash, tupelo, dogwood, etc., and there are missing those trees which one would be surprised to find in such a situation. In support of the swamp idea is the presence of what apparently is petrified peat and swamp bottom. On the other hand, spruce, tamarack, elm, walnut, et., are yet to be recognized as rooted on any lava surface and the conviction grows that they grew upon some surrounding extra-lava lowland or upland. Carrying on the idea, it is quite conceivable that chestnut, tulip tree, magnolia, alder, willow, etc., whose logs are so far entirely wanting, may have grown upon uplands and divides where their logs were not accessible to streams large enough to carry them into the basin. It is entirely reasonable that the present day Pacific Coast and Washington forests existed on high, dry uplands or in other situations in which the opportunity for preservation of both leaves and logs was not favorable. We are quite convinced that present day generic types and their habitat preferences have remained fundamentally the same since the Miocene. Probably all units of the temperate North American forests were found somewhere in suitable locations in the inland basin of Washington during the Miocene and that among these familiar and dominant American trees there were a great many exotic species in a sub-dominant role.

FIELD TRIP OCTOBER 24-25, 1936-HUNTING FOSSILS IN CLARNO SECTION

Leader: A. W. Hancock

Take Wapinitia cut-off to Maupin continue on through Maupin on Dalles California Highway for twenty two miles - at junction take left hand road to Shaniko 12 miles - at center of Shaniko leave main highway turn square to right around corner grocery store and follow road to Antelope. About three miles beyond Antelope road forks, take left hand fork. About three miles beyond John Day River bridge at oil well derrick turn abruptly off road to left follow dim road up dry gulch to end of road.

Take: -

Plenty of gas
Food for three meals
Water for three meals
Some warm blankets

Also some of the following articles: -

Heavy hammer
Pick
Shovel
Crowbar
Cold chisel
Paper to wrap specimens

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THE GEOLOGICAL NEWS LETTER

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LECTURES

Nov. 13, 1936 (Friday) - Mr. Robert Layfield, a member of the Society, will speak on the geology of "Saddle Mountain and vicinity." Mr. Layfield has recently spent considerable time in this part of the Coast Range in Clatsop County, and has made a report of his studies to the National Park Service of the Department of Interior. This is a portion of the state of which very little of the geology has been heretofore known.

Nov. 27, 1936 (Friday) - J. C. Stevens, a member of the Society, will address the Society on "The Colorado River Basin." Mr. Stevens has made special studies in this vicinity, and has a wealth of information not only covering the geology of the region, but also the hydrology, paleontology and anthropology.

Dec. 11, 1936 (Friday) - Dr. L. S. Cressman, head of the Department of Anthropology at the University of Oregon, will address the Society on "Indiam Writings and Their Interpretation." This will be a most interesting meeting.

TRIPS

Nov. 15, 1936 (Sunday) - Sauvies Island.
Leaders: Messrs. Franklin Davis and Geo. F. Shepherd.

Taylor, Frank B.

BEARING OF DISTRIBUTION OF EARTHQUAKES AND VOLCANOES ON THEIR ORIGIN

Geological Society of America, Bulletin No. 39, Page 174, 1928

Many maps have been published in the last thirty or forty years showing the distribution of earthquakes and volcanoes. All show a marked tendency for both classes of phenomena to concentrate in or near to the "young" or so-called Tertiary Mountain belt. The belt as a whole is characterized by "chronic and acute seismicity." But a large proportion of the major or world-shaking earthquakes have their epicenters not within the belt, as it is generally mapped, but on its submerged frontal slope, expecially on its basal parts. Many also occur farther out on the ocean floor, and some far away from all others. Reed's map of major epicenters for 1899-1911, inclusive, shows a remarkable distribution. More than two-thirds out of a total of 276 are in the western one-third of the Pacific Ocean, mostly on the ocean floor.

If the mountain ranges of the Tertiary belt are being made by a sliding of the continental crust sheets from high toward lower latitudes it is easy to see how stresses would be set up in the compression belt, and would cause earthquakes when they were relieved by sudden fracture or slipping. The whole mass of North America north and northeast of the Pacific ranges is sliding constantly southward and southwestward, without perceptible jar, on a deep seated basal film or layer of rock which is made potentially viscous by great vertical pressure and by heat, but is made actually viscous only in a relatively thin layer by the tremendous power of the added horizontal stress arising from the main crustal movement. This viscous layer is the equivalent of Daly's basal layer of viscous basaltic glass.

Where the basal thrust-planes emerge in the ocean bed beyond the shore of the front range, suboceanic earthquakes are produced. Nearly all major earthquakes are caused in these ways. Only a few are caused by sudden fracture and relief of tension in high latitudes. The process is the same in all of the moving continents; the body of the continent slides constantly and without a jar. Earthquakes occur only where the basal planes emerge through the non-viscous, fracturable crust.

Some of the conditions of volcanic action, and of the formation of subterranean igneous bodies seem as yet largely obscure. Probably the welling up of the great plateau basalts is relatively the simplest process, and marks the climax or most rapid stage of crustal movements.

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VANCOUVER ENGINEER HIRED

Morning Oregonian - November 1, 1936

Seattle, Oct. 31 (AP) - The city council has hired Claire P. Holdredge, Vancouver, Washington, to conduct a geological survey of the Ruby creek basin to determine rock foundations for the city's new power dam. Holdredge will be paid $50 a day for the survey, which will last about a week.

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FACTS AND THEORIES OF EARTHQUAKE PHENOMENA

By J. Wimmer

Introduction

Someone said that we cannot trust the ground upon which we stand. This in part, is true, for history records many disastorous Earthquakes which made the ground upon which man stands untrustworthy.

The study of earthquake phenomena is important to the Architect and the Engineer as well as to the Geologist and Seismologist. In fact, all who are engaged in construction enterprises in an affected area must become conscious of the results an earthquake may have on the stability of their structures.

Insurance Companies are likewise interested in this sporadic activity from the viewpoint of rates.

Definition and Effect

An Earthquake has been defined as a vibration of the surface of the Earth caused by a transient disturbance of the material at or beneath the surface.

Earthquakes produce physiological as well as psychological effects on man, and in addition effect not only geological structures but all of the works of man.

The extent of the area effected by an earthquake depends largely upon the energy produced by the wave and the depth of the location of the disturbance.

The effect is controlled to a large extent by the geological structure and is a junction of the speed of propogation and reflection of the wave.

Classification of Earthquakes

Earthquakes are classified according to natural or artificial, that is whether caused by internal earth movements or made by man or the agencies of man.

The source of natural earthquakes may be shallow or deep-seated.

A further classification is the geographical location into, local, near or distant.

Both shallow and deep-seated earthquakes may have any one of the above three, geographical classifications.

Types - Tectonic, Plutonic and Volcanic

Earthquakes are produced by stresses which may be Tectonic, Plutonic or Volcanic or a combination of these. When felt by man they are termed perceptible and when only noted by delicate recording instruments, imperceptible.

Perceptible earthquakes may be slight, strong, violent or castastrophic depending upon their resultant affect.

Tectonic Earthquakes

Tectonic movements are produced by faulting and warping of the earth's surface. Shocks due to Tectonic movements are more numerous than those due to either Plutonic or Volcanic agencies. To this class belong those which result in a displacement along a fault line.

Examples of this type are the sinking or elevation of an area, or a displacement either vertically or horizontally on either side of a fault.

In the earthquake in California on April 18, 1906 the horizontal displacement along the San Andreas fault line which extends from Mendocino County in the north to San Benito County in the south, a distance of approximately 270 miles, had a maximum displacement in one place of 21 feet.

The earth on the southwest side of the San Andreas fault was displaced northwestward relative to that on the northeast side.

It is to be noted that in Tectonic Earthquakes the evidence of fault scarps are sometimes lacking, although an upheaval in one section or a sinking in another section may nevertheless occur due to folding or warping of the crustal layer.

Folding, as a rule, is gradual. However when a rupture occurs it will produce an earthquake wave. The earthquake wave is caused by the sudden sliding of one surface of the rock over the other surface at the fault line. When the elastic strain on the rock becomes greater than it can stand, a rupture takes place. This movement is not instantaneous but lasts a certain time interval of from one second to a minute or more.

Tectonic waves start at the surface of the fracture and spread through-out the adjacent area at a rate proportional to the compressional force that the rock was subjected to, releasing a large amount of stored energy.

After the rupture has taken place the two surfaces will rebound somewhat until they reach a point of equilibrium relieving the strain.

The work done at the time of a rupture is equal to one-half the amount of slippage times the total elastic force acting upon the body.

In order to get some idea of the amount of energy stored up in a rock structure which is under an elastic strain it may be of interest to know that at the San Andreas fault above referred to, a total of approximately 4,000,000,000,000 horsepower was released in one minute of time. This tremendous amount of energy was dissapated in the form of heat.

Another type of Tectonic earthquake is that produced at sea. This type frequently results in tidal waves due to the faulting caused by vertical movements at the bottom of the sea. If the movement is largely horizontal instead of vertical practically no undue movement of the sea will be noticeable.

Plutonic Earthquakes

Plutonic earthquakes are those whose focus or locus is deep-seated, that is 50 to 750 Km. or more.

Considerable difference of opinion exists among seismologists as to the probable causes of deep-seated earthquakes. Some of the suggested reasons for them are:

1. Recrystallization - Fermor

2. Magmatic or cryptovolcanic - Branca

An outstanding feature of deep-seated earthquakes is the prominence of the shear or (S) waves as compared to the condensation or (P) waves.

These theories would tend to preclude the existence of liquid magma at least at this depth.

The origin of waves in a highly viscus fluid due to stress is hard to comprehend.

The percentage of deep-seated earthquakes to shallow-seated ones is very large; approximately 25% are considered as deep-seated.

It should be borne in mind that as the depth increases the amplitude of the wave is attenuated so that many more deep-seated earthquakes may occur than are actually recorded.

Recent studies of deep-seated earthquakes occurring in different parts of the earth indicates the depth of focus is as follows:

North American Coast.................	100 Km.
South American Coast.................	100 to 200 Km.
Japan................................	300 Km.
Arc arround Australia................	400 to 700 Km.

It is a well known fact that the strength of the rocks increases with depth, the weaker being on top. It is therefore easy to understand that faulting of the weaker rocks can take place more frequently than the stronger and deeper ones. Faulting of the deep-seated rocks calls for especially large stresses, stresses many times larger than those necessary to rupture the topmost rocks.

Another cause that has been advanced of deep-seated earthquakes is the effect produced by the internal heat of the earth on the super-structure. It is also known that the internal heat of the earth increases with depth. It is believed that the excessive heat in the interior is responsible for differential expansion and contraction in the upper 500 to 700 Km. of the earth's crust. Jeffery, has pointed out that cooling of the crustal material down to the depth of approximately 700 Km. has disturbed the initial thermal gradient. This is believed to be one of the causes of deep-seated earthquakes.

It appears probable that deep-seated earthquakes set up a stress by their repeated jarring of the crustal material which are a probable cause of shallow-seated earthquakes.

Volcanic Earthquakes

Volcanic earthquakes are those caused by volcanic activity. The earth's crust is constantly being shaped and changed by mountain building and volcanic activity. Mountain building as has been previously pointed out is accompanied by Tectonic activity resulting in structural changes and movements of the crustal material. These movements accompanied by a rupture of the homogenous material form another principal cause of earthquakes.

Those shocks that have definitely been traced to volcanic activity have been found to be slight and of local consequence. Few shocks of great intensity have been recorded which are ascribed to volcanic activity. Shocks that are however due to volcanic activity are mainly caused by gas explosions or the sudden stoppage of the magmatic flow as in dikes where the magma enters a fissure or opening.

An inspection and analysis of the earthquakes in the World from 1899 to 1933 shows that the majority are located at points distant from volcanic activity. This would tend to indicate that the primary cause is not centered in the immediate vicinity of volcanic activity.

It is interesting to note the distribution of earthquakes in the limited States as shown in the Reports of the United States Coast and Geodetic Survey for the years 1928 to 1933 inclusive. The only active volcano in the United States is Mount Lassen in Northern California (dormant at this time). Few earthquakes are shown whose epicenter is at or in the vicinity of Mount Lassen, while many are known to have occured, whose epicenter is known to be in areas remote from this locality.

Earthquakes may also be caused jointly by both Tectonic and Volcanic activity as for instance faulting near a volcano due to the sudden movement of compressed magma from one region of high pressure to an adjacent region of low internal pressure.

They are also produced by the building up of extremely high pressure areas within the earth due to the admittance of surface waters through fissures followed by an explosion of the steam similar to the action which takes place when a boiler is overheated. The high internal temperature of the magma increases the pressure and this pressure tends to decrease the volume. Cooling will also produce shrinkage of the material which will result in a change in configuration followed by a faulting of the mass. This shrinkage action results in Tectonic activity.

Intensity Scale

The outstanding factors in earthquake analysis are intensity and location.

The variation of intensity with reagard to location is an appraisment of the probable future effect that may be encountered.

In a particular location where earthquakes are known to occur either frequently or intermittently, the intensity will or may vary through a wide range of values.

A study of the locations will result in the determination of the free and active areas.

In the active areas the sections of maximum and minimum intensity values may be determined from the available seismological data.

In order that earthquakes may be consistently classified according to intensity, a scale of relative experience values or effects has been devised.

Whatever scale is used, must relate to the effect produced by the wave as noted by human agencies.

Prior to 1931 an intensity scale known as the Rossi-Forrel scale was used, subsequently this scale was modified and it is now known as the Mercalli Intensity Scale.

The following data lists both scales for comparison purposes. These scales are based on the accelerated energy; that is the force of the shaking produced by the earthquake at the surface of the earth as felt by human or mechanical agencies.

Earthquake Intensity Scale

Scale Equivalents		Description of Effect	
Rossi-Forrel No.	Mercalli No.	Rossi-Forrel	Mercalli - Rossi-Forrel
I	I	Microseismic	- Felt only by a few.
I to II	II	Extremely Feeble	- Felt by a few persons at rest.
III	III	Very Feeble	- Felt quiet noticeably out of doors, vibration like that of a passing truck.
IV to V	IV	Feeble	- Felt indoors by many and outdoors by a few; dishes, windows and doors disturbed.
V to VI	V	Moderate Intensity	- Felt by nearly everyone - dishes and windows broken - disturbances of trees and poles; pendulum clocks stopped.
VI to VII	VI	Fairly Strong	- Felt by all - heavy furniture moved, damage to chimneys.
VIII	VII	Strong	- Everyone runs out of doors - slight damage to well built structures - noticed by drivers of moving vehicles.
VIII to IX	VIII	Very Strong	- Damage considerable to ordinary substantial buildings with partial collapse; panel walls thrown out of frame structures falling of chimneys, smoke stacks, monuments and walls. Heavy furniture overthrown, changes occur in well-water levels.
IX +	IX	Extremely Strong	- Damage to specially designed structures - well designed structures thrown out of plumb. Buildings moved off of foundations - underground pipes broken.
X	X	Extreme Intensity	- Well built structures destroyed. Ground badly cracked. Land slides; water splashed over banks of streams and lakes.
	XI		- Few structures remain standing. Bridges destroyed. Fissures open in the ground. Rails bent.
	XII		- Damage to everything. Waves seen on the ground surface. Objects thrown into the air.

In the study of the actual intensity of the wave at the surface of the earth a weighting factor must be introduced to compensate for the apparent intensity at the surface relative to the actual intensity at the source.

The geological structure must also be considered. For instance in a water soaked soil or on earth fills a greater intensity will be noted than in a solid rock structure. This fact is of great importance to both the Architect and the Engineer.

From a comparison of the disturbances in different formations in the San Francisco earthquake of April 18, 1906; Reid, obtained the following results in comparison with rigid crystalline rock; in sandstone 1 to 2.4 times; in loose sand 2.4 to 4.4 times; in made ground 4.4 to 11.6 times; and in marshy soil 12 times the maximum displacement obtained in crystalline formations.

Wave Motion and Velocity of Propogation of Waves

Since the earth is considered to be an elastic body it is natural that earthquake waves should be controlled by the elasticity of the material composing the mass.

The observation of these waves is of course limited to the surface of the earth. The waves must pass through the mass before they can be recorded and studied. The nature of the mass cannot be definitely determined nor can its density or elasticity be measured. Therefore certain inevitable assumptions must be made. In making these assumptions considerable differences of opinions are to be noted among the seismologists with regard to the nature or character of these waves.

There are three types of waves in earthquake phenomena viz:

1. Longitudinal or compression waves designated as "P" waves, also called Push or Primary waves.

2. Transverse or shear waves designated as "S" waves, also called Shake or Secondary waves.

3. Surface waves which are divided into;
   (a) Rayleigh waves.
   (b) Love waves.

The "P" waves vibrate parallel to the direction of transmission and follow the chord of an arc, traveling at a speed of 7 to 10 Km. per second. They are dependent upon the Bulk-Modulus, Rigidity, and Density of the material through which they are propogated.

In the "P" waves each particle of the solid is displaced in the direction of travel of the wave - i.e. similar to a sound wave.

The period of the "P" wave is from 5 to 7 seconds.

The "S" waves vibrate normal to the direction of transmission and like the "P" waves follow the chord of an arc through the earth, traveling at a speed of about 4.5 Km. per second. The "S" waves are dependent only upon the Rigidity and Density of the material through which they are propogated. The displacement in the "S" waves is at right angles to the direction of travel. They are similar to light waves.

The period of "S" waves is from 11 to 13 seconds.

The surface waves are made up from the combination of the "P" and "S" waves. They are controlled entirely by the elasticity of the material and travel slower than the "P" or "S" waves but have the greatest amplitude. Their average speed of propogation is from 3.5 to 4 Km. per second.

In the case of the Rayleigh waves the displacement of the surface is vertical and partly in the direction of wave propogation. They usually equal about 0.92 of the "S" waves in velocity.

In that of the Love wave the displacement is always horizontal and at right angles to the propogation of the wave. They are possible only if the crustal material is not uniform, that is, there must be a difference in wave propogation in the different materials, the lower having the higher velocity.

Bucher, states that the velocity of earthquake waves is different beneath the continents and the oceans. Beneath the continents the waves seem to travel with low velocities down to a depth of 50 to 60 Km. Beneath the Pacific Ocean they travel with high velocities from the surface downward; while in the Atlantic and Artic Oceans lower velocities seem to be limited to the upper 20 to 30 Km.; below which the velocities are like those beneath the Pacific Ocean.

The velocities depend greatly upon the physical properties of the material through which the waves pass. These properties are compressibility and rigidity.

The differences in the noted velocities are in all probablility due to the fact that beneath the continents the crustal material consists largely of acidic rocks while those beneath the oceans are largely basic rocks.

The following table shows the average speed of propogation of Earthquake waves in Kilometers per second for both the Longitudinal and Transverse waves according to Sieberg; for different kinds of rock and for rocks of various geological age. A comparison of these averages with other data shows that the maximum and minimum values of both types of waves may deviate as much as 75 per cent from the average value.

Average Speed of Propogation of Earthquake Waves (Sieberg)

Kind of Rock	Speed of Propogation in Km. Per Second: Longitudinal (P) Wave	Transverse (S) Wave
Crystalline Schist	6.3	3.1
Plutonic Rock	5.3	3.2
Effusive Rock	2.8	1.9
Sedimentary Rock	3.6	2.0
Limestone	5.0	3.0
Sandstone	1.8	1.1
Geologic Age of Rock:		
Archaeozoic	5.6	2.9
Paleozoic - General	5.2	3.0
" - Sedimentary	4.5	2.5
Mesozoic - General	3.4	1.9
" - Sedimentary	3.4	1.9
Tertiary - General	2.4	1.7
" - Sedimentary	2.1	1.4
Quaternary - General	2.5	1.6
" - Sedimentary	2.2	1.3

Secondary Phenomena

Earthquake activity has been noted to be accompanied by certain phenomena such as Audible Sounds, Magnetic Disturbances, Resonance - Quakes and Earth Tilt.

Audible Sounds Preceeding an Earthquake

It is frequently reported that sounds preceed an earthquake by a short time interval of a few seconds. These sounds apparently come from within the earth and are more noticeable when the listener is indoors than when out of doors.

As an explanation of this phenomena the following is offered. Sound is the sensation produced by stimulation of the nerves of hearing resulting from vibrations or waves in the medium surrounding the ear. Sound is propogated through space by wave motion. Sounds as low in pitch as 20 and as high as 30,000 cycles per second may be heard by the human ear.

Earthquake waves of the compressional or "P" type which are the fastest, have a velocity of from 7 to 10 Km. per second but a low frequency, much lower than that of sound. The advancing wave front of an earthquake wave in the interior of the earth according to Gutenberg, set up short waves which are multiples of the fundamental, i.e. harmonics. These harmonics are in the audible frequency range and since their frequency is much higher than that of the fundamental wave, but of less energy they will travel faster than the fundamental and be heard as an audible sound a few moments in advance of the arrival of the fundamental wave.

Magnetic Disturbances

It has been noted at the time of earthquakes that magnetic needles are set in oscillation near and far from the source of the earthquake similar to the oscillation that would be produced by a change in the magnetic field according to Reid. These oscillations seem to last from one to two minutes and have been known to occur before and at the time of the arrival of the earthquake wave.

Resonance Quakes

In a study made by the School of Mineral Industries, State College, Pennsylvania it has been shown that the deep-seated earthquakes are followed by shallow-seated ones or vice-versa in an entirely different region on either the same or within a comparatively few days thereafter. These have been termed resonance-quakes

Resonance-quakes may be caused by mechanical influence, that is a movement in one section jarring an already highly stressed area in a widely separated section.

Earth Tilt

Another phenomena that has been noted especially in Japan is block tilting.

In 1793 the inhabitants of a coastal village in Japan, noted a sudden movement of the shore and assumed a tidal wave was coming. Nothing happened for four hours, than a great earthquake came followed by a destructive tidal wave.

This phenomena has been observed in other earthquakes and in four of them the time intervals varied from one-half to four-and-ahalf hours.

It appears to be due to advance tilting of the ground prior to the occurrence of the earthquake and is especially significant in Japan.

Due to this phenomena an earth tilt-meter has been developed by the Japanese, and by the United States, which it is hoped will give advance warning of the occurrence of an earthquake.

Conclusions

Earthquakes are no more numerous now than they were in the past, but the population as well as the populated centers are continually increasing with the result that the risk of earthquake damage is becoming an ever increasing problem.

The definite safeguarding of cities from damage by earthquakes is as yet an unsolved problem. It is known that it is not the first shock that does the damage but the after shocks which are destructive. The destruction appears to be the result of the combination of acceleration, period, duration of and the number of shocks.

Earthquake activity is a problem which requires coordinated study by both the Geophysicist, Engineer and Seismologist. The latter must gather all available data and interpret them in the light of known theory.

In order that all available data may be collected by the seismologist a sufficient number of recording stations with sufficient recording facilities must be established at frequent intervals and in localities where earthquake activity exists. At least three instruments should be provided at each station, two at right angles to each other and a third to respond to vertical waves.

Insofar as existing stations are concerned accurate and valuable information has been furnished by them. Outstanding work has also been done in the United States by the Coast and Geodetic Survey, the Weather Bureau, the Geological Survey, the Bureau of Standards, the Nation Research Council, the Carnegie Institution, the California Universities, and the St. Louis University as well as many other interested groups in various sections of the country.

In conclusion it is hoped that in the future we will be better prepared to withstand the effects of the oft-recurring earthquakes through the efforts of those who are giving so freely of their time and energy in an effort to make the ground upon which man stands trustworthy.

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NOTICE

J. VOLNEY LEWIS, regional geologist of the National Park Service, Region IV, has removed his office from Berkeley, California, to 601 Sheldon Building, 461 Market Street, San Francisco. Region IV includes ECW activities at national parks and monuments and also at state and local parks in California, Oregon, Washington, Nevada, Utah, Idaho, and Glacier Park in Montana. The geologic staff of Region IV includes also DONALD K. MACKAY, Associate geologist, with headquarters at the district office, 712 Spalding Building, Portland, Oregon.

MANGANESE ORE TO BE DEVELOPED

Morning Oregonian - Sept. 3, 1936

Aberdeen, Wash., Sept. 2 (AP) - Vast deposits of manganese in the Olympic peninsula will probably become of commercial value because of new refining methods, Dr. A. E. Drucker, dean of the school of mines at Washington State college, said here yesterday. He said he had perfected an electrolytic process for separating the ore.

Dr. Drucker urged communities co-operate in asking a federal survey of southwest Washington for manganese deposits and other mineral resources and seek state and federal appropriations for construction of a pilot plant at tidewater on Grays harbor or Hood canal.

Y.M.C.A. PLANS NATURE LECTURES

Morning Oregonian - October 25, 1936

Public Invited to Attend Series of Talks

For the benefit of men and women nature lovers, the activities committee of the Portland Y.M.C.A. has planned a free series of talks, pictures and exhibits, the first of which is scheduled for next Thursday evening in association hall. The public is cordially invited to any or all of these features, which are part of the fall and winter program of the central branch.

Members of the committee are: Allen Davis, chairman; Joe Earley, Ben G. Fleischman, Ed Ordway, George Frey, John G. Kilpack and Al Sieglinger.

Following is the detailed program of this feature:

October 29 - "Common Birds of Dooryard and Field", W. A. Eliot, authority on birds of the northwest.

November 12 - "Wonders of Our National Parks", B. A. Thaxter, principal, Couch School, Portland, and nature guide, Yosemite and Glacier national parks.

November 19 - "Fossil Flora and Fauna of Oregon," A. W. Hancock, member of the Geological Society of the Oregon Country, with fossil exhibit accompanying lecture.

December 3 - "Wild Flowers of Oregon," C. L. Marshallm mining engineer and well known lover of nature.

December 10 - "Birds of the Tree Tops," W. A. Eliot.

December 17 - "Successive Sedimentary and Ignious Deposits of Oregon," Clarence D. Phillips, president, Geological Society of the Oregon Country.

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Nelson, Richard N. and
Achenck, Hubert G.

CALCAREOUS ALGAE IN PACIFIC COAST LIMESTONES

Geological Society of America, Bulletin No. 39, Page 266

The presence of LITHOTHAMNION in a Quaternary formation on San Clemente Islan has been reported by W. S. Tangier Smith (1896) and calcareous algae were noted by Diller (1901) in an Oregon Eocene limestone. LITHOTHAMNION is recognized also in Eocene limestones of the Santa Ynez Mountains, California, and near Dallas, Oregon. Boulders of similar limestone have been collected from the conglomerates of the Sespe and Pico formations of the Ventura district, California.

In a discussion of the morphology of the fossil forms, it is shown that fragments of the thallus are preserved, and that conceptacles for reproductive bodies may be distinguished.

Recent red algae are important reef-builders. If modern views are accepted, most of them are limited, while living, to shallow water. This together with other evidence, points to the conclusion that the Eocene limestones containing these calcareous algae were deposited in warm, shallow water.

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LOG OF TRIP ON SAUVIE ISLAND
November 15, 1936
Leaders: F. L. Davis, Geo. S. Shepherd

Miles	
0.0	Portland city limits marker, about a mile beyond Linnton business district.
3.0	Burlington. At Burlington turn right over wood viaduct to ferry.
3.6	Ferry over Columbia Slough. (No charge) Ferry makes round trip every eight minutes and has capacity for 11 cars. Proceed up the hill from ferry to first intersection and turn to right continuing to mileage 4.1.
4.1	Cross roads, Reeder Road and Gillihan Loop Road. Party will assemble at this point at 9:00 A.M. and will proceed southeast along Gillihan Loop Road to view the confluence of the Willamette and Columbia Rivers and continue around the southern end of island.
13.3	Confluence of Willamette and Columbia Rivers.
18.5	Intersection of Reeder and Gillihan Loop Road, on the east shore. At this point the party on the return will go via the Reeder Road to the ferry on the return trip. Council Oak, 24'6" in diameter, is located on Reeder Road about ½ mile from this intersection on the Broad Slough side.
20.5	Dairy Creek Bridge.
21.0	Mrs. Hutchinson's Dairy Ranch. Deep well here.
21.8	Columbia County Line.
24.4	At this point on the Columbia shore, as determined by Geo. Shepherd, Lt. Broughton camped for the night on October 29, 1792.
28.4	Purported site of Indian village on shore of the Columbia River. At this point Mr. Richardson, a local resident, will exhibit artifacts and if time permits, the group will spend a short time on the river bank.
29.5	H & R Duck Club.
31.9	Warrior Rock Lighthouse. Party will inspect only "watched" lighthouse on the Columbia River except at the mouth. E. N. Cadwell in charge will describe equipment and operation of light and fog bell and exhibit Indiam artifacts found locally. Party will walk ¼ mile to extreme southern tip of island and view exposed basaltic rocks in this vicinity similar to the exposure across the Columbia Slough at St. Helens. These are practically the only rock exposures on the entire island.

Party will lunch at this place and will spend a short time looking for artifacts on the Columbia River beach. Party will break up in this vicinity at 3:00 P.M. and return to the ferry via the Reeder Road as noted at mileage 18.5

Special permission has been given in several instances for the use of private roads and the group must exercise the greatest care in <u>closing gates and driving slowly past stock in the road</u>. <u>Do not molest the crops of fruits or vegetables.</u> The roads are fair dirt roads for the most part, if taken slowly. The 10 miles at the northern end of the island will not be driven at faster speed than 10 M.PH.
(If there is much rain during the week, the roads will be impassable and the trip will be postponed.)

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol. 2 - No. 22 Portland, Oregon November 25, 1936

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LECTURES

Nov. 27, 1936 (Friday) - J. C. Stevens, a member of the Society, will address the Society on "The Colorado River Basin." Mr. Stevens has made special studies in this vicinity, and has a wealth of information not only covering the geology of the region, but also the hydrology, paleontology and anthropology.

Dec. 11, 1936 (Friday) - Dr. L. S. Cressman, head of the Department of Anthropology at the University of Oregon will address the Society on "Indian Writings and Their Interpretation." This will be a most interesting meeting.

GEOLOGIST PICK - OUR OFFICAL PIN

No doubt many of our members would like to wear the "Geologist Pick" the official pin of our Society.

These pins are made in two sizes and can be purchased for 75¢ from the following members of our Society:

Karl Klein - Maegley-Tichner Building

James C. Oleson - 2700 S. W. Patton Road

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EAGLE CREEK TRIP

October 11, 1936

This trip saw several innovations introduced by Mr. Wimmer. Instead of making up the usual caravan of cars at Fifth and Yamhill, and driving from spot to spot; we met at Eagle Creek, parked the cars, and took a trip on foot. To have to carry our lunch was something new, but no one considered leaving it behind. And at noon the speaking was done almost entirely by amateurs.

Under Mr. Wimmer's leadership, sixty-five of us registered and started up the Wahtum Lake trail. As we started Dr. Hodge called our attention to the andesite dike which cuts through the Eagle Creek or Warrendale formation. This he called a feeder from a volcano in the vicinity. The horizontal jointing of the dike makes it particularly spectacular.

Not far up the trail we stopped to view a charcoaled part of a tree embedded in the Eagle Creek formation just above the path. On the narrow ledge we grouped as closely as possible, while Dr. Hodge gave us a short talk on the history of the formation.

The Eagle Creek, or Warrendale, formation is Lower Miocene in age, and consists of unsorted boulders, tuff and ash from nearby volcanoes. In it there is also evidence of mud flows, stream action, and thin layers of lake sediments. Scattered through it are found remnants of trees, showing that there were long periods of volcanic quiet during which vegetation had time to grow. The leaves of some of these trees sifted down into small lakes, and were buried and fossilized; so that we can find their imprints now where the cross sections of lake beds are exposed. Gingkos, laurel, and sequoia were mentioned, as well as kinds common here now. Unfortunately we had been requested not to disturb them. The trees themselves have left broken, charcoalized layers as evidence of their destruction in later volcanic violence.

Above this Warrendale (Eagle Creek) lie the Columbia River Basalts, and above them are the andesites. Everywhere upon the path we found talus of one or the other, and the red coloring of basalt in the earth. Here and there the path crosses moss-covered slides of broken basalt, of the familiar brickbat type, and in one instance passes under a large landslide block of the material, lying at an angle of approximately 45 degrees. Bubble holes in the broken rock were in some cases filled with chert or chalcedony. Mr. Davis found a remarkable specimen to which Dr. Hodge has given the name of davisite, since it is not the usual silica deposite, and occurs only in the Davis vicinity.

As the path led upward, and the basalt dipped slightly downward, we soon passed its contact with the Eagle Creek and eventually looked down upon a number of flows of basalt on the opposite side of the creek.

At the famous Devil's Punch Bowl a few apparently dropped by the wayside, but the main group kept on until we came to Skookum Chuck Falls. One by one we clambered and slid down to the rocks below the falls, and fell silently to the business of eating lunch. Just below these falls the creek passes through a narrow gorge which it has made along a major joint plane in the solid basalt.

Our president, Clarence Phillips, was the first speaker after lunch. While Mr. Phillips still calls himself an amateur, he is beginning to speak with a professional ring. He showed us maps and charts of the vicinity, with a short discussion of each.

Dr. Arthur Jones gave us an interesting talk on the fossil flora found in the vicinity. These comprise a great many varieties, some similar to those found growing in Oregon today, and others now found only in latitudes farther south. "Dr." Leo Simon gave us the names and descriptions of trees and plants we had passed. All along the trail Leo had been in demand for identification purposes.

Mrs. Barr was the first lady to be called upon, and the only one to speak. She gave us a short talk on the Columbia River basalts. Eva Catlin, who was the other feminine speaker scheduled, reported that Dr. Hodge had "stolen" her speech --- much to Eva's relief!

Russell Collins gave us a very clear picture of the time during which these tuffs were laid down, and the later lavas. Mr. Wheeler brought to us exerpts on the Eagle Creek formation from Ira Williams comprehensive book on the Columbia River Highway.

Professor Watson explained the fascinating subject of radio-activity, the decomposition of uranium, and the computations by which the age of the earth is fairly determined.

"Dr." Davis, after vainly trying to introduce the subjects on the ballot, told us something about Ira A. Williams (whom he advocates for Oregon's hall of geologic fame) his work along the Columbia, and his book on the subject.

Dr. Hodge gave the speakers a hand, and told us that many great geologic discoveries have been made by observing amateurs. He also explained that from comparison of fossils in the Warrendale, and fossils in the John Day formation he had determined the age of the Warrendale as Lower Miocene, rather than Oligocene, as it was first designated. He also cleared up the confusion of the Eagle Creek-Warrendale name. The original Eagle Creek is named for a formation in the Blue Mountains, so that our Eagle Creek must be designated as Warrendale to avoid duplication.

We all owe a vote of thanks, I think, to Mr. Wimmer for planning this trip, and to his speakers for putting in their time and study for our mutual benefit.

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NOTICE

Hillsboro Quadrangle; and chart of Columbia River, St. Helens to Willamette River, published by U. S. Coast & Geodetic Survey. Latter shows entire Sauvies Isl. road system but no contours. Published July, 1936.

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EARTHQUAKE'S CENTER FOUND BY SCIENTISTS
Morning Oregonian - July 21, 1936

Washington, July 20 - Science has placed a finger on the center of disturbance of the Washington-Oregon earthquake. It was in a spot some 10 of 15 miles northwest of Walla Walla, Washington, in latitude (approximately) 46.2 degrees north, longitude 118.2 degrees west.

This location was worked out by scientists of the United States Coast and Geodetic Survey.

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DESERT GOLD

By Dr. E. W. Lazell

This summer the writer spent about two weeks in the desert country in northern Nevada about twelve miles from Sulphur, a station on the Western Pacific Railroad. The flat desert has an elevation of about 4000 feet. To the south and east of Sulphur, the Seven Troughs, Kamma and Antelope Mountains rise to over 6000 feet. The topography of the country is shown on the Lovelock Quadrangel of the U. S. Geological Survey.

Gold is present in the gravel wash in many of the canyons as flat flakes from the size of a pin point to nuggets having a value of one dollar or more. This gold was probably originally deposited by stream action near the shores of a lake which at one time covered the floor of the flat desert. A change in climate dried up the lake and the country took on its present form. Later the surface has been eroded by cloud bursts and cut into canyons and ravines; thus the gold originally deposited by stream action has been resorted and irregularly laid down in the canyons.

The recovery of this gold in a country destitute of water has proved an interesting problem and has attracted the attention of many engineers and miners, so far without success. The number of machines invented to effect the recovery is legions and the desert is littered with their remains. Many of the devices tried were based upon the use of air alone, others screened out the coarse gravel and employed water for the final recovery. While there are some springs and wells, they have only a small flow of water. The machines using water were a failure, due both to the scarcity of water and the long haul to the water, or in other words, it cost more to recover the gold than the gold was worth.

In spite of the difficulties, many of the desert miners are recovering the gold with a small portable machine using air supplied by an ordinary bellows; the machine is generally called the Mexican Dry Washer. Depending upon good fortune in finding a rich spot and the industry of the worker, the miners make from beans to ten dollars a day. Two men working together can handle about three yards a day with a dry washer, thus some of the ground must be very rich. At the time of my visit about 75 men were using this method in an area of one square mile.

One of the difficulties of using air is that the relative difference between the weight of gold and quartz is less in air than in water. The difference in air is 7.29 and in water, 11.0.

The illustration shows a common form of dry washer. The top inclined shute is covered with a wire screen having ½ inch openings. The gravel and sand are shoveled against this screen, the fine material falling into the bag below the screen. This bag holds about 3|4 of a cubic foot. When the bag is full, the crank is turned rapidly, operating the bellows below the lower inclined box. The lower box is the air riffle. This is covered with a 60 mesh screen and below the screen is the bellows supplying the air. The air riffle is on a slight incline and the puffing action of the air moves the sand down the slope. The gold is caught behind the cleats which can be seen crossing the screening surface of the riffles.

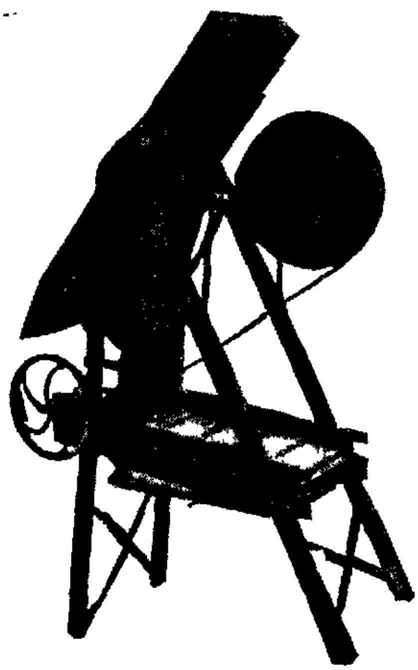

Figure No. 1 - Mexican Dry Washer

Some of the more progressive of the desert miners have improved the machine by operating it with a gasoline engine. If the gravel and sand is thoroughly disintegrated so that all lumps are broken, the dry washer is efficient and recovers the majority of the gold.

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THE SEDIMENTARY ROCKS

There are two principal ways in which sedimentary rocks are formed: (1) by the materials which have been accumulated from the weathering, transportation, and deposition of previously existing rocks. The chief agents of such transportation are air and water, the latter operating in the form of rivers, lakes, oceans, and glaciers. During the transportation of the rock fragments, there is a more or less perfect assortment of the materials according to their specific gravity, or weight, and the transporting power of the agent of transportation. As a result, in their deposition there is an arrangement, more or less perfect, according to the size of the particles and they are laid down in layers. This assortment, and the resulting deposit of layers, gives rise to stratification which is so marked a characteristic of the sedimentary rocks that they are often called the STRATIFIED ROCKS. (2) By the precipitation of material dissolved in the sea (and to a lesser extent in lakes). This material may result from chemical precipitation or may be in the form of shells or other hard parts of the organisms which inhabited the sea. Rocks of this origin are classified according to composition.

The laminated appearance of sedimentary rocks is accentuated frequently by contrasting coloration of the successive layers of grains as they are laid down. This coloration may be due in part to the original color of the grains and in part to the conditions of climate (relative humidity or aridity) which prevailed at the time of erosion and deposition.

By far the most abundant sedimentary rocks are shale, sandstone, limestone, and conglomerate.

In the following table, which lists only the most common types of sedimentary rocks, conglomerates, sandstones, and shales are often called the FRAGMENTAL, or CLASTIC ROCKS because they consist essentially of the fragments derived from the breaking down of other rocks.

TABLE IV. THE SEDIMENTARY ROCKS

TEXTURE	COMPOSITION	REMARKS	NAME
Rounded pebbles	Any kind of rock mineral	Gravel, cemented by other material	CONGLOMERATE
Angular pebbles	Any kind of rock mineral	Gravel, cemented by other material.	BRECCIA
Granular	Silica	Cemented by other material	SANDSTONE
Compact	Mostly hardened clay	Breaks into thin plates	SHALE
Aphanitic to crystalline	Calcite $CaCO_3$	Effervesces; white, if pure; may have cleavage	LIMESTONE
Aphanitic to crystalline	Dolomite $CaMg(CO_3)_2$	Effervesces only when scratched	DOLOMITE
Shells, loosely cemented	Calcite $CaCO_3$	Effervesces	COQUINA
Compact to fine-grained	Calcite $CaCO_3$	Very soft; white; effervesces	CHALK

TABLE IV. THE SEDIMENTARY ROCKS (Continued)

TEXTURE	COMPO-SITION	REMARKS	NAME
Loose, friable	$CaCO_3$ and clay	Effervesces	MARL
Spherical grains	$CaCO_3$	Small, round grains like fish roe	OOLITIC LIMESTONE
Compact and fine-grained. Tough	SiO_2	Breaks with conchoidal fracture and cutting edges. Often occurs as nodules of various colors	CHERT OR FLINT
Usually compact	C, H, O	Colors range from blck to brown. Usually a bright, often iridescent luster and a conchoidal fracture	COAL

DESCRIPTION OF THE SEDIMENTARY ROCKS

CONGLOMERATE--this rock consists of pebbles, more or less rounded, which are held together by a cement. The cement may be sand, clay, iron oxide, or calcium carbonate. The pebbles consist of rocks of any kind but usually are of some resistant material such as quartz and quartzite.

BRECCIA--when the fragments which make up the rock are angular instead of rounded. (Some breccias are the result of faulting and are known as Fault Breccias.)

SANDSTONE--this rock consists of sand grains which have been cemented togetherfirmly. The grains are chiefly particles of quartz or other durable material. The cement, as in conglomerates, may be silica, clay, iron oxide, or calcium carbonate. A siliceous cement produces the most durable and strongest sandstones.

In sandstones the grains are stronger than the cement and therefore any breaking occurs around the grains, producing surfaces which have a gritty feel.

Coarse sandstones grade into conglomerates and fine-grained sandstones grade into shale. The lower limit of grain size for a sandstone is that at which the individual grains are not distinguishable by the naked eye.

If the grains in a sandstone consist mostly of feldspar, the rock is termed ARKOSE.

Sandstones vary greatly in color but gray, yellow, red, and brown are most common.

SHALE--this name is given to muds and clays that have been compacted into rock. Therefore they are high in clayey constituents and are said to be ARGILLACEOUS rocks (Latin ARGILLA, clay). When shales contain considerable fine-grained sand, they are said to be ARENACEOUS; when they contain sufficient calcium carbonate to produce effervescence if touched with a drop of hydrochloric acid, they are said to be CALCAREOUS. All gradations occur.

A typical shale is so fine-grained that it appears to be homogeneous to the eye; has a smooth feel; is soft enough to be scratched easily with a knife blade; and has a semi-conchoidal fracture which causes it to split into shell-like fragments parallel to its bedding (layers).

Shales occur in a great variety of colors, from light to dark. When very dark, organic matter is likely present.

LIMESTONE--these rocks range from aphanitic varieties, so fine-grained as to appear homogeneous, to fragmental and ganular varieties. The aphanitic varieties are made up of chemically precipitated calcium carbonate, or of microscopic shells, or of a mixture of both. In coarse-grained limestones, whole or fragmentary shells can be seen easily. If the shells be abundant and cemented loosely, the rock is called COQUINA. On freshly fractured surfaces some limestones show the cleavage planes of calcite.

Since calcite is their chief constituent, the hardness of limestones (when pure) is 3 and hence they can be scratched easily. Limestones effervesce vigorously when touched with dilute hydrochloric acid.

Many limestones are impure as the result of admixture with clay (argillaceous) or fine sand (arenaceous) and, accordingly, grade into shale or sandstone, respectively.

The color of limestones varies widely but grays or bluish-grays are the most common.

CHALK--a variety of incoherent limestone. The individual particles have been cemented so weakly that the rock breaks down readily. As a rule, chalks are white or creamy white in color.

MARL--an intimate mixture of clay and particles of calcite or dolomite, usually fragments of shells. The rock is broken down easily and effervesces readily with hydrochloric acid. Some marls are composed of pure $CaCO_3$.

DOLOMITE--acarbonate rock composed of calcium-magnesium carbonate. Pure dolomite is slightly harder than pure limestone and will not effervesce in cold, dilute hydrochloric acid except on scratched surfaces (powder). The texture ranges from aphanitic to visibly crystalline. The color range is about the same as that of limestone, although brownish-white is quite common.

FLINT OR CHERT--(the names are used interchangeably) occurs either as beds or nodules in marine strata, such as limestone, chalk, calcareous shale, and calcareous sandstone. Siliceous sponge spicules and other siliceous organisms frequently are found in flints and cherts. Much siliceous material may have been dissolved by ground water after the strata were formed and later deposited where favorable conditions prevailed.

COAL--is produced essentially by the compacting and chemical alteration of vegetable material which accumulated in peat bogs or swamps. Coal occurs interstratified with shales, sandstones, and conglomerates, and sometimes limestones, forming distinct layers or beds.

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HUNT BONES OF FOLSOM MAN

Pathfinder - July 4, 1936

Skeletal remains of America's shadow man who drifted through this continent's distant past leaving only his peculiar stone weapons associated with bones of now-extinct animals he slaughtered and occasional hearth pits will be hunted by Dr. Frank Roberts of the Smithsonian Institution, this summer. Dr. Roberts has established his camp on what is known as the Lindenmeier site in northern Colorado. Because of evidence already discovered scientists are convinced that a village or large camp of the Folsom man stood on this spot shortly after the end of the last ice age and the discovery of skeletons of this ancient race will be the primary object of the expedition. So far no human bones belonging to these anceint Americans have been found.

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MILTON EARTHQUAKE

Mr. J. Tracy Barton, in a letter to Dr. Hodge, gave some interesting observations made by his grandmother of the previous Milton earthquake and observations of the last Milton earthquake made by his mother.

Mr. Barton states that his grandmother recalls very plainly the previous earthquake. In her memory it came shortly after she came to live near Milton in the early 70's and was not nearly as violent as the last one.

Mr. Barton's mother, Mrs. O. J. Barton of Milton, gave him some interesting facts regarding the recent quake. She was awakened in the night by the shaking of the house and states that she heard a loud hissing or ginding noise. Other people reported hearing the same noise. She stated that the water at the Shumway ranch raised four feet and in the first week of September was still at the same height. Dry creek at Blue Mountain Station where the highway crosses it between Milton and Weston has never had water in it during the middle and late summer according to Mr. Barton. However, his mother states that immediately after the earthquake a considerable quantity of water came down Dry Creek and that there is yet a sizable stream at Blue Mountain Station.

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EARTHQUAKES

By Nicholas Hunter Heck, Chief of the Division of Terrestial Magnetism and Seismology, United State Coast and Geodetic Survey - 1936. Princeton University Press - 222 pp 88 Figs. $3.50.

A general book on Earthquakes, scientific and instructive for both the student and laymen - a splendid contribution to our fundamental knowledge of the subject.

The author in his development of the subject traces the formation of earth vibrations and their effects upon man and animals to their causes, including slippage at the fault plane, the elastic rebound theory, volcanic activity, shrinkage of the earth's crust and isostatic compensation processes. The result of the release in short moments of time of the forces due to block tilting and other causes is clearly explained.

The author gives a concise explanation of earthquake phenomena with and without the use of instruments, the types of instruments in use and their utility together with a list of the seismographic stations. Earthquake records and their interpretation, the location of earthquake epicenters and the seismic belts of the Earth are shown in illustrated charts and maps.

A short description of the Great Earthquakes in the World, including those in the United States dating from 1812 to 1935 including the recent Helena, Montana earthquake forms an interesting historical addition. The relationship of the geological structures to the earthquake problem and a description of the various instruments used in these determinations together with descriptive illustrations furnishes invaluable information for the student of seismology.

The design of structures to make them earthquake resistant and the need of further study of this matter by engineers is dealt with in a very concise manner. A History of Seismology and a summary of earthquake information with a comprehensive index makes this book an invaluable addition to our knowledge of the subject.

This touches but breifly on the subject matter contained in the book. However it is impossible in this short review to do full justice to the many interesting facts and conclusions developed by the author in the 17 chapters. - J.W.

GEOLOGICAL SKETCH OF OREGON AND WASHINGTON TERRITORY

("I think our readers might be interested in an article entitled 'Oregon in 1885'. Clarence King, the first Director of the U. S. Geological Survey and S. F. Emmons and G. F. Becker, world-renowned geologists, were authors of the following very interesting article published by the Census Office in 1885.

The article itself must have been written a year or two earlier.

The editors think that our readers will find this reprint very interesting both because it was written by very eminent men and because it represents the sum total of knowledge regarding Oregon at that time." - Dr. Edwin T. Hodge)

The topography of Oregon and Washington territory bears a general resemblance to that of California. Near the coast are low ranges, separating from the sea a long valley, to the east of which rise important chains. The mean rainfall in the western portions of this region is very great, and much country is covered by dense forests. To the east of the great ranges the climate and physical character of these two political divisions are similar to those of the adjoining territory of Idaho. Both Washington territory and Oregon produce coal in important quantities, but the precious metal production of the more northern area is very small, while Oregon yields a million a year in gold.

Extremely little is known of the geology of these areas, which have been examined almost exclusively with reference to their bearing on doubtful points in the geology of regions to the south and southeast. Mr. King, in his SYSTEMATIC GEOLOGY, gives the main facts known on the subject; and some information regarding it is to be found in the Pacific railroad reports and in the AMERICAN JOURNAL OF SCIENCE.

As has been mentioned, the Sierra Nevada mountains were formed during a great post-Jurassic upheaval. The Cascade range, however, is more recent, although from a topographical point of view it might be regarded as a continuation of the great Sierra. The real northern representative of the Sierra is the Blue Mountian range of eastern Oregon, for both are due to the same orographical cause. The coast of the Pacific ocean of the Cretaceous period, therefore, bent eastward to the north of California, and followed the Blue Mountain range northward. The Blue mountains are composed, like the Sierra, of granite and metamorphic strata, and in the latter Mr. King found Triassic fossils. It is probable that nearly or quite all of the metamorphic rocks of Oregon east of the Blue range are Triassic or Jurassic. The Cascade range contains marine upper-Cretaceous beds, (a) but so far as is known none of later date, and it was probably raised above water-level at the close of the Cretaceous. It was certainly uplifted before the Miocene, for during this epoch a fesh-water lake occupied the interval between it and the Blue mountains West of the Cascade range, and near the coast on the other hand, Cretaceous and Tertiary stratapredominate both in Washington territory and in Oregon, and it is probable that the coast ranges of Washington and Oregon, like those of California were elevated chiefly by a Post-Miocene disturbance.

Throughout the Miocene immense volumes of lava reached the surface in Oregon and Washington territory, and the area occupied by it perhaps forms the larges lava field in the world. It spared an irregular belt along the coast and failed to cover the northeastern corner of Washington and part of eastern Oregon, but buried the rest of the country, in part to a great depth.

Besides granite, the principal massive rock of Oregon and Washington is basalt, but andesites also occur in great quantities. The bed rock of the Wickaiser mine, Ochoco district, Wasco County, Oregon, is shown by a slide in the census collection to be diorite, proving at least that earlier eruptive rocks are not entirely absent. The ore deposits are chiefly veins in granite or metamorphic strata, and do not appear to be associated with volcanic rocks.

Much the most important mining region of Oregon is Baker county, which lies in the southeastern corner of the state and adjoins Idaho. The gold veins of this region are in granite and metamorphic slates in and near the Blue mountains, and may thus be considered as occurring on a continuation of the gold belt of California. They are accompanied by auriferous gravels, which are of much local importance, though of greatly inferior volume to those of California and Idaho. The same arguments which are held to prove the Tertiary age of the gravels of California would probably apply to these also, but detailed information bearing upon the point is not available. Trias-Jura strata are also exposed in the Cascade range at a few points where the overlying material has been removed by erosion, and a little gold quartz and gravel have been discovered in such localities; for example, in Lewis county.

In the northern part of California, as has been mentioned, the gold-bearing rocks have a wide distribution, and are not confined to a comparatively narrow belt, as they are in the middle of the state. Similarly the gold mines of Josephine and Jackson counties, which adjoin California and lie to the west of the Cascades, do not seem to bear a direct relation to the main ranges; but it is noteworthy that this region of scattered deposits in the two states is also that in which the Sierra and the Coast ranges meet, and are so entangled that as yet no one has succeeded in discriminating the two systems. The geological relations of the Skagit mines, in Washington territory, on the upper waters of the Skagit river, are not known further that that the gold is found in the bed of the present streams and that the surrounding country is mainly granitic. Auriferous sands are found on the southern coast of Oregon, as in northern California, and are worked as wind and tide permit.

Coal-beds are frequent in the belt of country west of the Cascade range. Of these the most important are found at Coos bay, in Oregon, and at Bellingham bay, in Washington territory. The age of the Bellingham bay seams is known to be the same as that of the Monte Diablo coal or Upper Cretaceous, and those of Coos bay are probably also of this period. Iron ore is abundant, and has been smelted to a small extent, but under the disadvantage of high rates for labor. Quicksilver is found at the New Idrian cinnabar mine, Douglas county. Its occurrence seems to be similar to that of the California mines, and it represents the northern end of the series of deposits, the southern extremity of which is in San Luis Obispo county, California. It would be incorrect, however, to characterize this entire series as a "belt", for toward the north the known occurences are at long intervals.

Whatcom and Yakima counties are the only ones in Washington territory from which gold mines are reported though small quantities of gold are also obtained from the sands of the Columbia river, while King and Thurston counties produce coal. Oregon, Baker, Grant, Wasco, Douglas, Josephine, Jackson, and Umatilla counties are reported as containing gold mines. Coos yields auriferous beach sands and coal, Clackamas iron, and Douglas cinnabar.

a These are of the Tejon group, and may prove to Eocene.

OREGON

BAKER COUNTY

(Note-Determinations in parentheses are given on the authority of experts)

Mine	Ore and gangue	Walls		Character of deposit
		Foot	Hanging	
BURNT RIVER				
Gold Ridge.........	Quartz, gold, and pyrite.....	Granite..	Granite..	Vein
CONNER CREEK				
Conner Creek.......	Quartz, Limonite,(gold and sulphurets)...............	Slate,basalt dike*	Slate,basalt dike*	Do.
FARRIS GULCH				
Farris Gulch.......	(Auriferous gravel)..........	Granite..	....	Placer
POCAHONTAS				
Bailey.............	(Auriferous gravel)..........	Granite..	....	Do.
Lew Cosper & Co....	......do.....................	Argillaceous sandstone....	....	Do.
Salmon Creek.......	......do.....................	Granite..	....	Do.
Tom Payne..........	Quartz,gold,(and iron and copper pyrite)............	Slate....	Slate....	Vein
RYE VALLEY				
Powers & Co........	(Auriferous gravel)..........	Sandstone	....	Placer
Rye Valley.........	Quartz,stromcyerite, copper carbonates,(antimonide of silver and iron pyrite)....	Granite..	Granite..	Vein
SHASTA				
Manadus............	(Auriferous gravel)..........	Gneiss...	....	Placer
SILVER CREEK				
California.........	Quartz,mispickle,pyrite, (stephanite,gold and silver bearing pyrite)............	(Unknown)	Granite..	Vein
WILLOW CREEK				
Boswell............	(Auriferous gravel)..........	Slate....	....	Placer
Virtue.............	Quartz,gold,(iron and copper pyrite)....................	Shale....	Shale....	Vein

*Examined microscopically

COOS COUNTY

Pioneer Black Sand.	Magnetite,titanic iron, quartz,and gold...........			

DOUGLAS COUNTY

New Idrian.........	Cinnabar,limonite,(feldspar, manganese oxide...........	....	Sandstone	Vein

GRANT COUNTY

Mine	Ore and gangue	Walls		Character of deposit
		Foot	Hanging	
ELK CREEK				
Deep Creek.........	(Auriferous gravel)..........	Slate....	....	Placer
Elk Creek..........	.......do....................	....	....	Do.
GRANITE				
Buffalo............	Galena, pyrite, quartz, (stephanite, and mispickel.......	Quartzite	Slate....	Vein
Barne & Lucas......	(Auriferous gravel)..........	Shale....	....	Placer
Klopp & Johnson....	.......do....................	..do.....	....	Do.
Monumental.........	Tetrahedrite, polybasite, chalcopyrite, pyrite, quartz, (mispickel and zincblende).	Granite..	Granite..	Vein
Trail Creek........	(Auriferous gravel)..........	Granite..	....	Placer

JACKSON COUNTY

APPLEGATE				
Chapel & Co........	(Auriferous gravel)..........	Slate....	....	Placer
Grand Applegate....	.......do....................	..do.....	....	Do.
UNIONTOWN				
Gin Lin............	(Auriferous gravel)..........	Slate....	....	Placer
STERLING				
Sterling...........	(Auriferous gravel)..........	Slate....	....	Placer

JOSEPHINE COUNTY

GRAVE CREEK				
Steam Beer.........	(Auriferous gravel)..........	Slate....	....	Placer
YANK				
Sugar Pine.........	Galena, pyrite, chalcopyrite, and quartz................			

WASCO COUNTY

OCHOCO				
Wickaiser & Co.....	(Auriferous gravel)..........	Diorite*.	....	Placer

*Examined microscopically

WASHINGTON

YAKIMA

(Note.- Determinations in parentheses are given on the authority of the expert.)

PESHASTON				
Shaeffer...........	Quartz, (gold), and pyrite.....	Metamorphic....	Metamorphic....	Vein
SWANK				
Swank..............	(Aureferous gravel)..........	Sandstone (and slate)........		Placer

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MOUNT KATMAI AND MOUNT MAGEIK: C. N. FENNER (1930)

Geophysical Laboratory, Carnegie Institution - Paper No. 700

Society members who are readers of the National Geographic Magazine will recall the series of articles (ending 1922) on the Valley of Ten Thousand Smokes, which was explored from 1915 to 1919 by Dr. R. F. Griggs and his party, whose report led to the establishment of the Katmai National Monument. On these trips the crater of Mt. Katmai was seen from the rim only, it appearing impossible to descend to the crater floor. However, in 1923 the author returned to the scene, and was successful in making the first descent into this crater, to study its features at close range.

The most spectacular phenomenon observed was an active mud geyser, which threw large quantities of mud into the air at intervals of a few seconds, with reverberating detonations audible a mile distant. At the orifice was a small pool enclosed by an annular mound of black mud. The scene was obscured at times by steam, both from the geyser itself and from fumaroles, mudpots, and boiling pools. At one spot the odor of hydrogen sulphide was pronounced. A crescentic "island" of platy andesite encloses a deep lagoon of milky-blue water, apparently much deeper than other pools on the crater floor.

The lagoon was fed by water that tumbles down from melting snow and ice on the surrounding crater rim. There was no evidence that the water in the lagoon was rising, although it apparently had no surface outlet. "A channel through the walls must be present, which takes care of the inflow when it reaches a certain height. Probably an analogous condition prevails at similar craters elsewhere, as at Crater Lake, Oregon."

A descent was also made into the crater of Mount Mageik. Here again was observed great fumarolic activity, with boiling pools and mudpots. Fumes of sulphurous acid were too strong to permit close examination. At the largest vent, a constant roar accompanied emission such quantities of steam that - " I was not sure it was actually visible at any time."

At the author's camp, snowdrifts gave a plentiful supply of water; while a pit dug 3 or 4 feet into the pumice furnished a fireless cooker. "With the waning of fumarolic activity observed in 1923, as compared with 1919, such an arrangement may by this time be a thing of the past."

Excellent cuts, 32 in number, add greatly to the interes of this paper.

K. N. P.

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THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

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LECTURES

Dec. 11, 1936 (Friday) - Dr. L. S. Cressman, head of the Department of Anthropology at the University of Oregon will address the Society on "Indian Writings and their Interpretation". This will be a most interesting meeting.

Dec. 25, 1936 (Friday) - No meeting - Merry Christmas.

Jan. 8, 1936 (Friday) - Mr. James Kelly will address the Society on the "Geology of Central Oregon." Mr. Kelly is a graduate of Oregon State College and has spent considerable time in studying the geology of Central Oregon, particularly in the vicinity of Supplee, Oregon. At present he is connected with the United States War Department assisting in the making of its mineral survey. He will have a most instructive message.

Jan. 22, 1936 (Friday) - Dr. W.D. Wilkinson, Professor of Geology at Oregon State College will speak to the members of the Society on the "Tertiary Igneous Rocks of the Dayville Quadrangle." Those who are acquainted with Dr. Wilkinson know that this will be an outstanding meeting. He has made special studies of this particular section of Oregon.

TRIPS

Dec. 13, 1936 (Sunday) - "Dam of the Gods".
Leader: Carl P. Richards.

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OUR SOCIETY IS BECOMING NATIONALY KNOWN

Below we are quoting part of a letter received from Mr. Guy E. Mitchell, Librarian of the Geological Survey, Washington:

"I have been very pleased that the Library of the United States Geological Survey has been receiving regularly your little publication, 'Geological News Letter'.

In the October 25 issue I notice the index of Volume I. I would very much appreciate having a complete file of your publication in this Library and greatly desire to include the various articles of the bulletin in the forthcoming edition of the Bibliography of North American Geology, which is now being prepared for the publisher. Our file begins with Volume I, Number 18. Could you kindly furnish the numbers we lack?

I am very much interested in the progress that your lively young organization is making, and hope that in the near future you will be able to publish your bulletin in a format which will insure its permanent preservation."

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The Island Wappato, Vol. 1, No. 1, made its appearance last November. It is a monthly publication devoted to the interests of Sauvie Island by George S. Shepherd, the attorney known to many as "40 feet to the sea " Shepherd. The paper likewise is to form a medium of expression for the many original ideas to which Mr. Shepherd gives voice.

It is fortunate that someone with his ability is willing to do this thing for one of the finest districts in Western Oregon, rich in historical associations and rich in present day agricultural development.

Unfortunately, the district seems to be a forgotten one by both Multnomah and Columbia Counties to a considerable extent. Bridges, roads and dikes are needed among other things. It is the intention of Mr. Shepherd to ask for a place for the islanders in the sun as well as preserve the historical beginnings and Indian lore. The subscription price of the monthly is $1.00 per year, and George's dry humor alone is worth it.

Note - Through courtesy of Mr. Shepherd a copy of the paper - "Island Wappato" may be found in the Library of our Society.

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Tuesday Evening, November 24th, Dr. Hodge gave a talk before the local section of the American Society of Mechanical Engineers. The subjct of his lecture "The Part Mineral Resources of the Pacific Northwest Should Play in the Use of Bonneville Power".

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TRIP ON SAUVIE ISLAND

The caravan assembled on the island at the intersection of the Reeder Road and the Gillihan Loop Road on the west side of the island and proceeded to the southern end of the island and thence to the confluence of the Willamette and Columbia rivers, where a good view was obtained of this historic spot, called Bellevue Point. There were a number of channels interspersed with islands at this location at the time of Lewis and Clark's trip, which accounts for their difficulty in finding the mouth of the Willamette river. One of these channels was filled in within the last ten years.

The next point of geological interest to be pointed out was on the north end of the island, which the party reached at very late high noon after some stops to examine Indian artifacts. Lunch was consumed on Warrior Rock and on the adjacent sand bar overlooking the broad expanse of the Columbia river, nearly half a mile wide at this point. Directly across the river were the mouths of Lewis river and Lake river. The day was clear and warm under the November sunshine.

Sauvie Island in the eyes of the inhabitants thereof seems to be regarded as the forgotten island, the mecca of trespassers; to the historian it was the Garden of Eden that attracted the settlement of the earliest pioneers; in the eye of the average citizen of Portland, it is the island of cows, ducks, catfish, carp, arrowheads and flooded bottoms. It is all these and more to the amateur geologist; it is an island of gates, ferries, dikes, private roads, narrow roads, and no roads. As John Stevens remarked about the road into the Clarno Country, - "It got worse and worse and finally climbed a tree"; but with this difference, -- as the roads get worse and worse on the island they finally change into a series of gates.

Despite these more or less favorable characteristics, Sauvie Island is an interesting place for an afternoon spin from Portland, and will offer opportunities for the amateur to make studies and to speculate on the origins of what is said to be the largest fresh water island in North America. Approximately speaking, it is isolated by the water of Multnomah Channel on the west, the Willamette river on the south and the Columbia river on the east. It is 16½ miles long and 4½ miles wide in its widest portion, and about 1/5th of a mile wide at its narrowest point. The long axis lies almost directly in a north and south line. Its southern tip is within a mile of the city limits on the Lower Columbia River Highway. It is reached by the only remaining ferry crossing in Multnomah County which is located at Burlington, three miles north of the city limits on the Lower Columbia River Highway. The northern half of the island lies in Columbia County and the southern half is in Multnomah County. The soil of the island is very fertile. The principal industry is dairying. The general elevation is around 20 U. S. Engineer's datum, and much of it is flooded during the high water stage of the Columbia river. A portion of the northern half of the island is diked on the Columbia shore but the dike and the road on it are both in bad repair. There is a movement on foot for extensive diking now which is meeting with some opposition on the grounds that the annual flooding is a benefit.

The highest contour of the island shown on the Hillsboro quadrangle is elevation 50 and is located near the road just about one-half mile north of the ferry. It is near the site of the Hudson Bay Company's post on the Moore farm. The tree growth on the high ground is mainly fir and oak, while on the flooded ground is found oak, ash, cotton wood and willow.

Unfortunately, the time at the disposal of the group did not permit the study of the west shore line of the island nor its interior, nor did it permit of much study of the log of the deep wells drilled on the island for the dairymen, which logs were in the possession of the writer.

From the northern tip of the island a number of basaltic, dike-like structures extend southward from the northern extremity about one-half mile. These exposures are of the brick-bat type and resemble the igneous rocks of St. Helen just across the channel. The small portion which extends to the east shore of the island forms the point called Warrior Rock, on which the lighthouse of that name stands.

The group on viewing these outcrops came to the general conclusion that they preceded the formation of the island, and, by forming more or less of a dam, so slackened the current velocity of the stream as to cause the deposition of the material carried in suspension. It would be interesting to know the depth of these rocks which can be conjectured from present information.

So far as the writer could determine, no other rock outcrops are found on the island. However on information obtained from Mr. Earl Marshall, Multnomah County Surveyor, a later trip was made to Oak Island, lying between Sturgeon Lake and Mouse Island Lake. This land is owned by Everding and Farrell, and permission is necessary to visit it. The island is evidently the remains of an old gravel bar and much shingle is exposed on the Sturgeon Lake shore. There is a surprising amount of quartzite on it; also vesicular igneous rock, basalts and granites, all well water worn, and some of the quartzite found was well decayed. Where roads had been excavated small boulders were notice with maximum dimensions up to 30". A good part of the soil on it is Columbia sandy loam.

To get a broader view of the island in terms of the geology of the immediate vicinity, investigation regarding the changing confluence of the Columbia River and the Willamette River since the Pleistocene submergence should be made. If the four quadrangle sheets of the area contiguous to Portland are moulded together this investigation will disclose some interesting facts.

Bretz points out that one of the abandoned channels of the Columbia river can be tracedfrom Rocky Butte to confluence with the Willamette river in the heart of Portland. Another is evident east of Vancouver. He further calls attention to the fore-set characteristics of the terraces at Portland dipping mainly westward and northwestward as shown in any gravel pit or in the long railroad cut in the northern part of Portland. Condon said the high bluff at the University of Portland site overlooking the Willamette River at Swan Island is a terrace remanent, left by erosion and not deposition.

Attention is also called to the log of the deep wells drilled on the island. These holes have been located on the map of Sauvie Island accompanying this article. These wells were drilled at various times by Mr. Strasser, Mr. Liezing and others.

Mr. Strasser furnished the writer with logs of twelve wells drilled on the island between 1926 and 1931. All these wells, Mr. Strasser reported, were drilled through a cap layer of a cemented gravel where a good water was struck and which generally stood in the casing at approximately the level of the water in the river.

The schedule of the wells follows:

Location	Depth	Remarks
#1S	90'	1926 - fine sand and silt to 85' - gravel with water at 90'. Suction pump.
2S	220'	Well driven in sand 133' and 87' in solid rock. Water hard and brackish. Supply limited.
3S	192'	1926 - fine sand to 180' - gravel to 192' - Suction pump
4S	264'	1930 - Very sandy-water was in gravel.
5S	245'	1930 - Sand to 235'. Gravel to 245'. Large supply but of poor quality. Suction pump.
6S	170'	1931 - Silt and sand to 145'. Cement gravel at 165'. Suction pump well.
7S	254'	1931 - To solid rock encountering salt water and well abandoned. Gas blew water 20' in air and burned when ignited.
8S	173'	1926 - Sand - Some very dry and hard. Good supply of water. Deep well pump.
9S	106'	1928 - Silt and sant to 102'. Gravel to 106'. Good water.
10S	128'	1928 - Silt and sand to 128'. Gravel to 131'. Suction pump.
11S	132'	1926 - Silt and sand to 120'. Gravel to 132'. Suction pump.
12S	387'	1931 - Silt, sand, shale and clay to 375'. Rock to 387'. Water like Epsom salts. Hole abandoned.

The driller, Mr. Strasser, has the log of most of these wells in detail and kindly gave the writer the complete log of the deepest well - #12S - which is located on Rocky Channel just across from Rocky Point. It is of value as showing the characteristics of the stratigraphy on the deepest hole known to have been drilled on the island. The elevation of the top of the hole was between elevation 20' and elevation 25' U. S. Engineers' datum. The log is reproduced on the map sheet which accompanies this article.

On Oak Island good water is obtained from dug wells ten feet in depth, in some of which, well points were driven 20' further.

Mr. Ziezing, well driller, reported that he drilled several wells on the island and three of these are here noted:

Location	Depth	Remarks
1Z	75'	At new brick school house on Reeder Road - 75' to gravel.
2Z	200'	200' to gravel - Hutchinson's farm.
3Z	200'	McIntyre Farm - 200' to gravel.

On the north end of the island one well was noted which was drilled for the McCormick Lumber Company on what is known as the Harrison and Rowe place, one mile south of the north end of the island. This well is noted as 1 M on the map accompanying this article. This well is 100' deep and the quality of the water is poor, but no record of thelog could be found.

From the examination of the surface of the island, the log of the wells and the quadrangle sheets of the general vicinity, the following deductions may be made:

Sauvie Island is a general area of deposition dating from pleistocene times shortly after the pleistocene submergence, possibly a part thereof. It is an island formed by a meandering stream which dropped its material held in suspension due to a decrease in the velocity of its current, which decrease may have been due to two causes working jointly (1) the blocking of the stream by the igneous extrusions of Warrior Rock and like formations at the north end (2) by the almost 90° bend in the Columbia River at the lower end, which change in direction would also affect velocity.

It is tied into the fore set picture of the Portland Delta.

The writer is inclined to except Oak Island gravel bar from these conclusions. Might it not be a part of a very much older island which survived erosion after the pleistocene submergence? The decayed quartzites lend some color to that conclusion.

There is submitted with this article a revised log of the trip for future reference. Also a map of the island is attached. The writer wishes to acknowledge the assistance of Bruce Schminky in preparing the map which was printed by courtesy of the Swender Blue Print Company.

Franklin L. Davis

For those who wish to make further studies of the island, the following bibliography is referred to:

Quadrangle sheets

Soil Survey of Multnomah County

The Late Pleistocene Submergence in the Columbia Valley of Oregon and Washington. By J. Harlen Bretz - Journal of Geology - Vol. XXVII - No. 7 - October-November 1919.

Condon's Two Islands

Navigation Chart of Columbia River, St. Helens to Willamette River, including Vancouver and Portland. Scale 1|40000. This map shows the island complete and is sued as the basis for the map accompanying this article.

LOG OF TRIP ON SAUVIES ISLAND
November 15, 1936
F. L. Davis and Geo. S. Shepherd, Leaders

****

Miles	
0.0	Portland city limits marker, about a mile beyond Linnton business district.
3.0	Burlington. At Burlington, turn right over wooden viaduct to ferry
3.6	Ferry over Columbia Slough. (No charge) Ferry makes round trip every eight minutes and has capacity for 11 cars. Proceed up the hill from ferry to first intersection, and turn to right, continuing to mileage 4.1.
4.1	Cross-roads, Reeder Road and Gillihan Loop Road. Party will assemble at this point at 9:00 A.M., and will proceed southeast along Gillihan Loop Road to view the confluence of the Willamette and Columbia Rivers, and continue around the southern end of the island.
8.8	Hall Place (Old Gillihan Place).
9.5	Cieloha Place (Confluence of Willamette and Columbia Rivers).
10.3	Back to road from Cieloha and Hall farms.
12.6	Omar C. Spencer stock farm.
13.8	Geo. S. Shepherd farm.
13.9	Intersection of Reeder and Gillihan Loop Roads, on the east shore. At this point the party on the return will go via the Reeder Road to the ferry on the return trip. Council Oak, 24 feet 6 inches in circumference, is located on Reeder Road about ½ mile from this intersection on the Broad Slough side.

Miles

14.4 Mrs. Hutchinson's Dairy Ranch. Deep well here.

17.2 Columbia County Line.

19.8 At this point on the Columbia shore, as determined by Geo. Shepherd, Lieutenant Broughton camped for the night on October 29, 1792.

23.8 Purported site of Indian village on shore of the Columbia River. At this point, Mr. Richardson, a local resident, will exhibit artifacts, and if time permits, the group will spend a short time on the river bank.

24.9 H. and R. Duck Club.

26.3 Warrior Rock Lighthouse. Party will inspect only "watched" lighthouse on the Columbia River except at the mouth. E. N. Cadwell in charge, will describe equipment and operation of light and fog bell and exhibit Indian artifacts found locally. Party will walk $\frac{1}{4}$-mile to extreme southern tip of island, and view exposed basaltic rocks in this vicinity similar to the exposures across the Columbia Slough at St. Helens. These are practically the only rock exposures on the entire island.

Party will spend a short time looking for artifacts on the Columbia River beach. Party will break up in this vicinity at 3:00 P.M., and return to the ferry via the Reeder Road, as noted at mileage 18.5.

46.8 Portland city limits marker.

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When the two good men who collaborated on the trip described in this issue cannot agree on the spelling of their island, what is a poor editor going to do? Mr. Davis bases the spelling of "Sauvie" Island on the weight of Government usage as shown by the U. S. Geological Survey. Mr. Shepherd bases the spelling of "Sauvies" Island on the weight of popular usage. This explanatory note will account for the variation in the spelling in the two articles. The editor admits something should be done about it.

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NEW MEMBER OF GEOLOGICAL SOCIETY

We take great pleasure in announcing the name of our new member -

DAVID CHARLES OLAINE

Born November 26th, 1936

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THE HISTORICAL INTEREST AND THE INDIAN LORE OF THE SAUVIES ISLAND TRIP

On the trip to Sauvies Island the interest of the group seemed to be three fold, geological, historical and Indian artifacts. In this article I will discuss the two latter items.

The confluence of the Wilamette with the Columbia was viewed by the party. This point has historical significance for from here (Point Bell Vue) Lieut. Broughton on October 29, 1792, had his first view of Mount Hood to which he later gave the name of Admiral Samuel Hood when he arrived at a point on the Oregon shore opposite the present site of Washougal. Broughton proceeding along the westerly side of the Columbia river entered a branch of the Willamette and continued to the main branch. this he called Manning's river. He took soundings and found from two to five fathoms of water. He also noted two wooded islands which account for the failure of Lewis and Clark to observe the river in 1805 and again in 1806.

The party arrived at the place where Broughton spent his first night on Sauvies Island, but the parking accomodations would not admit of going down to the river's shore for further observations. From this point Mount St. Helens bears north 42 degrees East and a more modern description would be to place it a short distance downstream from the northerly end of Pete's Island. To those of the party it will be more definite to explain that where we left the road on the dike to detour through the sheep and turkey pasture was about half a mile north of the sandy beach where Broughton spent his first night on Sauvies Island among "a hundred and fifty of the natives". "X" marks the spot is at mileage 19.8 on the log of the caravan.

Warrior Rock Lighthouse, where the party lunched and received the hospitality of Mrs. and Mr. E. N. Cadwell, gained its name from Broughton's narrative of his experience there:

> "Having been there surrounded by 23 canoes carrying from three to twelve persons each, all attired in their war garments in every other respect prepared for combat. On the strangers discoursing with the friendly Indians who attended our party, they soon took off the war dress and with great civility disposed of their arms and other articles for such valuables as we presented to them, but would neither part with their copper swords or a kind of battleaxe made of iron."

In the study of the Indian lore and the search of Indian artifacts, the Geological Society could scarcely have picked a more interesting location. For a long period of time preceding the coming of the white man, the Indians and probably their predecessors had used Sauvies Island as a home and a burial ground.

The west side of the Island has a high ridge which reaches its highest elevation of 50 feet above sea level, U. S. Engineers' datum. Along this ridge many of the most interesting finds are made, such as peculiar stone slab with three circular shallow depressions thought to be a palette for paints which was seen at the Hall ranch at the first stop, - mileage 8.1. This artifact was found by Mr. Hall a short time previous to our visit. The Halls had other interesting pieces, such as war club stones, pestles, mortars and game stones.

Another fertile source of Indian relics are the memaloose grounds or cities of the dead. One of these most prolific in yielding artifacts was that on the Reeder farm, near Reeder Point, about log mileage 16.5. The present owner, Mr. Reeder, is the grandson of the original Reeder who settled the land in the 40's. Mr. Reeder very graciously exhibited to the group in the yard a very interesting display of Indian tools, weapons and figures, also skulls and various human bones. Also some large bones of unknown lineage found by his father under 75 feet of gravel near the White Horse rapids in Alaska during the gold rush days to the Klondike. Some of these specimens, Mr. Reeder stated, had been sent to Smithsonian for identification, and one figure, he was advised, was distinctly pre-Indian. Dr. Jones was so intrigued with a small animal skull that he "borrowed" it on the spot for further study.

Other articles displayed in the yard were old rifles, horse-pistols, and ox yoke that was used in coming across the plains by Grandfather Reeder. There was also a dug-out Indian canoe of "ye olden times". The interest of the group was so evident that Mrs. Reeder joined her husband in inviting the group into the house to view the old homemade furniture of the 40's. The ladies particularly responded with alacrity, and it was with difficulty that the caravan was moved ahead.

The next Indian site visited was at log mileage 24 on the bank of the Columbia River near the home of Mr. Richardson. The party did not have time to stop here but on the return trip Bruce Schminky stopped long enough to find a very fine stone scraper. At Mr. Richardson's house was exhibited the part of the rim of a mortar carrying a very ornate conventionalized owl's head as a decoration.

It is extremely unfortunate that this material is all being disseminated instead of being collected at some place where future Oregonians might view it. Will we be blamed for dereliction of duty by generations to come?

George S. Shepherd

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UNCLE SAM WILL LEND COLLEGE QUAKE CLOCK

Morning Oregonian - November 27, 1936

WALLA WALLA, Washington, November 26 (AP) - The United States department of interior will place a seismograph at Whitman college to record local earthquake shocks, Dr. W. A. Bratton, acting college president, said he was informed Wednesday.

The instrument will be shipped as soon as preparations have been completed here for its installation, Dr. Bratton said.

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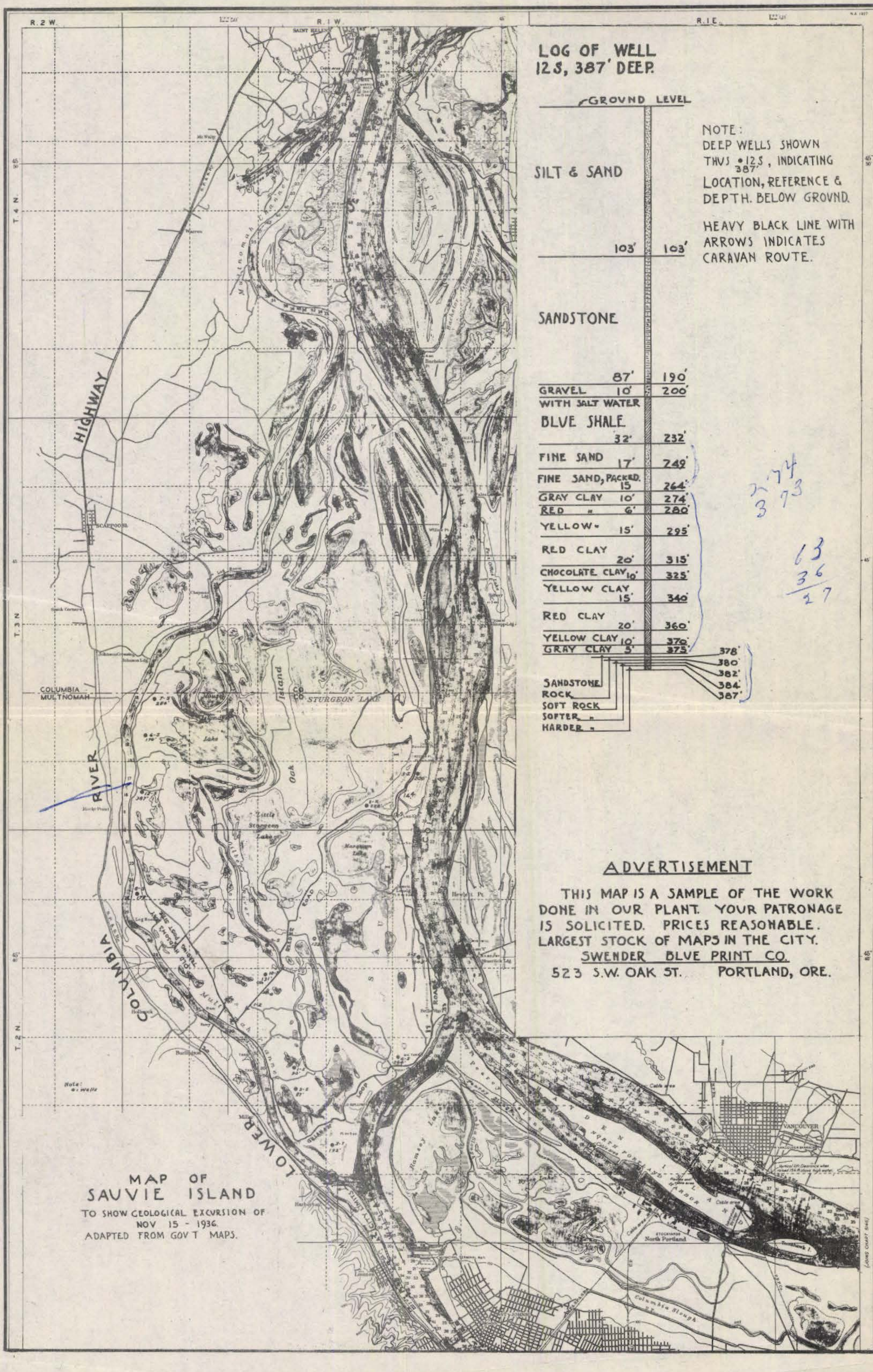
Editor - How long will it be before we have a seismograph in Portland?

(2)



R.2 W.
R.1 W.
R.1 E.
T.4 N.
T.3 N.
T.2 N.
LOG OF WELL
12 S, 387' DEEP.
GROVND LEVEL
SILT & SAND
103'
103'
SANDSTONE
87'
190'
GRAVEL 10'
200'
WITH SALT WATER
BLUE SHALE
32'
232'
FINE SAND 17'
249'
FINE SAND, PACKED. 15
264'
GRAY CLAY 10'
274'
RED " 6'
280'
YELLOW " 15'
295'
RED CLAY 20'
315'
CHOCOLATE CLAY 10'
325'
YELLOW CLAY 15'
340'
RED CLAY 20'
360'
YELLOW CLAY 10'
370'
GRAY CLAY 5'
375'
378'
380'
382'
384'
387'
SANDSTONE
ROCK
SOFT ROCK
SOFTER "
HARDER "
NOTE:
DEEP WELLS SHOWN
THUS •12S 387', INDICATING
LOCATION, REFERENCE &
DEPTH. BELOW GROVND.
HEAVY BLACK LINE WITH
ARROWS INDICATES
CARAVAN ROUTE.
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MULTNOMAH
STURGEON LAKE
Island
Oak
COLUMBIA RIVER
LOWER
VANCOUVER
North Portland
Columbia Slough
MAP OF
SAUVIE ISLAND
TO SHOW GEOLOGICAL EXCURSION OF
NOV 15 - 1936.
ADAPTED FROM GOV'T MAPS.

"DAM OF THE GODS" TRIP: December 13, 1936
Leader: Carl P. Richards

This is a trip for the purpose of studying the evidence and effects of the famous and much discussed landslide, which so recently (geologically speaking) played havoc with the Columbia River. The event is handed down in Indian legends telling of the "Bridge of the Gods" which spanned the river south of Table Mountain and it is confirmed by evidence which geologists read in various formations and structures at the site. Some of this evidence will be permanently obscured by flooding when Bonneville Dam is finished a year or so hence, so it is fitting that we should, at this time of extreme low water, visit the scene and observe as much as possible of this major event in the River's history.

We will leave S. W. Sixth and Yamhill St. at 8:30 A.M. Sunday, December, 13, and drive to Wyeth, near the 53rd mile post on the Columbia River Highway, where the party will assemble at 10:30. There we will be joined by Dr. Donald Lawrence, of Hood River, who has made an intensive study of this slide and its effects (especially of the submerged trees). He has kindly consented to visit the points of interest with us and tell us about their history and significance.

After visiting some of the more important sites along the Oregon shore, we will return west to the south end of the present (steel) Bridge of the Gods, where we will have lunch. This is close to the town of Cascade Locks, so that those who wish can patronize one of the restaurants there. From there we will cross the bridge (toll 50¢ per car, return free if within three hours) and visit some interesting features on the Washington shore above Cascade Rapids. Then, going back west on the Evergreen Highway, Bonneville Dam will be passed, and an opportunity will be afforded for a brief view of this work from the Government View Point, after which we will proceed to Beacon Rock about five miles further on. Situated practically in the middle of the Columbia River Valley, this monolith is a veritable grandstand for viewing the general geological structure of the Gorge, and those who can should not miss the opportunity to make the trip to its summit. There is an excellent trail all the way and a most leisurely ascent can be made in about 25 minutes. Talks on the geology of the locality will be made on the top and the notable features pointed out.

On returning to the Highway, the party will disband.

Not much hiking is involved in this trip, but good boots should be worn, as the shores of the river may be muddy. Plenty of warm clothing should be available, for the Gorge has a bad reputation at this time of the year for raw winds. Driving distance, about 150 miles, all paved highways.

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THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol. 2 - No. 24 Portland, Oregon December 25, 1936

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Address all other correspondence regarding the Bulletin and changes of address to the Business Manager.

LECTURES

Dec. 25, 1936 (Friday) - No meeting - M E R R Y C H R I S T M A S.

Jan. 8, 1936 (Friday) - Mr. James Kelly will address the Society on the "Geology of Central Oregon." Mr. Kelly is a graduate of Oregon State College and has spent considerable time in studying the geology of Central Oregon, particularly in the vicinity of Supplee, Oregon. At present he is connected with the United States War Department assisting in the making of its mineral survey. He will have a most instructive message.

Jan. 22, 1936 (Friday) - Dr. W. D. Wilkinson, Professor of Geology at Oregon State College will speak to the members of the Society on the "Tertiary Igneous Rocks of the Dayville Quadrangle." Those who are acquainted with Dr. Wilkinson know that this will be an outstanding meeting. He has made special studies of this particular section of Oregon.

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TRIPS

Dec. 13, 1936 (Sunday) - "Dam of the Gods."
Leader: Carl P. Richards.

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CHRISTMAS GREETINGS

As we come to the close of another calendar year and approach the Christmas Season, we are not unmindful of the spirit of good fellowship that prevails at this particular time. In our Society we have been privileged to enjoy, at all times, the most hearty and harmonious co-operation, the greatest of kindness and the best of fellowship. We extend to all our members and friends, our sincere wish for a Most Joyous Christmas, and a Progressive, Prosperous and Happy New Year.

Clarence D. Phillips,
President

Nearly two years of geologic history or at least history of the Geologic Society of the Oregon Country have transpired.. These two years have been years of joy, interest, and at times tremendous enthusiasm. The Society has grown in solidity and seriousness of purpose. The prestige of the Society is gradually being appreciated, not only in Portland, but in the country as a whole. The editor of the News Letter wishes to express to the members of the Society his deep satisfaction in the evidences of the successful future of our Society. He deems it one of the great satisfactions of his life to have been associated in the future of an organization that will mean so much towards the intellectual and economic development of that region comprehensively known as the Oregon Country.

Edwin T. Hodge,
Editor

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ADDITIONAL OPPORTUNITIES FOR AMATEUR GEOLOGISTS

Attention is called to two splendid courses given by the Portland Extension Center for students of geology this winter term. These courses begin the week of January 4 and will extend to March 5. They are held in rooms in Lincoln High School, 1620 S. W. Park Avenue.

Dr. Ira S. Allison will present a brand new course, "Geology of the National Parks", registration No. G352p, each Tuesday evening at 7:15 in room 104. A non-technical course designed to develop a more complete understanding and appreciation of the outstanding physiographic and geologic features of each of the National Parks.

Dr. Edwin T. Hodge will give a course on the geologic history of the earth with special reference to geologic history of the Northwestern portion of North America. This course is listed as G203p. "Historical Geology", each Wednesday evening at 7:15 in room 110. This is a general survey of the geologic history of the earth and the developments of life, with particular reference to significant events relating to Northwestern America.

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THE NOMINATING COMMITTEE'S REPORT

The nominating Committee, in accordance with the By-laws of the Society, has filed the following report with the Secretary:

"December 7, 1936.

"The President and Executive Committee
Geological Society of the Oregon Country
Portland, Oregon

"Gentlemen:

"Pursuant to your instructions of October 31, 1936, we, your nominating committee, report the nomination of officers for the ensuing year as follows:

"President	A. D. Vance
Vice President	A. C. Jones
Director	K. N. Phillips
Treasurer	Mabel C. Smith
Secretary	Lillian Neff

Respectfully submitted
L. E. Kurtichanof, Chairman
Amza Barr
Constance Endres
Carl Richards
Glenna M. Teeters"

Publication of the above report constitutes notice by the Secretary of such nominations.

Lillian Neff, Secretary.

Attention of the members is called to Article VIII of the By-laws, if any desire to make further nominations:

"Article VIII
Nomination and Election of Officers

"Section 1. A Nominating Committee shall be appointed consisting of five members, none of whom shall be officers or directors of the Society. Not later than the 15th of December, prior to the time of the annual meeting of the Society, the nominating committee shall file with the Secretary its nominations, containing the name of one nominee for each office to be balloted on. On or before the first day of January of each year, the Secretary shall notify the members in writing, or by a publication in the official publication of the Society, the names of nominees for each office. Other nominations may be made by members of the Society by filing with the Secretary, on or before the 15th day of January of each year, a list of such nominations, which shall be signed by at least ten members of the Society. The names of the additional nominees shall be communicated by the Secretary to each member, either by writing or by publication in the official publication of the Society, which communication shall be made not less than fifteen days prior to the annual meeting.

"Section 2. A letter ballot containing the nominees of the regular and special tickets shall be enclosed and mailed to each member. All ballots must be returned and in the hands of the Secretary prior to the annual meeting at which meeting the Secretary shall announce the result thereof. In case a majority of all ballots shall not have been cast for any candidate for any office, the Society shall proceed to make an election, in open meeting, for such office from the two candidates having the largest number of votes.

"Section 3. All officers elected shall take office as of the first of March following the annual meeting."

GEOLOGY OF SADDLE MOUNTAIN STATE PARK AND VICINITY

G. S. O. C. Speech by Robert A. Layfield

Before coming to the subject at hand let me mention the work of the Park Services (State and National) in the development of park areas. Many people do not understand the relationship of the two.

The State Park Service (a branch of the State Highway Department) sets aside certain areas as state parks. Money to develop these areas is provided by the National Park Service whose inspectors supervise expenditures. Foremen, camp superintendents and such personnel are State Park Service employees. Labor is supplied by C.C.C. men. When a park is completed maintenance is in the hands of the state.

Let me stress one thing to prospective visitors in these areas. Don't go with the idea of trying to see where all the money is spent. All endeavor is aimed toward keeping the area as natural as possible while at the same time enhancing its beauty. For instance, ugly snags are felled to supply picnic areas with wood. Many of the stumps are mounded over with earth and are seeded to natural mosses and plants. All this represents expenditure for which (we hope) there is nothing to show. So go there and enjoy a sereness in your surroundings and the Park Service will feel its object accomplished.

....

To give a background for the geology of Saddle Mountain Park, it is necessary to briefly review the general geology of the Coast Range.

Detailed work can only be done under great difficulty because of the heavy forest cover, deep soil, abundant rain, and consequent lack of exposures.

In general the Coast Range consists of a gently folded mass of Tertiary sediments cut by igneous intrusions. The area is maturely dissected, the main river courses being controlled by distribution of igneous rocks rather than by capture. The outstanding high points, such as Necarney, Saddle, Onion, and Mary's peaks, are igneous intrusions.

Cross sections of the Range in northwestern Oregon show a geanticline with five broad folds cut by many normal faults. This anticlinal structure extends northward from the Umpqua river 50 miles into Washington. South of the Umpqua the Range is a syncline with flanking anticlines. Dips rarely exceed 15° except near intrusives. This differs greatly from the Coast Range of California where sharp folds prevail.

The main formation of the Coast Range is the Tyee sandstone whose type locality is in Douglas County. This formation is correlated with the Tejon (Upper Eocene) formation of California on its marine fauna. The Tyee sandstone extends from the Rogue river northward 120 miles, into Tillamook County. At the locality it consists of 2000 feet of light grey, medium to coarse grained, thickbedded rock with many dull white decomposed feldspar crystals. Conglomerate is rare except for a few thin layers of acidic pebbles. It contains some shale and a few thin lignite seams of no commercial importance.

In the Astoria region the oldest formation is a series of diabase tuffs and breccias of Upper Eocene age exposed west of Megler, Washington. They distinctly differ in texture and composition from the overlying (Astoria?) shale. Age has been determined by discovery of a fossil clam Venericardia planicosta.

The igneous rocks of the Eocene are distinguished by much feldspar, no olivine, and more or less hornblende.

Oligocene strata in the Coast Range are limited to Clatsop, Columbia, and Tillamook Counties. The lower 400 feet of the Astoria formation, a series of dark clay shales, and sandstone, is thought to be Oligocene in age. Deposition was continuous in this area into Miocene time but the finding of the typical Oligocene fossil Aturia angustata as far as 400 feet above the base of the series indicates that horizon marks the end of Oligocene time.

The Astoria shale is exposed in many of the street cuts of Asoria. It is thin bedded, evenly stratified and dips 5°-15° SW. The peculiar topography is indicative of landsliding. The Astoria shale does not extend south of Clatsop County but grades into a sandstone in Tillamook County.

The Miocene rocks are the most abundant and most easily recognized in northwestern Oregon. Four-fifths of the fossil localities listed by Dall are Miocene. The series in this area consists of Mecaceous Clay shales intruded by basalt dikes and sills and in places overlain by volcanic breccia. In all localities the upper layers of the shales are more sandy. This is one of the lithologic characters which implies that the shales of Saddle Mt. Park are part of the Astoria formation. The sandy layers interfinger and interlense, are conformable, nonfossiliferous, and become coarse toward the top. This sequence conforms to Washburne's description of the known Astoria formation.

The Pliocene was possibly a period of emergence as its record is very slight. The only known locality is in Columbia county south of Clatskanie.

The four square miles of Saddle Mountain Park were presented to the state by the Crown Willamette Paper Company. The Park is located in central Clatsop county in the southern part of T. 6 N., R. 8 W. Saddle Mountain occupies two thirds of the park area. According to the most recent figures (U.S. Engr., 29th Bn.), the peak has an elevation of 3287 feet. On a clear day from the top, one can see Mounts Rainier, St. Helens, Adams, Hood, and Jefferson. The geology of Saddle Mountain Park is perhaps its most noticeable feature as the mountain is the chief object of attraction with its unusual dikes and mass of bare rock.

The only good exposures of rock are those of nearly vertical dikes which cut the mountain. Several trails cross and recross these dikes. There are no good roads into the Park yet. One road goes south from Astoria through Olney. One goes in from Jewell, and another, a private logging road goes in from the junction of the new Wolf Creek Highway and the Roosevelt Highway (U.S. 101) 14 miles south east of Seaside.

Saddle Mountain controls the headwaters of two drainage basins, Young's River flows to the north and northwest, emptying into the mouth of the Columbia River southeast of and adjacent to Astoria. The Lewis and Clark River approximately parallels Young's River being four to six miles to the west.

Two miles south of Saddle Mountain is Humbug Mountain whose south side is the headwater area of the Necanicum River which empties into the ocean at Seaside. Many of the ridges, especially the drainage divides, are formed on basalt dikes or sills. Heavy brush and second growth timber in the area surrounding the mountain serve to control runoff, maintaining most streams with slight decrease throughout the year. Run-off from the mountian itself lessens rapidly during the summer. Both front and back sides are cut by steep narrow gorges.

The angle of slope of the cliff rock is from 60° to 90°. Great blocks of the rock have broken off in many places leaving smooth surfaces. In places the exposed faces of these masses show evidence of bedding of the breccias dipping into the mountain. The same structure is found on blocks on both sides of the mountain indicating rotational landslipping rather than direction and angle of flow. This slipping is caused from erosion cutting away weathered rock and clay from the flanks, depriving the cliff rock of exterior support; also by termperature effects on water in the major joints.

Northwest of the Park near Olney and Fernhill the general dip of the Astoria sediments is to the southwest. The general dip of the sediments of Saddle Mountain region is to the northwest, apparently in the southeast limb of a broad low syncline striking generally NE.-SW. Dips taken on the foraminiferal grey-blue clay shales near Elsie, Jewell, Wolf Creek Highway and near Saddle Mountain are generally NW. from 10° to 15°.

Saddle Mountain and Humbug Mountain, piles of palagonitic basalt breccia, protrude through the sediments. Saddle Mountain is cut by numerous thin dikes that stand out from the surrounding material as walls up to fifty feet high. They are so regular, with their columnar jointing normal to the walls, that they look as if a stone mason had constructed them. None of the thin dikes cutting the breccia were found on Humbug Mountain. Possible explanation of this will be discussed later. Numerous wide basalt dikes and sills form ridges in the area several miles around Saddle and Humbug Mountains.

The area of the Park proper contains three distinct types of rock, the basalt breccia of the mountain, the finegrained dikes, and the more or less indurated mica clay shale surrounding the mountain.

The clay shales cover most of the area surrounding Saddle Mountain. They have been traced north to Astoria, east to Jewell and Elsie, south to Hamlet, and west several miles beyond the Park. The shales are a few hundred to 1000 feet thickand vary locally in lithology. They range from gray-sandy sediments to fine blue-black clays, and where weathered are yellowish-brown from iron oxide staining. Regardless of color they are all micaceous, containing muscovite and quartz sand grains as the only recognizable minerals. They grade upward to more sandy layers at the top. Interbedded are thin cherty layers three to six inches thick. Characteristic and helpful in lithologic correlation to the known Astoria formation are the numerous spherical and nodular calcareous concretions occurring throughout the clayey strata. Always in beds containing these concretions are several species of foraminifera, which appear to be Miocene types. Small poorly preserved pelecypod shell fragments and casts have been found.

The Park itself has but few poor fossil localities, bcause of the deep zone of weathering. Only in deep road cuts such as those of the new Wolf Creek Highway are good specimens found. One such locality that yielded good forams is on the Wolf Creek Highway four miles from the junction of the Roosevelt Highway. The beds strike N. 25° E. and dip 17° NW. A locality that yielded the best forams is located ¼ mile west of Jewell.

The commonest foram found in all localities is the species Nonionella miocenica, a cold water type. This foram occurs in the Monterey shales of San Luis Obispo County; California to which the Astoria Miocene is approximately equivalent. The Temblor (uppor Monterey) is considered equivalent to the Nye shales which are correlated with the Astoria Miocene. Other forams all suggest Miocene species. Characteristic are Operculina (complanata?) found at the Jewell locality, Nodosaria (spinicosta?), a vertical ribbed Miocene species, and Quinqueloculina, Spiroloculina and others (species undeterminable). With this fossil evidence and the fact that the strata compare lithologically with the upper part of the Astoria formation, especially in having sandy strata at the top and in the gentle NW. dips, it can be safely concluded the clays in and arround Saddle Mountain Park are of Upper Astoria age.

The igneous rocks of the Park are its most interesting geologic feature. The main mass of both Saddle and Humbug Mountains is basaltic breccia with palagonitic cement cut by numerous dikes of homogeneous fine-grained basalt intruded along major joints and fractures. The average breccia is composed of ½" to 5" angular basalt fragments cemented by glassy reddish-brown to black palagonitic matrix. Variation in the breccia is great. Some basalt fragments are highly glassy indicating sudden cooling, some are fine-grained, and others are vesicular with some vesicles filled with calcite weathered from the calcic feldspars of the basalt. Locally there are large accumulations of basalt similar to the dikes, but without the characteristic jointing of the dikes. Probably such masses should be regarded as part of the breccia.

Ellipsoids of basalt are common and give evidence of aqueous chilling and possibly underwater deposition. The ellipsoids are from a foot to five feet in diameter and generally exhibit good radial columnar jointing. Not necessarily should it be considered that the breccia flowed out and was chilled under a Miocene sea. Several evidences are against such a conclusion, but there must be an aqueous agency. Small pools or wet unconsolidated muds could cause this.

Further evidence of the aqueous chilling theory is the presence of palagonite. Palagonite is a colloidal hydrated variety of sideromelane , the transparent glassy variety of basaltic glass. Sideromelane is a variety of tachylite which was chilled so suddenly as to retain iron oxides in solution. The presence of the iron oxides allows it to readily weather by simple hydrothermal process to yellowish earthlike palagonite. Much of the glassy fragments of the breccia is possibly sideromelane. They are known to contain more dusty magnetite than is present in the dikes.

Very probably large masses of basaltic breccia were laid over all of the area between Saddle and Humbug Mountains. Stream erosion has cut down through the breccias to the clays, leaving the mountain as the main center of extrusion. The gravels of the streams are composed of fragments of basalt and breccia.

The dikes intruded in the breccia are the same type of rock as that intruded in the mica clay shales but differ in dimensions and somewhat in structure. Whereas the dikes of the mountain are seldom over ten feet wide, dip 50°-90°, and are limited in extent, those in the shales have low dips, are 20 to 200 feet wide and run for thousands of feet.

In one respect both are alike--in their jointing structure. They can always be recognized by the primary columnar jointing normal to the walls and gnerally secondary jointing parallel to the walls.

A thin section of the dike rock showed the following:

	% Estimated	
Augite	20%	Subhedral
Feldspars (labradorite)	45%	Highly fractured, small, lath shaped.
Magnetite (crystals)	10%	Anhedral
(dusty)	15%	
Glass	5%	
Brown Glass?	5%	With small inclusions of crystals that cooled too rapidly to materialize.

The subhedral and shattered crystals, the presence of dusty magnetite and glass are evidence of rapid cooling under high pressures.

The trend of Saddle Mountain ridge is NW.-SE. The dikes of the mountain all dip steeply and strike NE., i.e., normal to the ridge line. All dikes were found to widen at the ridge and, with the exception of one short dike beside the lookout cabin, extended down the west side (front) of the mountain. No evidence is found that the dikes extend over 3|4 of the way down the mountain. Some pinch out entirely.

What were the factors limiting dike occurrence? Three dike exposures striking northwest, almost parallel to the ridge line, were found a short way below the lowest elevation to which any dike could be traced continuously. Two of them form the bare face of the mountain for several hundred yards. The exterior breccia and clay has been removed leaving them like a layer of plaster against the cliff. They are only a foot to three feet thick and approximately "in line" and were possibly originally continuous. This might suggest two periods of intrusion; however, the dikes are so thin, with consequent chilling so fast that they could be practicall contemporaneous.

The broadening of the dikes suggests that the center of eruption was in the vicinity of the ridge, giving the key to the origin of Saddle Mountain. Saddle Mountain has formed from extrusion of breccia along a NW.-SE. fissure. During cooling of the great mass major jointing has occured normal to the fissure, along which the dikes were intruded at a later date.

In connection with this it is necessary to call attention to two interesting springs of the Park. It will be noted that most of the springs that head the rivulets which run down the gorges issue from the contacts of dikes and the breccia, and dry up soon after the rainy season. One little spring about 100 feet below the top, the highest spring on the Mountain, flows very slowly all year round. From it the lookout house is supplied with water. This spring issues from a joint along which no dike occurs. The breccia is sufficiently porous and the mass above the spring great enough to provide sufficient reservoir capacity to last the summer at the spring's rate of flow. The angular breccia fragments fit so tightly that they control the flow of this spring whereas the dikes having different texture that the adjoining rock allow a much quicker escape of water at the other springs.

The spring supplying water for the camp site at the base of the mountain has the whole mass for a reservoir. This spring flows several gallons a minute. It issues at the contact of the previous breccia and the impervious clay.

I wish to invite your attention to another phase of the Park that is interesting to visitors. In obtaining this information I am indebted to John Ifft, now an instructor in the Department of Zoology at U. C. L. A., who worked with me in this area.

The plant life is one of the noteable and unusual features of Saddle Mountain Park. The Park has two zones of flora, Transitional and Hudsonian. The abundance and variety of species is surprising and unusual for the altitude at which some occur.

Saddle Mountain is the southern limit in the Coast Range for Alaska Cypress (Chamaecyparis nootkatensis) and Noble Fir (Abies nobilis).

A rare single species occurs here, Moneses uniflora, and rare ferns, mosses and fungi. Another rare species is Lewisia columbiana (no common name). Due to the abundant rainfall such flowers as Purple iris (Iris tenax), Columbine (Aquilegia formosa), and Tiger lilies (Lilium columbianum) are found. A rare species west of the Cascades is Pink plumes (Geum triflorum). Native only to Saddle Mountain is the species Cladothamnus pyrolaeflorus (no common name). Some of the Hudsonian types include tufted sasifrage, Stellaria borealis, and Pentstemon (diffusus).

The birds of the Park are typical of the Coast Range. Altogether more than 60 species were catalogued and probably many more will be seen in other seasons. Following are some of the more common ones for those who are interested.

In a burned-over area on the west end and beyond the NE. side of the mountain are Oregon vesper sparrows, Fox sparrows, and Mountain quail. In the forests are Harris woodpeckers, Western pileated woodpeckers, various flycatchers, Red-breated nuthatch, California creeper, Seattle wren, Western winter wren, Russett-backed thrush, Vaned thrush, Golden-crowned kinglet, and Western tonager.

Mammals of the Park include Black bear, Raccoon, Weasels, Skunk, Coyote, Cougar (one cougar needs 50 miles of range to feed), Canada lynx, Bobcat, Chipmunk, Brush rabbit, Mountain beaver (no relation to the true beaver), Columbian black tail deer, and Elk (Roosevelt Wapiti). The band of elk is an interesting feature that the ambitious visitor may easily see.

In conclusion I would like to mention an item of historical interest. The old military trail (or "Tote" road as it is smetimes called) that was used about the middle of the last century between Astoria and Nehalem long before any roads were built, passes right through the picnic area and near the spring. Although nearly obliterated now it can still be traced in places through the forest in the Park.

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On November 19, 1936 at the Central Y.M.C.A., Mr. A. W. Hancock representing the Geological Society, delivered a most interesting lecture on "Fossil Flora and Fauna of Oregon" supplemented by an unnusual exhibit of fossils. We are glad that Mr. Hancock can participate on behalf of our Society, in the programs of nature being conducted by the Central Y.M.C.A. on Thursday evenings.

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Thursday evening December 17, 1936 in the Y.M.C.A Auditorium, President Phillips gave a lecture on "Successive Sedimentary and Igneous Deposits of Oregon." He referred to the submerged forest on the Columbia River at Cascade Rapids, which was caused by one of the largest landslides in the world's history. He also touched on other notable geological features of the state.

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Dr. W. Claude Adams and Mrs. Adams gave a lecture on Indian Lore Friday, December 18, 1936 in the main lobby of the Portland Chamber of Commerce before the Oregon Agate and Mineral society. Mrs Adams interpreted Indian writings and explained Indian manners and customs.

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A letter to Dr. Hodge from H. E. Rothrock, Assistant Chief, Naturalist Division, National Park Service, Washington, D. C., states:

> "The National Park Service is compiling a generalized classification of the geological features which are to be found in National and State parks. We are anxious to have the opinion of all those who are interested in such a compilation and those who are acquainted with the parks."

Dr. Hodge thinks it might be a good project for the Society to list the geological features that they deem important.

On the last 2 pages of the bulletin will be found a form on which to place your results. Mail these to Mr. Franklin Davis, 4317 N. E. Tillamook st., Portland, Oregon, Chairman of the committee appointed by President Phillips to compile the results.

CLASSIFICATION OF GEOLOGIC FEATURES IN PUBLIC RESERVATIONS

LEGEND

* OUTSTANDING EXAMPLE

O AVERAGE OR TYPICAL EXAMPLE

X REPRESENTED

	STRATIGRAPHY															PROCESSES & AGENTS									STRUCTURE				TOPOGRAPHY					
	AGE				TYPES							FOSSILS & MINERALS								EROSION OR DEPOSITION BY														
					SEDIMENTARY				IGNEOUS																									
PARK NAME	PRE-PALEOZOIC	PALEOZOIC	MESOZOIC	CENOZOIC-RECENT	SHALE	SANDSTONE	LIMESTONE	OTHER	INTRUSIVE	EXTRUSIVE	METAMORPHIC	MINERALS	PLANT FOSSILS	VERTEBRATE FOSSILS	INVERTEBRATE FOSSILS	VOLCANISM	DIASTROPHISM	HYDROTHERMAL	CHEMICAL	ICE	WIND	RUNNING WATER	GROUND WATER	OCEANS ETC.	FAULTING	FOLDING	UNCONFORMITIES	VOLCANIC	MOUNTAINS	PLAINS	CAVES	CANYONS	BEACHES RECENT	BEACHES ANCIENT
Ainsworth																																		
Battle Mt.																																		
Battle Rock																																		
Camas Mt.																																		
Cape Arage																																		
Cape Lookout																																		
Cape Sebastian																																		
Chandler Park																																		
Crown Point Loop																																		
Devils Elbow																																		
Devil's Pnch Bowl																																		
Drain Tunnel																																		
Ecola																																		
Emigrant Springs																																		
TerrenceH.Folley																																		
Ceisel																																		
HolmanPk(Wayside)																																		
Humbug Mt. Pk.																																		
Lava River Caves																																		
J.Day Fossil Bed																																		
Kellogg																																		
Long Tom																																		
Loom Lake Pk.																																		
Mayer																																		
McCord Creek																																		
Joaquin Miller																																		
Mt. Hood Loop																																		
PeterSkeneOgden																																		
Pt.OrfordCedarPk																																		
Rhododendron Pk.																																		
Rocky Creek Pk.																																		

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PARK NAME	STRATIGRAPHY															PROCESSES & AGENTS									STRUCTURE				TOPOGRAPHY					
	AGE				TYPES							FOSSILS & MINERALS								EROSION OR DEPOSITION BY														
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	PRE-PALEOZOIC	PALEOZOIC	MESOZOIC	CENOZOIC-RECENT	SHALE	SANDSTONE	LIMESTONE	OTHER	INTRUSIVE	EXTRUSIVE	METAMORPHIC	MINERALS	PLANT FOSSILS	VERTEBRATE FOSSILS	INVERTEBRATE FOSSILS	VOLCANISM	DIASTROPHISM	HYDROTHERMAL	CHEMICAL	ICE	WIND	RUNNING WATER	GROUND WATER	OCEANS ETC.	FAULTING	FOLDING	UNCONFORMITIES	VOLCANIC	MOUNTAINS	PLAINS	CAVES	CANYONS	BEACHES RECENT	BEACHES ANCIENT
Saddle Mt.																																		
Shelton																																		
Sheridan Pk.																																		
Short Sand Beach																																		
Silver Creek																																		
Starvation Falls																																		
Guy W. Talbot																																		
Tide Ways																																		
Tongue Point																																		
Uinto (Wayside)																																		
Ukiah																																		
Umpqua Lighthouse																																		
Viento																																		
Wallowa River																																		
Woahink Lake																																		
Wygant																																		
Harris Beach																																		
Glenada																																		
Sea Lions Caves																																		
Yachata																																		
South Bay																																		
Otter Crest																																		
Rocky Creek																																		
Boiler Bay																																		
Three Arch																																		
Huntley																																		
Prescott Mem.																																		
New Port Project																																		
Benson																																		
Crater Lake																																		
Oregon Caves																																		

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FOR VOLUME II

(Prepared by Ray C. Treasher)

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY