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(Ray C. Treasher)

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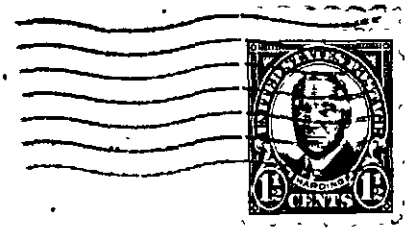

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THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol. 3 - No. 1 Portland, Oregon January 10, 1937

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Portland, Oregon.

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LECTURES

Jan. 8, 1937 (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, 1937(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

Jan. 17, 1937(Sunday)-Northeast of Vancouver. Party will visit a new leaf fossil locality on the south fork of the Lewis River and other points of interest.

Details of the trip will be announced at the lecture meeting of January 8th.

LIMERICK CONTEST

HEAR YE! YOU WORD TWISTERS, RHYME WRIGGLERS, AND LIMERICK MAKERS. HEAR YE! A CONTEST IS ANNOUNCED FOR THE BEST LIMERICKS FROM THE G-MEN. GET PENCILS AND PAPER AND BEGIN. YOU HAVE UNTIL FEBRUARY 26, 1937, THE DATE OF THE ANNUAL BANQUET, AT WHICH TIME YE SHALL BE GIVEN AN OPPORTUNITY TO RECITE OR SING YOUR TALENTS. MOST HONORABLE PRIZES SHALL BE AWARDED.

IN PURSUIT OF TALENT

WE, THE ENTERTAINMENT COMMITTEE FOR THE ANNUAL BANQUET, ARE DESPERATELY IN NEED OF INFORMATION. COME, GOOD FELLOWS TO THE RESCUE! DO YOU KNOW OF A G-MAN OR G-WOMAN WHO SINGS OR PLAYS AN INSTRUMENT, OR IS PERHAPS A BIT DRAMATIC? PLEASE, JUST WHISPER TO MR. KENNETH PHILLIPS, DR. JONES, OR MRS. POPPLETON THE TALENTED ONE'S NAME: IT WOULDN'T EXACTLY BE SQUEALING. JUST THINK WHAT AN OPPORTUNITY YOU WOULD BE PROVIDING THEM TO EXPRESS THEIR TALENTS! WHAT'S BETTER FUN THAN SEEING ONE OF YOUR FELLOW MEN PERFORM FOR YOUR DELIGHT AND ENTERTAINMENT, AND WHAT IS BETTER FUN THAN PERFORMING? COME FORTH YE TALENTED ONES AND OFFER UP YOURSELVES!

We had a good turn out at the Thursday Noon Luncheon, December 31st. Dr. Hodge announced he had some rock specimens which were secured in southern Oregon, and at future meetings he would bring others, which we may add to our collections.

Come out to the luncheons. Get acquainted with the group and secure some of these rock specimens for your collection.

Place. . . . . HILAIRES' RESTURAUNT,
622 S. W. WASHINGTON STREET.

Time . . . . . EVERY THURSDAY NOON.

S A U V I E I S L A N D: Nomenclature

A question was raised in this bulletin (Vol. 2, No. 23) concerning the spelling of Sauvie (Sauvies) Island. Any doubt should be dispelled by the following quotation from the sixth Report of the United States Geographic Board, 1932:

"SAUVIE: island, Columbia River, Columbia and Multnomah Counties, Oreg. (Not Sauvie's)"

This report of 834 pages summarizes all decisions by the Board on geographic names, domestic, colonial, and foreign, from 1890 to 1932. It is believed to be still available from the Superintendent of Documents, Washington, D. C., for 80 cents. Members of the Society will find it to be a valuable addition to their libraries.

K.N.P.

OREGON COUNTRY GEOLOGY

PLACERS OF THE UPPER APPLEGATE, JACKSON CO.

Ray C. Treasher and Robert Layfield

The field parties of the U. S. Engineers under the direction of Dr. Edwin T. Hodge, have been in southern Oregon for several weeks. This region has always been the scene of considerable mining activity, especially placer mining.

One is almost unable to find a stream which has not been placered to some extent, with varying results. Many streams have been worked and reworked, as Jackson Creek, near Jacksonville, which has been reworked 4 times and still yields days wages to some miners.

Jacksonville used to be the county seat of Jackson County, until the railroad left it off the main route and Medford received the county government. The old court house is used as a grange hall. The jail still stands with its imposing barred windows. An old church has a sign which states that it is "the oldest Protestant Church west of the Rockies." Many homes have shafts in their back yards and the street is constantly falling into old tunnels and drifts. The creek is lined with the wreckage of sluice boxes and early diggings.

Chinese labor played an important part in the early history. Chinese working for the white man, or for themselves. There are workings, on the Little Applegate River which were torn up by the Chinese working for "Gin Lin". Lin paid his men with gin and a small amount of cash, than ran a gambling house and got most of the money back, a rather nice set-up. He caused a flume to be built which is still known as the Gin Lin Ditch. He is reported to have returned to China in a few years with a "roll" of several million.

Sterling Creek is one of the famous old placer localities. An old channel lies just to the south of the present creek, and it contains 20' to 30' of gravel which is gold bearing. The headwaters of Sterling Creek are reported to tap and cut one of the old Pliocene high channels. These old channels were formed before the present elevation of the country and probably correlate with the Auriferous Gravels, some rich, high channel, placers of California. (see Bibliography of Oregon Geology, Auriferous Gravels) This high channel is reported to lie in a NW-SE direction, high on the range to the east of Sterling Creek, and probably a goodly proportion of the placer gold in Sterling Creek come from this high channel. The surrounding area is well gopher-holed with prospects on quartz leads, of the "pocket" type, but a source of considerable placer gold. The gravel contains several clay seams and good values are frequently found just above these clay beds.

Water has always been a serious problem in placering this area. Early operators figured the deposit rich enough to construct a ditch 30 miles long to bring water from the Little Applegate River to the placer sites. The ditch was built by Chinese labor, under a water right extending back to the 1870's, and is still in operation. It has to be seen to be appreciated, as it swings deeply into the gulches and tunnels though the point of sharp ridges. It is flumed in solid rock which probably accounts for its permanence. Its cost is estimated to have been $75,000., when constructed.

The property of the old Sterling Placer Mine has recently been sold and is now being operated under new management and style. The new operators realized that lack of water was a serious handicap and devised a method of recovery, using less water. Instead of a complicated series of flumes, riffles, and amalgamation plates, they have a simple rotating concentrator which is quite unique.

The principle is that of a man swinging a bucket of water. If swung fast enough, centrifugal force overcomes gravity on the upward swing and does not fall out. There is a critical speed at which centrifugal force will just balance the pull of gravity, and if a speed just below this is chosen, the water would almost fall out of the bucket, but not quite. In other words, the water would "loosen up" on the upward swing.

The concentrator is a sort of barrel-like device, looking like a ball mill, or like two cones of the same base diameter and differen altitudes, placed base to base. The machine is mounted on a horizontal axis and is rotated just a hair under the critical speed. As the material is fed into it, the heavier sands and gold are hurled farthest by centrifugal force and build a "bed" of concentrate at the "belly" of the concentrator. If rotated too rapidly, this bed would pack and not permit fine, heavy particles to penetrate to the periphery.

If however, the speed is just under the critical speed, at the peak of the rotation, the bed tends to drop slightly, just enough to loosen it and thus keep it "open". The gold, even to fine particles, is whirled to the periphery where it accumulates. Just a small amount of water is needed to cause the material to feed easily.

The less heavy material works through the horizontal axial direction and discharges. When a clean up is desired, the feed is cut off. The speed of rotation is decreased slightly, and the bed diminishes in size. The bed is finally flushed out and fed into a smaller model of the bigger machine and the process repeated. As the amount of concentrate is decreased, it is flushed out into a tiny machine just a few inches in diameter and here the final concentration is made. It is reported that the railing loss is very low, much lower than from ordinary placer operation.

The gold of the Applegate country is frequently hard to recover because the nuggets and flakes are coated with manganese dioxide, what the miners call black gold. The coating prevents the gold from being recovered by amalgamation and a large amount of placer gold has never been recovered for this reason. Lengthy experiments have been conducted to find some way of removing this film, without marked success. No dear people, there is no stock for sale in this new company.

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CONTRACTORS FIND UNDERWATER HOLE

The Dalles, December 4, -(AP) - An underwater cavern in the basalt bluff on the Columbia river west of this city presented an unexpected problem to contractors for the $18,000 Port of The Dalles oil dock, Thursday.

It was expected divers would explore the cavern before work is started.

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THE GEOLOGICAL NEWS LETTER

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Feb. 12, 1937(Friday)-8:00 P.M. Dr. David B. Charleton will address the members of the Society on "Mineral Waters of Oregon and Elsewhere, Their Properties and Uses." Dr. Charleton has his Doctor's Degree in Chemistry and Bacteriology. He was formerly on the faculty of Oregon State College. He owns and operates the Charleton Laboratories, Portland, Oregon. This will be a most instructive lecture, by a very pleasing speaker.

ANNUAL MEETING

Feb. 26, 1937(Friday)-6:15 P.M. CONGRESS HOTEL DINING ROOM. ANNUAL MEETING OF THE GEOLOGICAL SOCIETY. Dinner, fun, stunts, entertainment, new officers, special speakers. If you miss it, you will miss it - and regret it. Make your reservations early.

SEE LAST PAGE OF THIS BULLETIN FOR FURTHER DETAILS.
DON'T FORGET THE DATE!

GEOLOGY OF SUPLEE AREA
By James Kelly

INTRODUCTION

The Suplee Paleozoic area occurs as a window in the Tertiary lavas near the headwaters of the Crooked River, south of Suplee, Crook County, Oregon. The tributaries of this stream, Grindstone and Twelve Mile Creeks, head in the area and cut directly across it. The area covers approximately sixty square miles, being about twelve miles long and five miles wide at the widest part and elongated in a general north and south direction. It is included in T. 17-18-19 S. and R. 24-25 E. The topography lying north of a line from Wade Butte to Iron Mountain is included in an advance sheet of the Dayville Quadrangle.

The paleontology of the Suplee area has been studied and shows that the organisms are related to European and Asiatic faunas and that they lived in an arm of the sea which extended from what is now W. Europe through N. Europe and Asia, and Alaska, southward into California.

Brachiopods are abundantly represented in the fauna and included also are Foraminifera, Anthrozoa, Crinoidea, Molluscoidea, and Mollusca.

In general, the topography of the Paleozoic area is in the late mature stage. The slopes are gently rounded except when a more resistant stratum outcrops and preserves the ruggedness of youth. The limestone hills have a gently rolling subdued expression which is enhanced by the general absence of sagebrush or juniper, and the presence of a short grass, gives the hills a soft, velvety appearance. The hills composed of mechanical sediments present a more rugged appearance due to the occasional angular outcrops which protrude through the surface. The relief is decidedly misleading since the hills are higher and steeper than they appear. The late Tertiary lavas of a basaltic and rhyolitic nature, form an escarpment of semicircular outline around the area, giving a marked topographic unconformity with the paleozoic. The higher portions of the area are always composed of limestone or chert, the valleys being carved in the mechanical sediments. This condition is apparently the direct result of the type of climate, which is typically continental. The lack of moisture results in a retardation in the disintegration and decomposition of a homogenous and soluble material such as the limestones, and the extremes in temperature both seasonal and daily hasten the breakdown of the non-homogenous mechanical sediments composed of materials having a different coefficient of expansion while not appreciably affecting the homogenous limestone. Sagebrush does not thrive on the soils derived from the limestones. This may be due to the fact that the soil mantle on the limestone is thin, since the process of creep, greatly accelerated by the extremes in temperature, carries most of the soil into the valleys. However, the sagebrush grows abundantly in the valleys and on the soils derived from the mechanical sediments. Thus, contacts between limestone and mechanical sediments can be approximated by the abundance of sagebrush. According to Fenneman of the Physiographic division of the U. S. the region is included in the Harney section of the Columbia Plateau -- which he describes as a young lava plateau, having features of recent volcanism with ineffective drainage. As previously mentioned the paleozoic occurs as a window in these lavas. At the time these lavas were poured out over the area, they either abbutted directly against the sides of the Paleozoic land mass or covered it over entirely.

DAINAGE

The master streams of the area are the two E. W. streams, Twelve Mile Creek and Grindstone Creek, separating the S. part of the area from the central part and the two N. W. - S. E. trending streams, White Butte Creek or the S. fork of Trout Creek, and the N. fork of Trout Creek, separating the N. section from the central section.

These master streams cut dirctly across the strike of the strata, and have cut canyons in the Tertiary rim. Intermittent streams, the direction of which is governed by the strike of the strata are found between these master streams forming a trellis drainage pattern. The master streams cut entirely across the anticline and head in the E. margin of the area.

The problem of these E. W. trending streams may be resolved into five possibilities:

1. Superinposition by Tertiary lavas.

   a. Evidence of lava covering area is essential for this conclusion. (only two found, and they are at lower elevation.)

2. Superimposed by Mesozoic strata.

   a. Mesozoic found on both sides, but pre-tertiary formations had been deformed and eroded before the advent of tertiary lavas because a well-defined non-conformity exists between them.

3. Consequent drainage.

   a. The drainage pattern does not show evidence of this because:
      1. The center of the anticline would be eroded.
      2. And erosion continued would result in stream capture.

4. Superimposed by faulting.

5. Superimposed by jointing.

Valley of White Butte Creek shows evidence of faulting by faceted and aligned spurs and the valley cuts across the strike of the strata, further evidence of this is shown by displacement of an outcrop of chert. The N. fork of Trout Creek shows the same physiographic evidence but no structural evidence has been noted.

Both streams follow the major jointing pattern.

STRUCTURE

The first reference to the structure of the Suplee Paleozoic was by Dr. E. L. Packard in which he says, "the most extensive section now known is obtainable across a well defined Paleozoic anticline trending S. W. from near Suplee". Additional field work substantiates this earlier observation since the Paleozoic is seen to occur as an elongated anticline approximately ten miles in length, and with a maximum expcsure of six miles in width. The whole structure has been eroded and the only structural evidence of the anticline remaining is the opposing dips. The structure is covered on the S. and

W. by Tertiary lavas and on the N. by Triassic and Tertiary. In the central part of the area both limbs of the anticline are exposed where as in the N. section, the exposures are predominantly of the Eastern limb, only a narrow strip of the W. flank remaining uncovered by the lavas. Exposures of the E. limb are also predominant in the S. section.

STRATIGRAPHY

The rocks of the area include four main types: Limestone 38%; Mechanical sediments 50%; Chert 10%; Igneous 2%. The limestones and mechanical sediments occur as interbedded lenzes, the transition from limestone to grit or conglomerate, taking place laterally as well as vertically in the section. The cherts occur associated mainly with the limestone. Although they are not strictly confined to them.

The mechanical sediments may be divided into three types:

1. Conglomerate composed of rounded constituents.

2. Conglomerate composed of angular particles.

3. Coarse ss. or grit composed of a high per cent of subangular particles.

The Igneous rocks occur as dikes and are, therefore, post-Paleozoic.

ECONOMIC GEOLOGY

Limestone The limestone is of potential importance in the manufacture of cement and fertilizer. The Cherts would render some bodies unfit for commercial use, but pure bodies of limestone are present which could be easily removed by the use of steam shovel.

The cost of transportation would be too high under the present conditions. If transportation improves these deposits will no doubt be developed.

Petroleum Anticlinal structures are one criterion for petroleum, but structure alone is not all that is necessary. The top of the anticline is worn away and the individual beds are truncated. The strata has been subjected to stress which has formed an intricate network or joints allowing the petroleum to escape.

Operations for production of petroleum will be purely speculative, since field evidence points to two conditions. Either no petroleum was ever present or the petroleum has leaked out and the evidence destroyed by the agent of erosion.

SUMMARY

The Paleozoic series occurs as a window in the Tertiary lavas forming on the north, west, and south sides of a semicircular escarpment about the mature Paleozoic hills. On the eastern side the Mesozoic abutts against the Paleozoic, the contact being marked by a well defined escarpment composed of Paleozoic cherts.

The area is subdivided into three sub-sections, the divisions being made according to the type of topography. The topography is found to be directly

dependent upon and resulting from the structure and lithology of each particular sub-section.

The drainage system consists of four master streams which cut directly across the strike of the strata, and subsequent streams eroding at right angles to the master streams in the less resistant strataform a trellis drainage pattern.

The direction of the master streams is the result of system of joints and their relation to the drainage slope. The structure of the series is anticlinal, the axis of which shows evidence of deformation due to longitudinal thrusting from the north and south, the axis of warping are so spaced that they divide the anticline into three approximately equal sectors, so that the crest of the anticline forms a symmetrical reverse curve. The Paleozoic series is apparently structurally conformable with the overlying Mesozoic formations but a hiatus must occur between the two.

The jointing is very complex; however, the more prominent joints appear to have a direct relationship to the deformation of the area.

Faulting is not extensive, and conclusive evidence for anything but very minor movements has yet to be found, although There is some evidence that major movements have taken place.

The area is composed of limestones, mechanical sediments, and cherts with post-Paleozoic intrusives. The limestones are thought to be due to the reefs and to detrital material derived from the reefs being interbedded with the mechanical sediments derived from the land.

The sandstones and grits are composed mainly of cherts, but due to their occurrence as interbeds with limestone and lack of Paleozoic limestone fragments incorporated within them, points to the conclusion that they must be considered as part of the Paleozoic series. They are composed mainly of angular or sub-angular fragments and apparently were deposited as deltas on the pre-Mississippian land mass. The conglomerates usually contain flattened boulders which are thought to have become flattened by backward and forward movement on the beach.

The cherts are vari-colored and the occurence and field relationships indicate that a small percentage were formed by replacement, some may have been due to the accumulation of organisms, while the majority apparently are the result of chemical percipitation.

Igneous bodies of post-Paleozoic age have been intruded as dikes into the Paleozoic sediments in various places on the eastern flank usually near the Paleozoic-Mesozoic contact. These rocks have been classified as andesite porphyrics.

At the present time the region is of very little importance economically since the petroleum possibilities are very meager and the limestones are too far from market. However, improvements in the transportation facilities may cause the limestones to become of economic importance.

The sediments were deposited in a seaway which extended from Northern California through Oregon to southwestern Alaska, as an arm of a sea which

covered what is now western Europe and northern Asia. The condition of a rising land mass and a sinking sea bottom caused great accumulation of coarse mechanical sediments. Reefs growing off shore contributed detrital material, which together with the calcium carbonate precipitated by local concentration near the reefs, formed beds of calcareous material which interfingered with the mechanical sediments.

As the land mass approached peneplanation silica transported to the sea by the rivers was deposited and became chert beds. The sediments were then uplifted and deformed. Tertiary lavas poured out and surrounded this uplifted mass, but did not cover it entirely thus producing a marked topographic deformity.

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THE GEOLOGICAL FIELD EXCURSION OF 1935 OF THE OREGON STATE COLLEGE DEPARTMENT OF GEOLOGY

By Franklin L. Davis

(During the summer of 1935, the Oregon State College Department of Geology conducted an excursion through central Oregon at the conclusion of the summer field work for the students in the Suplee district from July 9, to July 13. This article is written by Mr. Davis from the notes made at the time. EDITOR.)

There is no doubt that the description of the Geological Tour, or field trip, with the Department of Geology of Oregon State College should be meticulously scientific, the humanities cast aside, the romance and mental exhilaration forgotten, and the tour described in the vernacular of the geologist, sticking closely to cold facts as he interprets them.

If you, dear reader, are expecting such an article, now is the time for you to stop, for the spell of this most wonderful trip is still upon me and this story will be a feeble attempt to put into words much that is beyond my creative powers to describe, not only the geology, but all the other interesting incidents and items of the trip. Both Wade and myself are looking forward with much anticipation to another trip to the land of picture geology par excellence.

The field trip followed a month's intensive field work by the summer camp of the Geology Department of Oregon State College in the Suplee District of the Dayville Quadrangle, U. S. G. S., the sheet for which can now be obtained. There were eight students in the summer course under the suppervision of Dr. Don Wilkinson and his assistant, Richard Bogue.

The log of the field trip covered approximately 450 miles, which, together with our log from and back to Portland, made a total of 900 miles for the entire trip. The log as prepared was very exact as to mileage and the location descriptions were excellent, making it a valuable document for future reference, and for that reason is made a part of this journal as Exhibit I. The route outlined was closely followed in the main, with the exception of the detour via Stauffer Postoffice instead of through Suntex. All told there were

twenty-nine people on the trip, Corvallis, Eugene, Chilcquin and Portland furnishing the various contingents. Thoes attending from Portland in addition to the writer were Dr. Edwin E. Osgood of the University of the Oregon Medical School, Mrs. Osgood and Tracy Wade in whose car I made the trip.

The writer made a fairly quick trip into the field camp on Monday, July 8, leaving Portland at 2:30 P.M. and arriving at the field camp, seven miles northeast of Suplee at 11:00 P.M., covering 275 miles in 8½ hours. The last hour of the journey was spent in escorting into camp another car which we picked up at Suplee with no lights. They repaid our courtesy by directing us to the camp location so the deal was "Even-Stephen". High lights on the drive in were varied and interesting. Wade drove his car like a veteran and the wheels never stopped rolling until we reached Madras, a distance of 150 miles from Portland, which distance we made in exactly three hours. Here we "gassed up" at Mr. L. H. Irving's service station and inspected his fine collection of John Day fossils, agatized wood, obsidian, carnelian, and many other specimens which were displayed in his station. Immediately outside his station he has placed a huge petrified stump. Mr. Irving, being a collecter himself, is acquainted with most of the Portland collectors and is very courteous and helpful to those seeking road or location information.

Wade in his many years of service with the telephone company spent much time in this territory, not only on duty, but with the rod and fly, so had a splendid driving knowledge. No matter how often one drives over the Wapinitia cut-off, it is always of interest to note the gradual increase of pine trees as the summit is crossed going eastward until the firs entirely disappear, and then finally the pine trees themselves fade out of the picture as the desert steps out in the road to meet you--the land of rattlesnakes, wood ticks, sage brush, and jack rabbits. Vultures float in lazy fashion overhead scanning the horizon for jack rabbit collisions on the highway. As we near Maupin, we passed an Indian driving a team of cayuses at a snail's pace and with the inevitable dog of nondescript breed following the rickety wagon. Characteristic of the region, which is practically devoid of a soil over the lavas, are the fence posts held in place by rocks piled around them. Also the local telephone lines are thus geologically supported. As we proceeded southward, Wade called my attention to the two-million-dollar phone line running as far south as Klamath Falls, which is one of the most modern lines in the country, the poles being creosoted for their entire length, instead of the subsurface portion only. This constitutes what might be called a million-dollar experiment and the telephone industry throughout the country is observing it with interest as the years roll by.

The weather was ideal, warm to be sure with a shimmering blue sky overhead in which scarcely a cloud was floating, as we dipped down into the Deschutes Canyon at Maupin and out again on to the horizontally bedded Madras formations superimposed on the sloping Columbia lavas. There is a combination of heights and depths at Madras which makes it one of the most interesting spots on the Dalles-California Highway, both for the scenic values and the grand scale of the exposures. A half hour out of Madras we passed over Criterion Summit at an elevation of 3359 feet with the Mutton Mountains making a striking panorama a short distance to the west. I will have more to say of these Mutton Mountains later. Shortly after five, we entered the long grade of Cow Canyon with its sharp curves and precipitous flanks. It seems steeper but the engineers tell us the gradient does not exceed five per cent. It is a picturesque part of the road. Within the deep gash, long

shadows fall and it seems late in the day, although only five o'clock. At the lower end of the canyon, colored exposures are seen which are the tuffs of the Clarno.

At Madras we made the mistake of taking the two legs of the triangle instead of the hypotenuse to Prineville and thus lost 19 miles. We should have left the Dalles-California Highway at Madras, whereas we held it to Redmond. This constituted the only lost road time of the entire trip, which is a good record for the distance driven in central Oregon.

There are many beautiful sights in Oregon which once seen are never to be forgotten. Such a sight is the approach to Prineville from the west. Winding down off the dry rim as we did in the mellow glow of the early twilight, the town suddenly lay before us, almost enclosed within the rim, and beautifully green. The town shows what water will do in eastern Oregon.

A short time before entering Redmond we crossed the Crooked River Canyon on the Peter Skene Bridge, which was my first trip across. Although we were trying to avoid all loss of time in our endeavor to reach camp as soon as possible, the spectacular gorge and the daring features in the bridge design stopped all progress until we had taken in to the full the combined masterpiece of nature and man.

The road from Redmond to Prineville is through the level land of the upper reaches of Crooked River, running though irrigated land for the most part, where the potato seems to be one of the chief crops. The demands for irrigation on the stream seems to be such that Wade was led to remark that the farther up the stream we went, the bigger it seemed to get.

Our joint entry into Prineville was the first visit for the two of us. It was of more than ordinary interest to Wade due to the fact that his mother was born in the town 65 years ago.

From Prineville on we had a fairly good dirt road, but rather tortuous. It is a road filled with interesting vistas, which some day we promised ourselves we would drive over again more leisurely. At Paulina, where we arrived at 9:15 P.M., we stopped for a last chance at gasoline and road information. The proprietor, Mr. A. L. Miller, gave us permission to eat our lunch on the platform in front of his store and at the same time gave us the latest news of the camp we were heading for. Dr. Packard had gone in the same day and left word with Mr. Miller to keep a lookout for Portland cars coming in to join the party and warn them to fill up their gas tanks. Mr. Miller has run the only business at this location for twenty years and in reply to our question as to how business was, stated that his competition was not so keen; the nearest competitor to the west was 32 miles back at Post; southeasterly, his nearest competitor at Burns, 117 miles away; northerly, his nearest competitor was at Mitchell, about 65 miles distant, so all in all he is pretty much of a local institution. While he is not a mineral collector, we rather jealously noted the magnificent piece of Jurassic marine sediment filled with magnificent specimens of clams and performing the humble duty of a door stop. It would really grace any collection of the period. By a combination of good luck and good sense in following Mr. Miller's instructions, we arrived at the camp at 11:00 P.M. Dr. Packard had pitched his tent near the entrance to the camp ground on the roadside and advised Dr. Wilkinson, who was in charge of the field party, that he need not worry about anyone coming into the camp in the night, and that he, Dr. Packard, would get up and get them located, however,

our car and the blind one which trailed us in from Suplee roared past his tent without disturbing his slumber. By dint of running the motors at a high pitch and other artful devices, we succeeded in getting Dr. Wilkinson out of his sleeping bag and got his emphatic and not overly pious greeting in the best of eastern Oregon style; it comes quite natural to Dr. Wilkinson to fall into the vernacular since he is a native of Wasco County, and it must have stood him in good stead many times in handling the string of young bucks under his command. However, he and a sufficient number of the aforesaid young gentlemen rolled out and assisted us to find proper ground and in pitching tent, digging hip-holes, and otherwise making us comfortable and at home. And so off to deep sleep in the pine forest, not to the accompaniment of the noise of flat-wheeled street-cars, squeaking automobile brakes and other city noises, but to the old familar yip-yipping of the coyotes and the sighing of the wind through the tops of the tall pines which was indeed a pleasant requiem at the end of a long, hard day. As we dropped off to sleep, Wade remarked that he had spent the first week of his vacation at one beach and he was now camped on another ocean shore, a shore extending far back into the Carboniferous period, which makes a mere youngster out of the present Miocene shore line.

Tuesday moring came quickly and all was bustle in the camp getting off to the last day's work in the field before the start of the trip. Wade and I were privileged to join the group at work for the day. It was my privilege to ride with Dr. Packard that day, who talked freely as he drove along concerning the district within which they were working. He stated that the Suplee district of the Dayville Quadrangle is one of the finest geological columns in Oregon, if not in the entire country. It is the very best exposure of the Jurassic Period in the entire North American continent and the finest cretaceous in the United States. The horizons are beautifully illustrated by the profusion of fossils found, both marine and land types, some of which are found in no other locality.

As we drove along, Dr. Packard explained how this district happened to be called to their attention back in 1926. At that time Claire Holdredge was a graduate assistant at the school and upon the recommendation of Dr. Packard, accepted a commission during the summer to report upon an oil or gas well being wild-catted in that district. While engaged in this work, he discovered the region was rich in fossils and took back an apple box filled with choice specimens to the college. Every year since that time the department has had a summer camp in the district, and in cooperation with the U.S.G.S. is rapidly working out the topography and geology of the district. Quite a bit of mapping was completed this summer by the students, as well as tracing out of the horizons and collecting fossils for use in identifying the formations. Much important work has been done in the area. Dr. Packard advised us that three master degrees and two doctor's thesis have been prepared on this area. Dr. Ralph L. Lupher of Washington State College, Pullman, Washington, and former student of Dr. Packard's, will publish an article on the region this year. He wrote his master's thesis on the area while at Eugene, and later, while taking his doctorate at California Institute of Technology, wrote his doctor's thesis on the same locality.

There is a large anticlinal fold running northeast and southwest along the crest of the anticline. There has been considerable faulting and folding in the district and, in fact, the anticline has been eroded or planed off so that it has taken considerable time to work out the geology. The lower 600 feet of the Jurassic here exposed is called the Mowitch Formation and is exposed near the camp and also several miles away, where the last day's field

work was done. A splendid specimen of slickenside was here obtained from the Mowitch, illustrating the characteristic surface produced by faulting.

Dr. Packard's principal objective for the day was the collection of specimens at present found nowhere else in the world except in this locality. It belongs to the clam family and the species is named Plicatta stylus gregarius and the genus is named plattatus stylida. It is found in the Mowitch formation along with much other marine material. The unraveling of the mystery of this clam and its structure forms an exceedingly interesting story in itself. As it was told by Dr. Packard to the assembled group on location, where a ledge outcropped filled with the specimens, it had a particular thrill and held the group so well that the faint hallooing of Dr. and Mrs. Osgood of Portland, who joined the group at this spot, was unintentionally neglected until it was realized that it was Dr. Packard and not cattle that was being paged. But to go on with the story; when this location was first discovered and the specimens examined, there was nothing in Zittell nor elsewhere for the paleontologist to hang it on. It might have been a brachiopd, a clam, coral or barnacle. Theories had to be worked out to a blind end and discarded and a fresh start made. Finally in 1929, they published a paper identifying it as a clam called rudistid, but further study convinced them that they were premature in the conclusions reached and the specimen is now honored with a name peculiar unto itself, viz,-Plicatta stylus gregarius. The adopted theory is that one foot extended, permitting the clam to rise up farther from the surface of the rock to which it attached itself. As the clam grew farther from the rock, it left a calcareous structure below in the shape of a shell, the body space always being carried upward. The corrugated muscle of the clam, by which it was attached to the calcareous stock, left a corrugated calcareous form also as it advanced up the stem. Some of the stocks have been found 15 inches long. A few years ago, Dr. Packard and his assistants collected a number of the fossils and prepared a reproduction of the fauna in its habitat and this eventually found its way into the British Museum. On this trip, Dr. Packard wished to obtain sufficient specimens of good quality to prepare another museum assemblage simulating the mode of its occurrence. He was particularly interested in obtaining a specimen of the lips; so far he has found only two or three good specimens of that portion. We found some interesting examples and gave the doctor his choice, retaining his discards for ourselves. He certainly had everyone loaded on that hot day coming down off that hot hill and appeared to be very happy over his material. He was particularly anxious that the "in stu" material in the exposed reef shown in the attached picture be not hacked and carried away over and above one or two good specimens he required from it. There were many good specimens lying around that had weathered out and could be picked up. Thus, as he explained it, there would be something left for the next chap that came along. The warning against the useless hacking away of rare specimens certainly characterizes Dr. Packard as having the true scientific spirit and makes a worthwhile example for all of us to follow. At this location were also to be found many other examples of Jurassic fauna such as a small fluted shell called rincinella, an early form of the pecten, the oyster, a straight form of the snail called the nerennia, an extinct cephalopod called Belemnite, which has as its closest living relative the octopus and squid, the clam and an early form of the pecten, all of which were added to my collection. There were also present ammonites, gastropods, echinoids and other marine forms, all of which are excellent index fossils of these formations. Lunch, back at the parking point of the cars, was rather embarrassing due to the neglect of the water bottle and the necessity to bum water in the desert. To add to the discomfiture, the geological pick of the writer was lost on the way to the car and required

an intensive search to find it back up on the trail.

After lunch the party returned to the neighborhood of the camp, which was of the same formation as that in which the morning was spent, being the other eroded portion of the anticline. Here were found practically the same specimens as at the morning location, including some plicatta stylus gregarius, although not so plentiful. There were at one time so many ammonites scattered around at this location that the place received the name of ammonite hill. When first discovered, ammonites as large as automobile steering wheels, according to Dr. Packard, were picked up at this location, but they are difficult to find now.

An interesting stop was made during the morning at the ranch of Mr. Wieberg, who was an old classmate of Wade's at Oregon State. After atwenty year interval, they recognized each other on the instant. "Hello, you old son of a gun," says Tracy. "Well, you damned old reprobrate, what are you doing away up here," says Wieberg, and thus the amenities of the occasion were fulfilled. This man Wieberg is a sort of he-man, according to rumor in those parts. It is said that he has about 10,000 acres of fair land and money in the till. He also appears to be a very eligible bachelor. Of course, when you learn that in that country it takes 10 acres to pasture one sheep, 10,000 acres isn't such a big ranch after all. Near the house are hot springs serving two bath tubs all covered with a board shack. The water is just hot enough that you can stand it and there I took my first bath in a mineral hot springs.

Wade came into camp that night with an icthyosaur vertebra from the Jurassic. Dr. Packard says that skeletons 30 feet long are found in eight different localities in addition to some other unidentified reptiles.

Tuesday's close brought the work of the annual student's field camp to an end and we were all ordered to bed early that night in preparation for an early start on the following day on the Geological Field Tour through central Oregon, the log of which as prepared by the Geology Department of Oregon State College is appended to the end of this article.

Wednesday morning we broke camp at 5:00 and were on the road by 7:00, with all signs indicating we were in for a very hot day. Our plans for the day contemplated a drive from the Columbia Drainage area over a plateau of approximately 4800 feet into the Harney Basin of inland drainage. We drove back along the road towards Paulina on the same road by which we entered the district, the historic old stage road from Prineville to Canyon City, leaving it at the road branching to the south, 17 miles from camp. The road to the south followed up Grindstone Creek as shown distinctly in the Dayville Quadrangle sheet where the road is marked in red. This is an old military road and Dr. Packard pointed out that Dr. Condon camped a night at this intersection with the soldiers during his first trip to south central Oregon in 1862.

Our attention was called to Snow Mountain, which is seen in the southeast. It has a good weather road to its summit, and elevation of 7200 feet. From its top on a clear day, say just after an atmosphere clearing rain, it is said that one can see Steens Mountain to the east, the Cascades in the west and Mt. Shasta to the southwest. Question: Is this the highest point in Oregon to which one may drive a car? Dr. Packard, with whom I had the good fortune to ride on this and the the following day, indicated that we were driving over the Shaw formation containing many fossil vertebrates. Grindstone Creek, as well as Twelve

Mile Creek, are important tributaries of Crooked River.

Street's Ranch, which we reached in the middle of the morning, is remembered as a pleasant oasis set in the midst of a semi-desert. The general locale near this location was flat and represented the bed of a Pleistocene lake long since dried up, however, the moist spell which eastern Oregon experienced early in the present century caused the long grass to thrive in such surroundings as this and the large number of deserted cabins spotted on the old lake bed bore mute testimony to the tragedies of human existence which occurred there. It is said that they even came into the district carrying their possessions on wheelbarrows, so anxious were they to arrive. The story is well told in Davis' Honey in the Horn, which vividly describes such treks.

Shortly before noon we arrived at the Bend-Burns Highway and crossed it, stopping a short distance after crossing it to eat our lunch in the broiling hot, bald-headed desert, and to take a half-mile walk over to inspect Glassy Buttes at close range and possibly find some interesting obsidian. We had made our first find of this material just as we reached the Bend-Burns Highway and there was considerable enthusiasm and cut fingers as we found our first obsidian, much of it of a deep brown color, however, the walk to Glassy Buttes yielded nothing of particular interest. All we could make out was a typical lava and if there was obsidian around, we didn't see it.

Upon our return to the cars we found a native in discourse with the field students. He was asking their opinion of the cause of the formation of the so-called "thunder eggs" found twenty miles northeast of Madras. When he learned that the group was headed south, he suggested that we go by his home at Stauffer, where he could show us much minerological material of interest. Some of us persuaded Don to take the two legs of the triangle instead of the hypotenuse and go by this Mr. Forbes' place in Stauffer. Names on the map of eastern Oregon are like mirages--rather misleading. Mr. Forbes occupied the sole and only house in Stauffer and was postmaster and everything else combined. His principal occupation was that of mineral collector and his outlet was mainly in the East. His own name for the place was Poverty Flats and the place certainly did not belie the name. The pictures taken are proof of this. By means of certain sundry parts of an old Ford car, he had rigged up a lapidary shop in which he made good sections and turned and polished them very nicely as well as producing "Indian" arrows in great profusion and size, using obsidian as material. He had a large number of specimens of iridescent obsidian, which he disposed of for a consideration and a number of the party added to their collection in this way. The encounter with Mr. Forbes and his shop in the middle of the desert was rather unexpected and correspondingly thrilling to most of the amateurs in the group. The twenty-five mile drive that afternoon over what practically amounted to no road until we intersected the Suntex-Wagontire Postoffice road was one of the wildest caravans in which the writer has ever had the pleasure of participating. The leader set a hard pace and the sharp jolts shattered the glass in Tracy Wade's headlights and the sagebrush scratched the paint unmercifully. In the Preliminary Report on the Geology and Water Resources of Central Oregon, written by Israel C. Russell in 1905, this particular area is marked on his sketch map of Central Oregon as "Great Sandy Desert". It felt just that way to us too on that hot afternoon.

When we got onto the Suntex-Wagon Tire Mountain road, we stopped by a small spring to rest and refresh ourselves and listen to the interesting story of Wagon Tire Mountain, which in reality is several miles long. Both the

human and the geological story of this mountain hold the attention and the one depends upon the other. Were it not for the springs high on the mountain set in a desert surrounding, there would be no cattle and no humans settled thereabouts to fight for water rights real or imagined: Why are the springs away up on the side of this 6500 foot mountain rather than down in the flat? McArthur says the name came from the wagon tire of an emigrant's wagon which was burned by Indians in the early days.

When we arrived at Wagontire Post Office were on the U. S. Highway 395, known locally as the Yellowstone Cut-off, and our road troubles were over for awhile. We stopped here for pop and gasoline. Most drivers in the caravan were fairly paralyzed to learn that gasoline was 50¢ a gallon at this point. An interesting sidelight occurred in this connection during the Labor Day trip the following fall. Jack Stevens with his car load of passengers, including the writer, had been unable to catch up with the caravan and we sought permission to put up over the night at a CCC camp not far from Fossil. Bob Stevens and myself were taken to the cabin in which a road foreman slept and announced to the sleeper as guests for the night. He observed us by candle light for awhile and finally said,-"Your Mr. Davis from Portland, aren't you?". I admitted asmuch but couldn't understand why I was so well known, until he continued,-"You fellows thought that gas was all-fired expensive down at Wagontire Post Office last July didn't you?". He was the proprietor who had filled up the tanks and was now doing a little road work while his family ran the Post Office and service station. I remember the remarks we made at the time we bought gas were really clever. Another incident at Wagontire Post Office was rather peculiar on that hot July day. Due to a slight change in the itenary we had not passed through Suntex where certain members of the party expected to join us. Dr. Packard had cut out the Poverty Flats side trip to go back and get them but he missed them. He returned to Wagontire Post Office and sat at a table in the open porch writing a note to send this group when a whirlwind swooped down upon him and took everything loose off the table on which he was writing and took the cap off his head and whirled away with it for some distance. The group was lined up here by the writer and their picture taken for posterity.

As we sped swiftly south on this road with the head of Lake Abert as the objective, the outstanding points in the landscape were easily identified from the map. To the left were first seen Horse Head Mountain and Little Juniper Mountain; to the right Ram's Peak and Horse Butte, and still further along on the right there jutted out prominently Gray's Butte and Juniper Mountain. Should something not be done to inject a little more imagination into the naming of these vantage points?

As we neared Lake Abert the old Pleistocene lake terraces of lakes, long, long ago gone dry, were quite generally noticeable at three levels. On the eastern rim of Lake Abert in all the majesty of its geological youthfulness stood Abert Fault, almost perpendicular, 2000' above the lake bed. Dr. Packard says Lake Abert Fault is considered to be the youngest in the world and is so recent that erosion has not yet started and the slumpblocks are still emphatic features of the landscape. European geologists come to view it Dr. Packard went on to say and many a European text book in geology is embilleshed with a picture of Abert Fault. It is without doubt one of the outstanding features in Oregon's wonderful picture book of geology and before we went to bed that night an incident occurred which will always remain impressed upon my mind,-but I am getting ahead of my story. That evening we left the highway and drove across the hard packed earth to the old XL ranch situated near the head of the lake. On this part of the drive we stopped to photograph and ex-

amine a travertine deposit which was built up to a height of fifteen feet above the level of the plane. Dr. Packard surmised it was the vent of a hot spring which might have existed in the bed of the lake.

The mess truck had a hard time that day and did not arrive at the camp ground until seven whereas the caravan pulled in at 5:20 tired and hungry after an all day's drive of 159 miles. However, we had emergency rations and some of the Corvallis professors who were on the trip were kind to us so we all got enough to eat before the truck arrived. We heard rather scary stories from the hired hands at the ranch about rattlers so pitched our sleeping bags where we thought they would not bother us. As the last rays of the sun were playing on the tops of the ridges and we were lounging about the camp street, suddenly Dr. Packard came running past the tents and sleeping bags with his hands outstretched like a prophet of old and crying, "Oh look, look! You must look!" It was indeed a wonderful sight for the sun's last rays had painted an unimaginable prism of colors on the heights of Abert Fault across the lake. Parish has attempted to catch just such desert colors in his mountain pieces. In looking back on the trip with all its many interests I am constrained to call this the high light of the trip although it lasted but a few seconds.

Breakfast Thursday morning had its drawbacks. The rancher had the only fuel available and told us to help ourselves but to remember he hauled his fire wood 53 miles. Then too the camp outfit had a bad break and we had no bread but we all got something to eat in time to pack up and hear Dr. Packard's lecture before we broke camp at 7:30 a.m. He discussed the old lake terraces and the geology of the fault and the nature of the alkaline waters in both Lake Abert and Summer Lake. Nearly all the gravel and boulders on the lake shores are covered with a white alkaline incrustation. Dr. Wilkinson noticed a freshly fractured rock near road making activities and was thrilled to find he had a piece of vesicular porphyritic andesite.

We drove swiftly through Valley Falls and on to Paisley where we picked up the members of the party from Chiloquin and Corvallis that had missed us on the preceding day. Around Summer Lake we sped along on the west shore, beneath the high standing Winter Rim that General Fremont named on his trip of 1856, 79 years before. Mr. E. E. McKee, the courteous service station operator at Summer Lake gave us some evaporated salts of the alkaline water. We stopped frequently for talks by Dr. Packard or Wilkinson or both, and arrived at Lake Post Office at high noon and ready for lunch. As usual there was only one building containing store, post office and living quarters for the postmistress, Mrs. Buchanan and her family. The terrain was flat, desolate, sandy and bare and very hot. At the Lake we got explicit directions as to how to proceed to Christmas Lake or Fossil Lake and arrived there at 2:00 p.m. As our speedometer indicated we were on the last mile before we reached the site, I remarked to Dr. Packard that this was the mile I had been looking for all day. He replied, "It's the mile I've been looking for, for thirty years". In other words he never before had the opportunity to visit this famous old lake bed in the thirty years of his residence in Oregon. We spent a half hour finding many choice specimens of horse teeth, camel bones and many bird bones and others which were not identified. Most of the group presented Dr. Packard with the best specimens. Dr. Packard and a friend, Mr. Ray of Eugene and the sons of the two spent the rest of the day and the night on this site, making a dry camp and returned the next day to Corvallis so this was our goodbye to Dr. Packard on the trip.

(To be continued in the next Bulletin)

LIMERICK CONTEST

Don't forget the Limerick Contest! Bring your limerick with you to the banquet. Real prizes are offered.

Rhyme your antecdotes today.
Swing them with a dashing rhythm,
Add a little sauce and pepper,
Come, you G-Men, do your stuff.
Show us what you can produce.

PURSUING TALENT

Now it is well known to us
Of talent we have a great plenty.
The G-men are gifted at writing
And digging up fossils and stones
And asking so many good questions.
Their voices, they use them a plenty
In shouting the geological ages,
So why can't they lift them in singing
Of their prowess in fields of glory?
Come forth, ye bards and delight us
At the coming Annual Banquet
Of our Great Geological Society.

SECOND ANNUAL MEETING, February 26, 1937

Place: Congress Hotel, 1024 S. W. 6th Avenue, Portland, Oregon

Time: 6:15 P.M. (Informal)

High lights of the program:

Dinner Music.....Eichenlaub Ensemble.
Short business meeting.....installation of new officers.
Geological limericks.....songs.....skits.....amusement.

Guests - Guests are being invited from colleges in the Pacific Northwest and California, and from other geologically-minded clubs. The Dean of the School of Applied Geology, Edinburgh University, is expected to attend and will speak briefly on his geological observations during his travels thoughout the world.

Principal Speaker - Frank I. Jones member of the Society, will show his slides, many in natural color, taken in the Valley of Ten Thousand Smokes, while he was official photographer for the expedition of the National Geographic Society to the Katmai region. He will discuss the recent volcanic history of this most remarkable area, which few men have ever seen. This is a show that members can not afford to miss

Reservations: Reservations should be made with Mrs. ELIZABETH BARR, 5417 S. E. 99th AVENUE, by FEBRUARY 10, to ensure adequate seating arrangements. MAILING THE RESERVATION CARD TO BE SENT TO EACH MEMBER OBLIGATES YOU TO PAY FOR THE SEATS RESERVED. This will be an outstanding meeting; a full year for regrets if you pass it up. Make reservations N O W; then sit down and write a snappy geological limerick.

Cost: $1.00 per plate, and cheap at the price. Tickets at the door.

Mrs. DORIS WOLCOTT JONES
2640 S W PATTON ROAD
PORTLAND, OREGON

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LECTURES

Feb. 12, 1937(Friday)-8:00 P.M. Dr. David B. Charleton will address the members of the Society on "Mineral Waters of Oregon and Elsewhere, Their Properties and Uses." Dr. Charleton has his Doctor's Degree in Chemistry and Bacteriology. He was formerly on the faculty of Oregon State College. He owns and operates the Charleton Laboratories, Portland, Oregon. This will be a most instructive lecture, by a very pleasing speaker.

ANNUAL MEETING

Feb. 26, 1937(Friday)-6:15 P.M. CONGRESS HOTEL DINING ROOM. ANNUAL MEETING OF THE GEOLOGICAL SOCIETY. Dinner, fun, stunts, entertainment, new officers, special speakers. If you miss it, you will regret it. Make your reservations early.

SEE LAST PAGE OF THIS BULLETIN FOR FURTHER DETAILS.

DON'T FORGET THE DATE - FRIDAY, FEBRUARY 26, 1937.

TRIP

Feb. 21, 1937(Sunday)-Field trip to northern Washington County.
Leaders: R. Reynolds and Bruce Schminky.

Watch Newspapers for further details.

Geological Time Scale
(From Turtox News)

Era	Period	Years from Beginning of Period to Present
	(Recent.	
	(Pleistocene	1,000,000
Cenozoic	(Pliocene	
Era, 4%	(Miocene	10,000,000
	(Oligocene	
	(Eocene	20,000,000
	(Cretaceous	45,000,000
Mesozoic	(Comanchean (Lower Cretaceous)	
Era, 11%	(Juassic	64,000,000
	(Triassic	75,000,000
	(Permian	90,000,000
	(Pennsylvanian (Upper Carboniferous)	105,000,000
Paleozoic	(Mississippian (Lower Carboniferous)	120,000,000
Era, 30%	(Devonian	143,000,000
	(Silurian	158,000,000
	(Ordovician	195,000,000
	(Cambrian	225,000,000
Proterozoic Era, 25%		350,000,000
Archaeozoic Era, 30%		500,000,000

The figures given in the third column are based on a conservative estimate made by Professor Schuckert of Yale University.

Tabular view of the Plant Kingdom (After Shimer)

Division	Subdivision Class or Order	Range	Common Name or Example
Spermatophyta	(Angiosperms)		
	(Dicotyledones	Comanchean to present	Oaks
	(Monocotyledones	Comanchean to present	Grasses
	(Gymnosperms)		
	(Gnetales	(Fossil Record Scant)	Ephedra
	(Coniferales	Permian to present	Pines
	(Ginkgoales	Permian to present	Ginkgo
	(Cordaitales	Devonian to Permian	Cordaites
	(Cycadales	Permian to present	Cycads
	(Cycadofilicales	Devonian to Jurassic	Neuropteris
Pteridophyta	(Lycopodiales	Devonian to present	Club-mosses
	(Equisetales	Devonian to present	Horsetails
	(Sphenophyllales	Devonian to present	Sphenophyllum
	(Filicales	Devonian to present	Ferns
Bryophyta	(Musci	Tertiary to present	Mosses
	(Hepaticae	Tertiary to present	Liverworts
Thallophyta	(Fungi	Silurian to present	Fungi
	(Algae	PreCambrian to present	Seaweeds
	(Diatomeae	Jurassic to present	Diatoms
	(Schizophyta	Pennsylvanian to present	Bacteria
	(Myxomycetae	(No fossil record)	Slime Molds

THE GEOLOGICAL FIELD EXCURSION OF 1935 OF THE OREGON STATE COLLEGE

DEPARTMENT OF GEOLOGY

By Franklin L. Davis

(Continued from last Bulletin)

The chief characteristic of the trip the rest of the day was speed. I regret to say that at Fort Rock where I secured permission to take a picture of the rock, that the distance deceived me and I held the party up 35 minutes but I did get a remarkable picture and Professor Othus came to my rescue by getting through the fence some way and driving across the fields to pick me up. Then on into Fremont National Forest and a visit to the Ice Caves. Then on past East Lake to Paulina Lake where we camped for the night in the crater of Mt. Newberry at elevation 6344'. Notwithstanding the elevation we spent a hot sultry night. The next day was spent in exploring around the crater, boating, fishing, swimming, eating and just plain lazying. The group all climbed to the rim, about 1800' above the lake all but myself and Dr. Wilkinson ruled me out owing to the heel blisters I had acquired the previous day on the Fort Rock devastating hike. Also the group visited the obsidian flows which are most spectacular at this location. That night we had a most enjoyable campfire with many wonderful stories. Probably the best was Dick Bogue's story of the geology of southern Oregon and the story of the Modoc Wars as related to it.

Saturday saw the crowd begin to break up, part heading for homes to the south and part of us coming north. On the way into Bend we visited the Lava cave extending a mile underground, and drove to the top of Pilot Butte, where we found a forest lookout station. At Terrebonne we detoured six miles to see the Diotomaceous earth deposits and see how it was processed. The dazzling white of the deposit under the blinding glare of the midday sun made us appreciate our sun-glasses. This was the last stop of consequence. Dr. Wilkinson rode with Tracy and myself back to Portland and gave us a running lecture on the highway the rest of the way into Portland where we arrived late Saturday afternoon, tired, dirty and hungry but with a feeling that it had been the most wonderful week of vacation we had ever expereinced. A great deal of appreciation is due Drs. Packard and Wilkinson for their untiring efforts to make the trip the success it was.

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L O G O F

Geological Field Tour

through

Central Oregon

Prepared by Dr. Packard and Dr. Wilkinson

The field trip through Central Oregon is offered as a part of the required work of a Summer Session Field Course in Geology, but will be open to a limited number of persons interested in visiting localities of special geological significance.

These will include the Paleozoic and Mesozoic fossiliferous horizons of

the southern Dayville quadrangle; Glass Buttes; the Fault block structure at Abert Lake; several alkali lakes, including the famous Fossil Lake, where large collections of ancient mammals and birds have been found; Fort Rock; Newberry Crater; Lava Caves; cinder cones, and recent lava flows; the geologic formations of the Deschutes vally including the Clarno Eocene; the fossiliferous John Day Oligocene; Columbia River Lava Miocene; the Madras Pliocene formation, and the Inter canyon lavas; Mount Hood and Portland.

The department assumes responsibility only for the selection of the route, camping sites, schedules, leaders, and informal explanations of the geological phenomena. Each party must arrange for its transportation and provide for camping facilities. A small auto tent will be convenient since several camps will be established on the high desert. Supplies and gasoline will be available at a number of places enroute.

ITINERARY

Dates & Places	Approximate Mileage	Geologic Features
July 9 Geology Camp Suplee (40 miles)	0	The camp is located at the southern edge of a Paleozoic and Mesozoic area forming a window in the Cenozoic lavas and tuffs. At the camp site marine Jurassic fossiliferous beds may be found, especially on Ammonite Hill. The route to Suplee crosses the major Jurassic anticline which exposes a remarkable fossiliferous section. To the north the underlying Triassic is exposed. Fossiliferous localities occur near Suplee. The flat tables are capped with ryolites of Harney-Pliocene age below which fossil mammals have been found. The route leaves Crooked River basin and follows up Grindstone along the old military route probably traveled by Thomas Condon. In the lower canyon, Columbia River Lava is exposed, capped by Pliocene tuffs. To the eastward, opposite Twelve mile Creek, are Tucker and other buttes of fossiliferous Paleozoic Limestones, the largest known bodies of limestone west of Baker. The low pass into Silver Creek drainage leads into the Great Basin of internal drainage.
Suntex	40	The Harney Basin. Late basaltic flows form the rim rock in places covered with tuffs. To the west lie the Glass Buttes, described by I. C. Russell in 1884. They represent erosional remnants of older lavas which cooled so rapidly that they solidified as volcanic glass. Because of its fracture it was widely used by the Indians.
Wagontire (HWY. 395) (42 miles)	75	To the east is the volcanic mass known as Wagontire Mountain (elevation 6375). This appears to be a remnant of an old acidic flow that was not buried by the younger lavas and tuffs.

Lake Abert (2d camp) July 10	117	Abert Lake, now dry, was once a part of a vast Pleistocene lake that extended south to Valley Falls and thence northwesterly some miles beyond the town of Summer Lake. That lake was 260 feet deep at Paisley
(20 miles)		Abert Lake lies against the escarpment of the Abert fault, the rim of which is 2041 feet above the road bed. This cliff exposes the eastward edges of lava flows and tuff beds and represents a typical Basin Range fault block mountain first described by Russell. Beneath the lake floor are lava sheets once continuous with the rim layers. The rock floor of the lake basin dips eastward into the fault. That triangular block is limited to the west by another fault.
Valley Falls (Junction Hwy. 31)	137	Abert Lake was highly alkaline, containing borax, halite, epsomite, and sulphates and carbonates of Potassium and Sodium. Chewaucan Marsh is the remnant of a similar lake. They all show two lake levels of the Pleistocene.
(20 miles)		
Paisley (27 miles)	157	Lava capped tables appear to the north and the faulted Tucker hills lie to the south.
Summer Lake (18 miles)	184	This lake, like the others, fluctuates with the climatic cycle. Its waters were strongly alkali and from the time to time attempts have been made to utilize the salts. Winter Ridge, another block faulted mountain, lies to the south. It dips southward.
"Sunken City" (24 miles)	202	In modern times Silver Lake extended to the southward from this junction. Thorn Lake was to the north. Both probably were parts of a large Pleistocene Lake including Christmas Lake and Fossil Lakes. All of these are now dry. Igneous dikes extended across Silver Lake like the walls of a building.
Fossil Lake (3d Camp) July 11	226	Fossil Lake was discovered by Governor Whitiker and visited in 1877 by Thomas Condon, who first collected fossil bones of birds and mammals. Russell, Sternberg, Cope, Stock, and others have collected at
(32 miles)		this famous locality, and Condon, Cape, Schufeldt, Stock, Miller, and Elftman have described its fauna.
Fort Rock (18 miles)	258	An interesting erosion feature developed in lava flows and resembling the walls of a fort.
South Ice Cave (16 miles)	276	A lava cave containing ice even during the summer season.
East Lake	292	East Lake and Pauline Lake lie within Newbury Crater, named and described by I. C. Russell, and
(3 miles)		lately described by Howell Williams in the February

1935 issue of the Bulletin of the Geological Society of America. The sequences of the volcanic history of this great volcano which may have erupted within the past 1000 years may be summarized from Williams report.

Paulina Lake (4th camp) July 12 — 295

The Newbury volcano has a basal diameter of 20 miles. It rises 4000 feet above its base. On its outer slopes it supports at least 150 basaltic cinder cones. A vast amphitheater 1000-1500 feet in height form the walls of the caldera.

Paulina Lake is about 230 feet deep. It is fed by springs and waters seeping from East Lake. Some of the springs have temperatures of 120° F. and near them opal is now forming.

(13 miles)

"The main episodes in the history of the Newberry volcano are as follows: First, the upbuilding of a main shield, chiefly by rhyolitic and basaltic eruption from a central caldera; then, the enlargement of the caldera, principally by down faulting; and, finally, parasitic eruptions of rhyolite and basalt both on the flank of the shield and on the floor of the caldera." (Williams 1935, p. 259.)

Lava River Cave Park (Hwy. 97) — 308

(17 miles)

A very recent lava flow that cooled and formed a crust from beneath which the liquid lava escaped leaving a tunnel over a mile long. Nearby is Cinder Butte, a typical recent cone built up of cinders with a crater at the top, and breached at the base from which a stream of basaltic lava issued. To the west lie the Cascades with the Three Sisters, the remnants of Mount Multnomah, described by Hodge as another gigantic crater. "Lava blisters" are common near Bend, and are due to escape of gases while Madras lavas were cooling.

Bend (18 miles) — 325

Pilot Butte dominates the volcanic region near town, and many cones are visible from the top. The basalts are of Madras Pliocene age.

Redmond (6 miles) — 343

The surface is covered by vessicular basalt of Madras Pliocene age.

Terrebonne (6 miles) — 349

An extensive deposit of diatomite, the siliceous tests of Diatoms, used as an abrasive, absorbent and for many other industrial purposes. The Inter-canyon Lava of Pleistocene and Recent age occur along the highway north of town.

Peter Shene Bridge (17 miles)	355	A five hundred foot section is exposed by the Crooked River. Madras and Inter-canyon formations are visible from the bridge. To the east are igneous masses of Clarno Eocene.
Madras (19 miles)	372	The type of Madras formation described and mapped by Hodge.
Gateway (32 miles)	391	Clarno Eocene, John Day Oligocene, and Columbia River Lava. Miocene exposed along Trout Creek and vicinity. The highly colored rock of John Day age have yielded oreodons, horses, and other typical John Day fossil mammals.
Maupin (36 miles)	423	The deschutes Canyon is here cut in Columbia River basalt, but is overlain by Madras lavas and tuffs which extend up to the base of the Cascades.
Swim (5th Camp) July 13 (60 miles)	459	Mount Hood
Portland	519	

E. L. Packard - W. D. Wilkinson
Geology Department
Oregon State College
1935

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MOUNTAIN MAPS

We are all familiar with the use of maps and the terrors of trying to refold strip and road maps with complicated foldings. Few of us carry maps of any size with us into the field unless they are folded. And folding is rather hard on the ultimate serviceability of said map.

There are various methods of mounting maps to make them more durable, and also to permit folding without destroying the effectiveness of it. In the January, 1937, issue of Ward's Mineral Bulletin there is an advertisement for a superior method of mounting maps. The method consists of placing a prepared mounting film between the cloth and the map, and then pressing the 3 layers together with a moderately warm iron. The resulting seal is waterproof, strong, and permanent, according to the advertisement.

This method is somewhat more expensive than the old wallpaper-paste and elbow-grease method, but appears to be more effective. Further information can be obtained from Wards Natural Science Establishment, 302 Goodman Street, North, Rochester, New York.

Incidently, Ward's puts out a monthly house organ called, Ward's Mineral Bulletin, which they will send upon request. This bulletin gives data on new optical equipment for examining specimens, and notes and advertisements on interesting mineralogical material. It is interesting reading. Mr. Leo F. Simon has copies of this bulletin. (RCT)

JAMES J. ARNESON
Pendleton, Oregon

Lying in the foothills on East Birch Creek, about twenty-two miles south of Pendleton, is an outcropping of ancient strata, probably of Miocene formation. This outcropping extends along the creek in a northeasterly direction for approximately four miles before disappearing from sight beneath the basaltic lavas which comprise most of the rocks of this district.

This outcropping may be readily identified by even the most casual observer, by the yellowish color, which discloses it to be of distinctly different composition from the surrounding rocks. Where the rusty brown lavas that overlay most of the Columbia basin end abruptly and the yellow felsites appear in sharp contrast, here begins a new world to the geologist, or rather, here begins the old world. Here once, in ages long gone, palm trees raised their heads over tropical jungles, jungles as dense, no doubt, as any in equatorial Africa today. Sluggish streams wound their lazy way through morasses where perhaps the sun's rays never penetrated beneath the heavy foliage.

More than likely it was a silent jungle; a jungle without animal life in any form, for the abundant fossil remains that have been preserved for us fail to reveal a single trace of fauna. Of flora there is a wide variety in many different strata, revealing a changing climate and changing vegetation. In the lower formations are found swamp grasses, reeds and occasional palm leaves, where in upper levels are found plants of more temperate climes, such as ferns and salal and the needles of conifers.

For a time the chemical conditions appear to have been suited for the formation of coal, for there are several outcrops of carbonaceous matter. It is possible that fair coal may yet be found at some depth, but the lavas, which welled up and covered the entire area, and the intense heat which accompanied it, obviously must have destroyed the upper deposits.

There is a good road close to this formation. Leaving the highway at Pilot Rock, the visitor must turn left at the first road and follow up the creek about seven miles. The outcropping described above will be found several hundred yards to the left of the road and about five hundred feet up the hill.

The rocks comprising the formation include massive sandstone, shales, porphyritic granites, felsites and basaltic lavas. Minerals to found are limited to those usually found in the rocks mentioned. There are no metals present.

Once on the ground, a little study of structures will put the prospector on the trail of fossils. When the fossil-bearing shales have been located, a little effort, with the aid of a hand pick, should turn up some fine specimens of leaves imprinted in the rock. It is an intriguing thought, that when one cleaves open a layer of shale, revealing its hidden leaf, he has exposed it to the light of day for the first time in millions of years.

The Birch Creek fossil beds offer to the visitor a life time of memories for a few hours of study. He should learn to project his mind into the past and virtually live with the strata in which he works. The visitor may only have a few hours to spend on a visit to this fossil deposit, yet he may live a whole geological epoch as he ascends this hill.

MORE ABOUT THE BANQUET

If you are a member of the Geological Society of the Oregon Country, if you have an active interest in geology, or if you simply enjoy the mental exhiliration that comes from the combination of good food, fellowship, fun, frivolity and festivity, you have a date for Friday, February 26, at the Congress Hotel in Portland. The second annual meeting and banquet of the Society is the occasion for the celebration. Review of past year's activity .....a look ahead.....rare entertainment by home talent that you may not have hitherto suspected.....observations by a distinguished scientist from Edinburgh University.....limericks by you (and perhaps about you).....climaxed by an address on the Valley of Ten Thousand Smokes, with colored slides by Frank I. Jones, photographer for the National Geographic Society expedition. Surely this will be a meeting no member can afford to miss!

Have you made sure of a seat by sending in a reservation? If not call or write Mrs. Elizabeth Barr (Sunset 4081), 5417 S. E. 99th Avenue. Do it now! We are depending on our members to attend this meeting practically 100%.

Geological limericks for the contest are being collected by Kenneth N. Phillips. Please don't wait until the last minute to turn yours in. If you have the inspiration but need help on rhyme or rythm, see Dr. Osgood.

Liberal door prizes and limerick prizes will be awarded - something of lasting geological interest. You must be present to win.

"For your friends are my friends
And my friends are your friends,
The more we get together, the happier we'll be."

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F L A S H !

A printed program is being prepared for the annual banquet, to be embellished with photographs of Society members, group activities, and field trips. Do you have in your collection any good photographs of general interest? If so, bring the negatives and a print to the luncheon on Thursday, February 11, or to the lecture on Friday, February 12. Unusual hikes, fossil finds, picture-book geology, campfire groups are suggested topics. Ray E. Mackenzie and a committee will select those suitable for a "roto" section that will serve as a worth-while record of some Society activities for the year just past. It is planned that these unusual programs will be distributed at the annual meeting February 26. Only a few photographs can be printed; so don't feel hurt if yours are omitted for lack of space. Films should be identified for return to owner.

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Sec. 562, P. L. & R.

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2640 S. W. PATTON RD.,
PORTLAND, OREGON

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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SEE LAST PAGES OF THIS BULLETIN FOR FURTHER DETAILS.

DON'T FORGET THE DATE - FRIDAY, FEBRUARY 26, 1937.

LECTURES

March 12,1937(Friday)-Mr. Eldon Brickell, the local representative of, and through the courtesy of, the Victor Animatograph Corporation of Davenport, Iowa, and the Erpi Picturos Corporation of New York, will show three reels of educational geological pictures with sound. The reels include "Geological Work of Ice", "Mountain Building", and "Volcanoes in Action". Those members who viewed the pictures in the Public Library about a year ago, will remember that these pictures are of unusual interest. A large attendance is anticipated.

March 26,1937(Friday)-Dr. Donald B. Lawrence of Hood River, will address the members of the Society on the subject of "The Submerged Forest of the Columbia Gorge". Dr. Lawrence has made extensive studies of the phenomena. The Society recently made a field trip to the vicinity of the Submerged Forest, and the address of Dr. Lawrence is very timely for the explanation of the huge slide of material which caused the Dam of the Gods and the Submerged Forest.

TRIPS

Feb. 28, 1937(Sunday)-Field trip to northern Washington County. Leaders: R. Reynolds and Bruce Schminky.

Watch Newspapers for further details.

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DUES ARE NOW PAYABLE FOR THE NEXT FISCAL YEAR, WHICH BEGINS MARCH 1st, 1937.

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The Commissioner of Internal Revenue of the Treasury Department of the United States, has recently ruled that the Geological Society of the Oregon Country as a non-profit, educational corporation is exempt from the filing of any returns for income tax, capital stock tax, or Social Security taxes.

The Commissioner in his ruling, also made the following comment:

"Contributions to your organization by individual donors are deductible by such individuals in computing their taxable net income in the manner and to the extent provided by section 23(o) of the Revenue Act of 1936. The deductibility of contributions by corporations is governed by section 23(q) of the Revenue Act of 1936".

The above does not apply to annual dues paid, but will be of benefit to anyone making additional donations.

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The following proposed amendment to the By-laws of the Society will be submitted for vote of the members at the Annual Meeting on Friday, February 26, 1937 at the Congress Hotel:

BE IT RESOLVED that the By-laws of the Geological Society of the Oregon Country, be and 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. After granting of charter, all members of such chapter shall then be members of the Geological 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 each 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 ten (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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BELIEVE IT OR NOT - (apologies to Ripley)

ANNA CREEK; Oregon has at least one stream with the following notable peculiarities: (1) its low flow occurs during the wet season; (2) its flood flow occurs during the dry season; (3) a rock thrown into the creek will float away; (4) a log rolled into the water will sink; (5) ice forms not on the surface but from the bottom up, occassionally filling the channel so completely that the water is forced out and over the banks. This stream is Anna Creek, which rises in Crater Lake NationalPark, and joins Wood River near Fort Klamath.

The explanation is simple enough. (1) Low-water flow comes entirely from springs, which decrease through fall until late in winter, owing to the fact that all precipitation is im the form of snow, and ground water is not recharged until melting begins. (2) Freshets come in June or July, from melting snow. (3) The frothy pumice from Mt. Mazama floats readily when not too wet. (4) Some trees along the creek are the lodge-pole pine variety (loggers "jack pine") which will sink unless rafted with the lighter yellow pine. (5) "Anchor" ice is a phenomenon of radiation that is common to many swift, turbulent streams. It forms during the night in large quantities on beds of rivers, and is said to form more rapidly on dark-colored rocks than on light-colored ones. It may form to a thickness of a foot or more in one night. It may also collect enormous quantities of needle ("frazil") ice in a short time; but bright sunshine usually causes it to rise and float away, even though the temperature remains below freezing, sometimes carrying with it appreciable quantities of sand and pebbles.

K.N.P.

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COLUMBIA RIVER: NEW MINIMUM DISCHARGE.

In the period January 6-13, 1937, the Pacific Northwest was subjected to a severe dose of "unusual" weater. Cold weather was general through out the Columbia River Basin. Even before the cold period, the flow of the Columbia River was unusually low; and due to cessation of melting snow, confinement of shallow ground water, and temporary storage in the form of ice and ice-bound pools, the flow dropped rapidly to a record minimum. For 6 consecutive days (January 8-13) it was lower at Celilo Falls than the previous minimum flow of 40,000 second-feet. The lowest discharge noted was 37,500 second-feet (elevation, 126.0 feet above sea level at Celilo Falls), which establishes a new low since 1877.

Incidentally on January 7 it was colder at Portland (+14 to +23F.) than at Barrow (+22 to +24F.) on the northern tip of Alaska, almost 4 degrees north of the Artic Circle. Applications for spending next winter at the latter resort will be considered in the order received.

K.N.P.

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SUBMERGED VALLEYS ON CONTINENTAL SHELVES AND CHANGES OF SEAL LEVEL. A RESUME

Ray C. Treasher

A subject of general interest which is attracting geologists of late is that of the various submerged canyons on the continental shelves. Those on the Pacific Coast are being studied intensively and may hold the key to the solution of the problem. One of these canyons exists as an extension of the Columbia River and thus this investigation is brought close to our door.

These features were noted years ago on the Atlantic Coast. When Long Island Sound was charted for navigation, an exceptional deepening of the bottom was observed. Spencer (10), Hull (6), and Upham (12) in 1893 and 1902 recognized this depression as an extension of the Hudson River and suggested that it was a submerged valley. The idea did not meet with general acceptance until the Coast & Geodetic Survey made soundings, plotted the actual submarine contours. Others were located, not only on the coast of the United States, but in Europe and elsewhere.

Geologists and physiographers immediately began formulating hypotheses to account for those unusual features. Davis (3) suggested the storms and currents tended to concentrate shoreward rushing waters into embayments and that the return water acted as an undertow, dragging silt along the bottom and thus scouring the submarine canyons.

It has long been recognized that the ice of Pleistocene glaciation locked up considerable water and caused a lowering of sea level of at least 300 feet. The computations considered the thickness of the ice, and the areal extent, giving a clue to the amount of water abstracted from the ocean. This also helped account for the carving of the continental shelves.

However, this 300 foot lowering still does not solve the submarine canyon problem as the soundings show depths as much as 3000 feet below sea level.

Dr. R. A. Daly (2) advanced the idea that the canyons were formed subaqueously by scour of muddy salt water. The silt on the continental shelf, perhaps aided by the excessive silts produced by continental glaciation, tended to slump or flow down the continental shelf, thus scouring depressions in the soft rocks which ultimately developed into canyons, in a similar manner to those formed sub-aereally by normal erosion.

Hess and MacClintock (5) would solve the problem by tampering with the speed of rotation of the earth. They suggest that if the speed of rotation decreased there would be a tendency for the ocean water to migrate toward the poles, as a result of the decreased centrifugal force. There would result an apparent "lowering" of sea level in the equatorial region and a "raising" in the polar regions. In this way, they hope to account for a lowering sufficient to allow the submarine canyons to be formed. Their claim is, that to lower sea level by locking the water in ice, would call for an ice sheet 50,000 feet or 9-10 miles thick. They readily admit the difficulties attendant on a change in the speed of rotation, and present their hypothesis in an effort to stimulate criticism.

Shepard (8) has studied the submarine canyons in California quite extensively. He objects to the Hess-MacClintock hypothesis, in that a "neutral line", or line of no elevation or lowering would exist at 35° latitude, and these canyons have been located as far north as Bering Sea. In a recent article (9) he sets forth the results of his studies.

He shows diagrams of the Monterey submarine canyon, and others. These canyons have a tributary pattern very similar to sub-areal streams, so much so that it is difficult to understand their formation sub-aqueously. One striking figure compares a cross-section of the Monterey Canyon with that of the Grand Canyon of the Colorado and it needs no imagination to see the similarity. Eleven out of fourteen canyons studied have been excavated in solid rock, granite in some cases, which throws further difficulties in the path of su-aqueous formation.

There is a possibility, he continues, that the bottom of the sea may have been depressed to cause a general lowering of 3000 feet, but as yet no evidence has been found to support this contention and cites South Sea Island geology as proof. He feels that the 300 foot lowering caused by ice locked water is an underestimate. Data of Soviet geologists on Asiatic glaciation (11) indicates a greater ice cap than usually admitted, and he states reasons for believing the Artic ice sheet was much thicker. Recent estimates of a 7000 foot glacier on Greenland and the overriding of Mt. Washington in the East are brought into the picture. The Antartic ice probably had greater extent and thickness. It is physically and meteorologically possible to have had a northern hemisphere glacier 4 miles thick, which would account for a 3000 foot lowering of sea level. His article is well worth reading.

Submarine canyons on the Pacific Coast, particularly off California were noted by early observers. None of these depressions appear off the Oregon Coast. At the mouth of the Columbia River is one of these canyons of considerable magnitude. Farther north off the Straits Juan de Fuca, is one which turns abruptly southward after leaving the present coast line. Many others have been charted along the British Columbia and Alaskan coast. It has been suggested that some of these were glacially carved, but this would not account for the Columbia River canyon.

There is evidence in our Oregon Country, at least west of the Cascade Mountains, to indicate either an elevation of the land or a depression of sea level. Williams, in a private report shows a deepened channel of Lewis River, at Ariel damsite to 80 feet below sea level, and in another, that at Vancouver the old bed of the Columbia was more thean 275 feet below present sea level.

The problem is by no means solved. It will take years of study and collection of data from all parts of the world. Each contribution adds something to the picture and ultimately the whole will give the true story. It may be that our Oregon Country will be the area which will give the final clues for solving the problem. Any work which either amateur or professional geologists can add to the story will be of benefit.

The appended, selected bibliography may help the reader who wishes to

inform himself on this subject first hand. The Bibliography of the Geology and Mineral Resources of Oregon will indicate others, with particular reference to Pacific Coast conditions.

1. Daly, R. A., "Changing World of the Ice Age", 1934.

2. "Origin of Submarine Canyons" (Presented before Geological Society of America, December 26, 1935.)

3. Davis, W. M., "Submarine Mock Valleys", (Geographic Review, v. 24, pp. 297-308, 1934.)

4. Hess, H. H., (Transactions of American Geophysical Union, pp. 168-170, 1933)

5. Hess, H. H., and MacClintock, Paul, "Submerged Valleys on Continental Slopes and Changes of Sea Level", (Science, v. 83, no. 2153, pp. 332-334, April 3, 1936).

6. Hull, E., "The Sub-Oceanic Physiography of the North Atlantic Ocean" (London 1912. also Royal Geographic Journal, v. 13, pp. 285-289, 1899, also Victoria Institute, 1898-1908)

7. Shepard, Francis P., (Geographic Review, v. 23, pp. 77-89, 1933. also American Geophysical Union, Transactions, 1933 and 1935)

8. "Submerged Valleys on Continental Slopes and Changes of Sea Level", (Science, v. 83, no. 2165, pp. 620-621, June 26, 1936)

9. "The Underlying Causes of Submarine Canyons" (National Academy of Science, Proceedings, v. 22, no. 8, pp. 496-501, 5 fig., August, 1936)

10. Spencer, J. W., (Geological Society of America, Bulletin, v. 14, pp. 207-226, 1903)

11. Stepanov, P. T., "Useful Minerals of the North U. S. S. R." (v. 1, Geology, Moscow, 1935. in Russian)

12. Upham, W. (American Geologist, v. 10, pp. 222-223, 1892)

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THE MAMMALS AND LIFE ZONES OF OREGON - Vernon Bailey - Government Printing Office, 416 p., 75¢. A study of the mammalian life in a region hitherto not well covered from the zoological point of view. Mr. Bailey is of course eminently qualified to speak with authority on both the systematics and the distribution of mammals, particularly the mammals of the West.

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LAST CALL! DINNER IS SERVED IN THE DINING CAR!

THE DATE - February 26, 1937.

THE PLACE - Congress Hotel, Portland, Oregon.

THE TIME - 6:15 P.M.

THE DRESS - Informal. (Ladies with formal dresses won't be bounced.)

THE OCCASION - The second annual meeting and banquet of the Geological Society of the Oregon Country.

ILLUSTRATED PROGRAM - R. E. McKenzie is head of a committee that is preparing a rotoprinted (not mimeographed) program embellished with photographs showing high spots in the business and pleasure of the Society during the past year. This unique program will serve not only as a valuable souvenir of the meeting, but also as a pictorial resume of our second year's activity.

ADDRESS BY RETIRING PRESIDENT - A brief talk by C. D. Phillips, our second president, who has worked untiringly in the interest of the Society during the year now closing. Members owe him the honor of attending the meeting en masse, if only to acknowledge appreciation for his unselfish services.

ADDRESS BY INCOMING PRESIDENT - A few words from our new president. You will want to hear what he has to say about prospects for the year ahead of us.

MUSICAL TREATS - Members of our own Society will wake the sleeping lyre and invoke the spirit of Orpheus for our pleasure. By special request of music lovers, Ray Treasher will NOT play Schubert's "The Bee" on his violin.

GEOLOGICAL ADVENTURING - We will have with us on this occasion, Dr. Francois de Trapperocque, visiting lecturer on geology at Edinburgh University,

citizen of the world and accomplished linguist. Pursuit of his specialty, the petrology of igneous rocks, has brought him to the Pacific Northwest, where some of the greatest lava fields in the world are found. He has been persuaded to speak to us on "Travels and Adventures of a Geologist". We can make a good impression on this distinguished visitor if members will attend this dinner in full force.

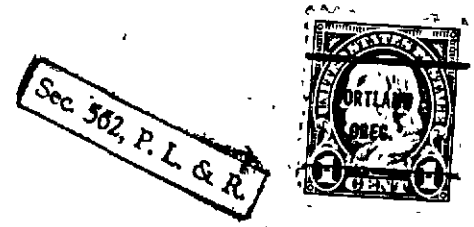
LIMERICKS - You can read your own geological limerick, or hand it to K. N. Phillips if you prefer. Geological prizes awarded for the best ones submitted.

MOUNT KATMAI, AND THE VALLEY OF TEN THOUSAND SMOKES - This will be the high spot of the program. Frank I. Jones, Portland photographer and member of our Society, will show natural-color and black-and-white photographs of volcanic phenomena in the Katmai region, Alaska, and will lecture on its recent volcanic history. Mr. Jones is one of the very few men who can speak with authority on this area from personal experience. He has gone to considerable trouble and some expense to increase the lighting capacity of his fine projector for this occasion, so that the pictures will show up better than ever before. DON'T MISS THIS EVENT!!!

RESERVATIONS - Reservations must be made in order that the committee can advise the hotel management of the number expected to attend. Mrs. Amza Barr, 5417 S.E. 99th Avenue (Sunset 4081), is in charge of registrations. At this writing it appears that it will not be necessary to reserve seating space, as suggested earlier; there will be plenty of good seats.

BE ON TIME - the folowing limerick is dedicated to the man who fails to heed this warning:

_____ _____ is usually late.
He came in tonight at eight - eight.
But, sad to relate,
We're unable to state
What he and his tete-a-tete ate at eight-eight.
K.N.P.



Mrs. DORIS WOLCOTT JONES
2640 S W PATTON ROAD
PORTLAND, OREGON

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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Portland, Oregon.

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

LECTURES

March 12,1937(Friday)- Mr. Eldon Brickell, the local representative of, and through the courtesy of, the Victor Animatograph corporation of Davenport, Iowa, and the Erpi Pictures Corporation of New York, will show three reels of education geological pictures with sound. The reels include "Geological Work of Ice", "Mountain Building" and "Volcanoes in Action". Those members who viewed the pictures in the Public Library about a year ago, will remember that these pictures are of unusual interest. A large attendance is anticipated.

March 26,1937(Friday)- Dr. Donald B. Lawrence of Hood River will address the members of the Society on the subject of "The Submerged Forest of the Columbia Gorge". Dr. Lawrence has made extensive studies of the phenomena. The Society recently made a field trip to the vicinity of the Submerged Forest, and the address of Dr. Lawrence is very timely for the explanation of the huge slide of material which caused the Dam of the Gods and the Submerged Forest.

April 9,1937(Friday)- Mr. Claire P. Holdredge, a member of the Society, and a professional geologist of considerable reputation, will address the regular meeting on "The Complete Geological Picture of Bonneville Dam", Mr. Holdredge has been acting Geologist for the U. S. Engineers during the period of construction and is well equiped to give a full resume of his findings. Those who have heard Mr. Holdredge before know that he is an able lecturer.

TRIPS

March 21,1937(Sunday)- McMinnville - Willamina - Dallas & Amity
Leader: Wessley Paulsen.

G 340p. ELEMENTS OF PALEONTOLOGY. Third term, 2 hours.

An introductory study of the more common types of invertebrate fossils, including forms occuring commonly at localities in the Northwest.

Dean Packard.
Tuesday, 7:15, room 104.

G 352p. GEOLOGY OF OREGON. Third term 2 hours.

Affords opportunity to obtain a general knowledge of the geology of the state without having to meet the technical requirements imposed on a professional geology major. Of interest to a student majoring in general science and especially useful to one expecting to teach general science.

Professor Hodge.
Wednesday, 7:15, room 110.

DUES ARE NOW PAYABLE FOR THE NEXT FISCAL YEAR, WHICH BEGINS MARCH 1st, 1937

THE MILLS OF GOD GRIND SLOWLY

If it were not for the reference to the "proposed Multnomah Court House", the following editorial might have been taken from any of the local daily newspapers during the past summer without causing surprised comment. It is, however, a clipping pasted in the scrap book of Widden & Lewis in 1893. At that time this firm prepared the plans and was supervising the construction of the present City Hall. It is also of interest to note that twenty years earlier than the following editorial Thomas Condon, the patron saint of all Oregon geologists, was appointed State Geologist with the meager salary of $1,000 per year. Truly the mills of God grind slowly. Let us hope that they will grind exceedingly fine.

Geology in Oregon will prove more interesting and instructive than in almost any other state in the Union. Many of the rock formations in the state have a high commercial value, and there are few ledges but are somewhere exposed so as to become accessible to the quarrymen. It is a remarkable fact, indeed, that with our vast and valuable resources in building stone, at Ashland, at Roseburg, at Forest Grove, at Albany, at Union, along the Columbia River, in fact in nearly every portion of the state, we are still shipping in stone from other states, some of it from a great distance, for practically all our large buildings now being erected. The chief difficulty would appear to be in the fact that our mineral resources have never been scientifically investigated, and hence we have no authoritative reports bearing on the quality, quantity or accessibility of our building stone. It is left to individual effort to gather up by personal investigation facts which in other states are placed by the government where they soon become the property of all the people. Rock and mineral deposits, unlike the other natural resources, are not apparent to ordinary observation, and even when a hurried tour of investigation is made by prospective builders, as was done by the county officials and the architect of the proposed Multnomah county court house, the result cannot possibly be satisfactory. Besides, business men have not the time nor disposition to make tours of investigation in order to examine material.

The state should do this for them. She should examine all the rock formations within her borders, and have prepared a scientific geological report on the same. It is understood that a bill has been reported to the legislature at Salem this session providing for the appointment of a state geologist. Such a measure should meet with the earnest approval of every citizen of Oregon, for it will do for her what it has already done for Washington, that is, assist materially in opening her quarries and mines, and developing her mineral resources.

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MINERAL SPECIMENS: HOW TO IDENTIFY THEM

(U. S. Daily News)

WHERE CAN INFORMATION CONCERNING MINERALS BE OBTAINED?

One of the most important sources is the United States Bureau of Mines. Many States have governmental bureaus which will identify minerals found by residents of the State, in most cases without charge. If an assay is made, a small fee may be asked.

The Bureau of Mines, although its policy is not to duplicate the services by State bureaus, will furnish information about prospective markets for minerals and will identify mineral samples.

Inspection by the Bureau is confined to simple optical and chemical tests. This usually is sufficient to show whether the material has commercial possibilities, or at least whether the expense of an assay is warranted.

The United States Geological Survey and the Smithsonian Institution both undertake to make simple tests of mineral specimens as a public service. However, it is the policy of all the Government bureaus not to conflict with the work done by commercial concerns; therefore they refuse service on large quantities of specimens submitted by mineral dealers, mining engineers, or well drillers. Such work should be sent to commercial assay offices.

A list of public laboratories which make mineral assays and indentify specimens is given in the free Information Circular No. 6597 which may be obtained by writing to the Bureau of Mines.

The Director of the United States Mint has announced that assays of ores will be made at the United States assay offices at Seattle, Wash., and the United States mints at Denver, Colorado, and New Orleans, Louisiana, at these charges: Gold $1; Silver, $1; Lead, $1.50; Zinc, $2; Copper $2. Remittance should accompany the order and should be in cash or by money order, not personal check.

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RARE ORE DISCOVERED

(Oregonian Aug. 8, 1936)

TROY, Idaho, July 31 (AP) - T. F. Seidenschwarz, Spokane mining engineer, reported the production of beryllium ore from the Muscovite mica mine. He said the mineral was discovered in work that proceeded secretly for three years.

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EARTHQUAKE INVESTIGATION IN CALIFORNIA 1934-1935 - United States Department of Commerce, Coast and Geodetic Survey - Special Publication No. 201 - Supt. of Documents - Price 35 cents - 231 pages, 124 figures - 1936.

- INSTRUMENTS -

Previous studies which were made of earth vibrations and their effect on buildings were made on structures accelerated by a wind force, which as a rule, has an appreciable as well as a varying time interval between maximum and minimum value.

This project undertook to develop stong motion instruments to record the acceleration and displacement in short periods of time. The instruments which were developed are known as the Accelerograph and Displacement meter.

The Accelerograph, like the seismograph, uses the principal of three components set at right angles to one another. The instrument is normally at rest and is put in full operation in 0.2 second by an electrically operated pendulum starter.

The Accelerometer is used to measure ground acceleration and to obtain ground displacement.

Displacement meters while fundamentally the same as the Accelerographs have a different pendulum and starting device.

Both the Accelerograph and Displacement meters are wired together so that both operate simultaneously furnishing a composite record of the earthquake activity.

Another instrument, the Tilt meter, which has been in use in Japan, for a number of years was used to measure the amount of tilt in a section of the earth under investigation. It has been noted in Japan, that preceding an earthquake a pronounced earth tilt appears in the vicinity of the faulting structure.

The Tilt meters in use in this country are based on the principal of interferometry. Anobjection to their use is that meteorological changes have had an appreciable effect on their operation rendering their records at times worthless.

The Seismographs that were used are of the pendulum type. They measure the ground motion during an earthquake. A difficulty that has not been overcome with seismographical instruments is that instruments of different sensitivity are required at a given station in order that a full record is obtainable. Both a strong and weak motion instrument is necessary to get a complete picture of an earthquake wave. Some earthquakes occur slowly while others reach maximum value in a very short period of time. An instrument capable of recording slow motion is entirely inadequate to record sudden and fast motion. The period of the pendulum is the determining factor in these several cases. Short period pendulums accentuate short period waves and long period pendulums accentuate long period waves.

The ratio of the motion of the pendulum to that of the ground is called the magnification factor of the instrument. These factors are the key to seismographic analysis.

- HISTORICAL -

Prior to 1925 Seismological data was collected by the U. S. Weather Bureau. In the year of 1925 this work was transferred to the Coast and Geodetic Survey who have been responsible for it to the present time.

In 1929 post card questionaires were sent to each Postmaster in the state of California with instructions to report each shock felt in their area, noting the proper answers to the questions on the reverse side of the card.

Cooperation was also obtained from Public Service Companies who furnished information reports. During the period 1929 to May 15, 1935 approximately 11,500 reports have been received, indicating the extreme interest Californians have in this matter.

It is interesting to note that between April 1, 1933 and April 1, 1934 there were 85 shocks recorded by seismographs in the state of California. Only 16 of these were reported by human agencies. The reason for this difference is explained by the fact that the seismograph being extremely sensitive will record shocks that can not be preceived by human agencies. The value of the data nevertheless cannot be over-estimated, especially by the Engineer, Insurance Rater, or Builder.

- VIBRATION OBSERVATIONS -

Considerable study has been given in California to the building of earthquake resistant structures. Some of the factors which enter into the study of building vibration are mass, rigidity, variation of height, subsurface material, material composing the structure, the natural period of the structure and the height to width ratio. It is pointed out in the studies that where the height to width ratio of a building is less that 3, shear distortions predominate. This seems to be true of many of the Pacific Coast Buildings.

Vibration observations were made on 212 buildings in California and from the data collected it is shown that the amplitude of vibration at a given level is proportional to the elevation of that level, i.e. the period is a linear function of the height. An investigation of the vibration effects on 37 water towers was also made. These studies were made on full as well as empty tanks. The study included the effect of full and slack tie rod tension and their effect on empty, semi-full and full tanks with respect to periods of vibration. In the study of artificially vibrated tank towers it is interesting to note that two distinct systems of vibration exist - one, the material composing the mass and the other, the water in the tank. In other words a coupling vibrating system is established due to the difference in the mass of the two materials, the structure and the water. The resultant of these two mass vibrations produces a vibration having the shape of an elongated ellipse. The size of the ellipse varying with the amount of water in the tank, other factors remaining unchanged.

From these tests it is shown that the tracing has a definite effect upon the vibrating period, also the degree of tightening of the tie rods has a likewise effect on the period of vibration.

Another factor that enters materially into the picture is the condition of the ground upon which the structure rests, whether made or natural rock and the geological formation of the immediate surrounding area.

Vibration measurements were also made on numerous bridge structures including some of the piers of the uncompleted San Francisco-Oakland and the Golden Gate Bridges. The results of these tests in conjunction with further tests as the piers are loaded and the bridges completed will furnish valuable data.

In San Francisco numerous ground vibration tests were made to determine the ground period caused by street traffic. It was found that two dominant frequencies were outstanding, one of approximately 12 and another of approximately 40 cycles per second.

- VIBRATION STUDIES -

The analysis of vibration diagrams is a difficult problem and requires much tedious effort. A considerable amount of misinterpretation may result from an analysis made by an inexperienced analyzer.

The resultant curves that are obtained on vibration tests are usually of a complex nature containing harmonic components, variations in amplitude and period. These may be the result of exteraneous causes, not always evident or easy to ascertain.

The aid of a Harmonic Analyzer becomes of considerable value in the interpretation of these complex diagrams.

- BUILDING AND GROUND VIBRATOR -

A portable vibrator unit was constructed at the Stanford University with two unbalanced flywheels geared together and rotating in opposite directions, revolving at a speed of approximately 600 revolutions per minute.

With this apparatus buildings with periods of 1.33 seconds could be exicted for study purposes.

The tests are made by bringing the machine to full speed then removing the driving unit and allowing the machine to gradually come to rest, the vibrograms being taken during the period of decreasing speed of rotation of the vibrator. The machine is used for producing vibrations in buildings, on dams and on the ground.

For recording vibrations suitable vibration meters are placed in the vicinity. These meters have a high magnification factor in order to obtain suitable vibrograms.

A considerable amount of information concerning the dynamic behavior of structures has been obtained with the aid of the above machine.

A discription of forced vibration tests were made at the following places on the respective structures:

Palo Alto - - - - -	Building
Woodside - - - - -	Searsville Dam
Pasadena - - - - -	Bridge and Bedrock
San Gabriel - - - -	Dam

Los Angeles - - - - - - Building
San Jose - - - - - - Building
San Francisco- - - - - - Rocky hill with some loose sand.
Mare Island - - - - - - Dredger filled ground and causeway.

- EARTHQUAKE DAMAGE TO TYPE III BUILDINGS IN LONG BEACH -

Long Beach, California was severely damaged on March 10, 1933. Following this catastrophe an investigation was made of type III buildings.

Type III buildings are classified as those of ordinary masonry construction, the exterior being wood, interior wood, steel or masonry.

Practically all type III buildings investigated were of brick construction.

The study includedthe location, the amount of damage to type III buildings and the location of damaged chimneys. These were correlated with the sub-surface conditions.

It was found that the damage to this class of structure when located on softer and more recently deposited ground where the ground-water level was 2 to 10 feet, was less than that to buildings of the same class on older or firmer ground where the water level was greater. Damage on higher ground was greater than that on lower ground near the ocean beach.

The study also brought out the fact that there was less damage to buildings located adjacent to one another than there was to buildings standing by themselves. This being obvious due to the increased rigidity and increased mass that a number of buildings adjacent to one another have over a simple structure. Also the free period of vibration of a large mass is different from that of a small mass. The nodal point of vibration of the latter may easily be within the range of that of most earthquakes resulting in severe damage.

It is also to be noted that the amount of damage decreased with the number of stories involved in the particular building. No satisfactory explanation for this has been given.

PERIODS OF GROUND MOTION IN SOUTHERN CALIFORNIA EARTHQUAKES

The natural period of microseisms are known to vary in different localities although the cause of the artificial vibrations are the same. The natural period of earth vibrations are of especial interest to engineers in building construction projects.

It has been pointed out that the free period of buildings should be different from the free period of the ground upon which they rest. The difference in the free period of ground motion is due to the vibration in strata in the several sections considered.

An analysis of many seismograms taken in the state of California by the various recording stations seems to indicate that the vertical components of the ground movement show more clearly the short periods than they do the horizontal components. The latter indicate a larger number of waves with periods of from 1.0 to 1.2 seconds duration.

In the study of the probable relation of period to distance it is shown that the range of periods belonging to a certain distance is very narrow. Also certain periods as 0.5 to 0.6 second and 1.0 to 1.2 seconds prevail at certain distances at all stations investigated. These data indicate the range of periods that prevail at the locality where the records were made. They are of extreme importance to the building engineer in the particular locality, they show the periods most dangerous to buildings, therefore buildings in these localities should not have free periods in these ranges.

It is thought that the above periods represent the natural periods of two sub-surface layers - a thin layer having a period of 0.5 seconds and a thick layer having a period of 1.1 seconds.

Earthquake waves have periods from a fraction of a second to a half-minute or more. Those of long wave length seem to be connected with large block movements. it is thought that the waves in traveling through the earth's crust change their periods due probably to the difference in viscosity of the material through which they travel. It is also thought that different material through which the waves are propogated are acted upon in a different manner depending upon their period with respect to absorption of energy; the shorter waves undergoing more, and the longer waves less absorption.

- THE FOUR UNIT PORTABLE SEISMOGRAPH -

A new form of electromagnetic seismograph is described by the authors. This instrument consists of four portable electromagnetic seismometers arranged to record simultaneously on a single moving film. It can also be used for recording simultaneously, ground movements at four separate points.

- GEODETIC WORK IN EARTHQUAKE REGIONS IN CALIFORNIA -

A description is given of the location of arcs of triangulations that were made in recent years in the state of California and a list of lines of levels that were run during the period of 1933 and 1934.

Reviewed by - J. Wimmer.

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MANY INTERESTING TRIPS FOR 1937

Many interesting trips have been suggested to the Exploration Committee for the coming season. A schedule of these trips will be released as soon as trip leader's time can be fitted to calendar dates. Just to whet the appetite of Society members, we are submitting a few of the suggested caravans.

The much discussed Tenino mounds will be studied under the leadership of Ray Treasher. Dr. Earl L. Packard, Dean of the School of Science at Oregon State College has invited us to Corvallis for another get-together dinner, lecture and field trip. Claire Holdredge will conduct a tour of the lower Columbia River. Robert A. Layfield will lead the Society on a trip to the Saddle Mountain State Park. Dr. Thomas P. Thayer will take us into the wilds of the North Santiam River. Mr. Phil Brogan has extended us an invitation to visit that very interesting locality known as the "Playground for Red-Blooded Americans" - Bend. And in case that Clarence Phillips leads us too hot a chase along the lower Clackamas River, J. C. Stevens has agreed to take us up to the Klickitat River where we may cool our feet at the "dry ice"well. For the present let us say that the following three-day week ends should be kept open:-May 29,30,31; July 3,4,5: and Sept. 4,5,6. Also be expecting a camping trip or a tour af at least one week duration.

 H. B. Schminky, Chairman

SPRUCE IN THE WESTERN MIOCENE

By George F. Beck
Science Department, Washington State Normal School, Ellensburg, Washington
(From Northwest Science of November, 1936)

One of the real surprises in store for us as we began to section specimens of petrified wood from the Vantage and certain other horizons in Central Washington, was the prevalence of a spruce type hardly hinted at in the leaf lists as published for the various sediments of Yakima time (upper miocene?)(1)

Influenced by the redwood and redwood border forests which Dr. Chaney has reconstructed for the Mid-Tertiary of this general region(2)we felt obligated to exhaust all possibility of putting many or most of these generalized spruce woods, Pioceoxylon to the paleobotanist, into the modern genus Pseudotsuga (Douglas fir). This effort has at length been abandoned and we are now in a position to contend that most of the logs involved are in fact spruce (Picea), that a small fraction of them undoubtedly represent tamarack (Larix) and that an insignificant per cent at best can be referred to the genus Pseudotsuga (Douglas fir). To support this virtual exclusion of the Douglas fir we point to the consistent absence of spirals in even the best preserved specimens, although ghost spirals such as occur in the tamarack are found in certain reddish woods. In given horizons such as the Vantage, spruce types attain a dominance approaching fifty percent, and one is immediately challenged to defend his determination of this genus in the face of the spruce-less leaf lists of the older paleobotanists.

In view of this unsuspected dominant spruce element and other discrepancies the question arises as to the advisability of including the Latah or any strictly Yakima flora (whether based upon foliage or wood) in Dr. Chaney's Mascall flora(3) When Dr. Chaney described this flora as of oak-madrono character, a forest type now found along the redwood borders of California, no one had conceived of the lowland swamp forests which succeeded each other out upon the monotonously flat lava flows of the Yakima series, nor had there been visualized the somewhat different swamp and lowland forests which undoubtedly followed the old established water courses up into the hinterland. It seems necessary, therefore, to revise and enlarge upon Dr. Chaney's Mascall type forest or to deny its widespread application to the Pacific Coast Inland Basin.

Comparing, as best we may, our Ginkgo series of dominant genera with those of Dr. Chaney's Mascall we obtain a negative result with the implication that any forest of strictly Mascall character in Central Washington during Yakima time must have confined itself to higher altitudes. On page 35 Dr. Chaney lists eleven types as dominant in the Mascall flora. We give them in his order of dominance with the number following indicating the rank we can allow each in our Ginkgo forests. Following is a list of the dominant Ginkgo genera with Dr. Chaney's Mascall standing included(4)

MASCALL FOREST

1. Umbellularia (California Laurel	0
2. Platanus (sycamore)	11
3. Ulmus (elm)	3
4. Sequoia (redwood)	8
5. Aesculus (buckeye)	0
6. Alnus (alder)	0
7. Populus (cottonwood)	0

8. Juglans (walnut)..... 5
9. Quercus (oak)..... 4
10. Acer (maple)..... 7
11. Pasania (?) (tanbark oak)(?).....0(?)

GINKGO FORESTS

1. Picea (spruce)..... 0
2. Taxodium (swamp cypress)..... 0
3. Ulmus (elm)..... 3
4. Quercus (red and white oak)..... 9
5. Juglans (walnut)..... 8
6. Liquidam (red gum)..... 0
7. Acer (maple).....10
8. Sequoia (redwood)..... 4
9. Nyssa (tupelo)..... 0
10. Fraxinus (ash)..... 0
11. Platanus (sycamore)..... 2

As for the four last types in our petrified forest list there remains the possibility that several exotic trees deserve recognition in a list of eleven dominants. At least there is no certainty of numerical cominance beyond the first seven in the list.

It is not our argument that the Ginkgo types above occur together in a restricted forest community. In fact the petrified spruces and swamp cypresses rarely occur in immediate proximity, as for instance in the Henson, a prostrate forest, an assemblage otherwise anomalous in that elm gives way to sycamore as a conspicuous element and red gum enjoys a marked dominance among the hardwoods. There is no assurance in a prostrate forest that the various included logs have been rafted in from and identical altitude or setting.

Once we had accepted spruce as a dominant member of our Ginkgo series of forests we were ready to consider the circumstances under which it may have flourished. Our attention was first given to the spruce as a high altitude element in company with such other conifers as hemlock, fir and pine. This possibility was given up when careful search yielded but the merest traces of the three other conifers named.

After recognition of the "pillow lavas" in which the logs are consistently buried(5), we were well on the way to accept the spruce as a swamp element. Further, it became necessary to review all so-called redwood specimens and demonstrate that each was not in fact swamp cypress--the foliage and woods of these two fossils are with extreme difficulty to be separated. Finally we have come to the conclusion that the dominant logs in the Ginkgo series represent swamp and lowland types exclusively, and that this characteristic is reflected in certain of the associated leaf beds.

It will simplify our problems to divide the original habitats of these dominant petrified logs into three distinct areas. (I) Shallow overflowing lakes which outlining various stream courses nourished and knew typical Taxodium swamps. With this southern low altitude tree occurred such familiar associates as white cedar, tupelo, water ash, etc. (II) Low gradient partially dammed (by lava) courses of these same streams supporting above the lava level such swamp trees as spruce, tamarack, soft maple, red gum, white and red oak. (III) Rich lowlands back into the old pre-Yakima land surface presenting to each annual flood such stream

border types as elm, walnut, maple, red and white oak. The net product of these three areas was an assemblage of rooted border trees and open water rafts which waited in the ephemeral lava lakes of the period for the next volcanic outburst. Here conditions were favorable for their entombment and petrifaction.

One interior, swamp leaf bed has been discovered in the Vantage area--in fact, it lies immediately beneath the Vantage assemblage of logs. Its apparent contrast with the Vantage logs is certainly influenced by the fact that the overlying logs are derived almost exclusively from zones two and three as outlinged above. Several marginal lakes, by which we mean beds of sedimentation along the border of the Columbian (Yakima) lava flows, have been studied. Among these are the Latah (6), Grand Coulee(7), Idaho(8) and several floras in Kittitas county which we have recently encountered. Several leaf beds promise to yield additional information relative to the more upland forests of Yakima or near Yakima time: The Eagle Creek Flora(9), the Ellensburg Flora(10) and a new "Kittitas" bed. We reserve discussion of these floras for a future paper.

In line with the acceptance of spruce as a swamp element in the Pacific Northwest Miocene is its consistent occurrence in all suites of Tertiary fossil woods which have come to my attention. No conifer is more consistently associated with such types as Taxodium and cedar in what seems to be quite generally swamp assemblages, including the Eocene coal bearing horizons. Of special significance is the prevalence of spruce in the Chehalis woods quite certainly derived from early Tertiary volcanics. Here the hardwood associates are anything but familiar American trees. This "petrified forest" contains many elements of interest and will be discussed at length in the future.

In summary, evidence gathered in the petrified forests of Central Washington is conclusive that the spruce was a conspicuous member of low altitude lowland and swamp forests in Yakima time. With it occurred dominant genera now characteristic of the Atlantic section of North America and a wide range of subdominant types now found elsewhere in the Northern Hemisphere. It is likely that the spruce flourished in areas outside the Yakima region and throughout a larger portion of Tertiary time.

REFERENCES

(1) See the writer's "Exotic Ancient Forests of Washington" in the August, 1936, issue of Northwest Science for a discussion of which this is a continuation.

(2) Chaney, Ralph W., "A Comparative Study of the Bridge Creek Flora and the Modern Redwood Forest." Carnegie Institution of Washington, Publication No. 349, pp. 1 to 22. 1925.
(3) Idem. pp. 23 to 48.

(4) Beck, George F., "Fossil Bearing Basalts." Northwest Science, November, 1935.

(5) Berry, E. W., "A Revision of the Flora of the Latah Formation." U. S. Geological Survey Prof. Paper 154, pp. 225-265, pls. 49-64. 1929.

(6) Berry, E. W., "A Miocene Flora Grand Coulee, Wash." U. S. Geological Survey Prof. Paper 170, pp. 31-42, pls. 11-13. 1931.

(7) In fairness to Dr. Chaney and his conception of a redwood forest in the Oregon Miocene, I must add that I have studied woods from the Gray Ranch on the Crooked River and they conform strikingly to his leaf determination for the

dominant Bridge Creek forest trees.

(8) Berry, E. W., Miocene Plants from Idaho. U. S. Geol. Survey Prof. Paper 185, pp. 97-123, pls. 19-24. 1934.

(9) Chaney, Ralph W., Flora of the Eagle Creek Formation. Cont. from the Walker Museum. Vol. 2, No. 5, pp. 115-181, pls. 5-22. 1920.

(10) Knowlton, F. H., in Smith, U. S. Geological Survey Atlas, Ellensburg Folio (no. 86), page 2. 1903.

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BORROWING MOVIES FROM UNCLE SAM
(U. S. Daily News)

Is it possible to obtain motion picture films from the Government for use of schools, civic organizations or other non-profit agencies?

An extensive assortment of films on a wide variety of subjects is available from Federal agencies. No central agency distributes those films but the United States Office of Education has compiled a list of the available films which it will furnish upon request. Inquiries should be addressed to the United States Office of Education, Washington, D. C.

Although most of the available pictures are silent films a number of sound films are being distributed.

Applications for films should be sent to the Federal agencies which distribute them. The films will be loaned free, with the cost of transporting them to and from Washington the only expense to be borne by the user.

Largest collection of pictures is presented by the Department of Agriculture. They cover livestock subjects, crops and crop diseases, wild animals and birds, insect pests, country life, highways, farm engineering, farm management, Federal inspection services, forestry, insects, crop marketing, meteorology.

A series of films describing life in the Navy, travel scenes, and naval operations is distributed by the Navy.

The Bureau of Reclamation of the Department of Interior has 17 films for public use, ranging from "Apple Time on Yakima Project" to "Settlement on Federal Reclamation Projects".

The National Park Service has a number of movies showing the wonders of the parks. Two films, "Land of Flaming Canyons and Subline Chasms," which is in colors, and "A Trip Through the Land of Flaming Canyons," have proved exceptionally popular.

Water power, engineering, mining and manufacturing and first aid are covered by Bureau of Mines pictures. The United States Public Health Service has films on social hygiene and health topics.

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McMINNVILLE - WILLAMINA - DALLAS & AMITY
Field Trip - March 21st
Leader - Wessley Paulsen

Caravan will assemble at Junction of westside Pacific Highway (99W) and Tillamook Highway (18). Those desiring transportation are requested to be at S. W. 6th & Yamhill not later than 7:30 A.M.

0.0	Miles	Junction Point - Leave on highway 18 at 9:00 A.M.
17.2	"	Willamina
17.5	"	Willamina Clay Products Co. plant. Seven different types of strata are exposed in the clay pit. Leave 10:00 A.M.
20.0	"	Wallace Bridge - Junction Highway 22. Various geological structural features to be seen along the South Yamhill River leave 11:00 A.M.
35.0	"	Dallas - Lunch Leave 12:30 P.M.
45.0	"	Oregon Portland Cement Co. quarry. Interesting structural features of an old land surface. An old sea cliff of Eocene limestone shows hoodoos and balanced rocks and wave made pot holes. Fossil shark teeth, fish, lobsters, crabs, sea urchins and leaves have been found. Leave 2:30 P.M.
72.0	"	Amity - Ledge of Oligocene tuff. Casts of clams, worms, gastropods and wood to be found. Break up here about 4:00 P. M.
80.0	"	McMinnville.

TOTAL - 160 Miles.

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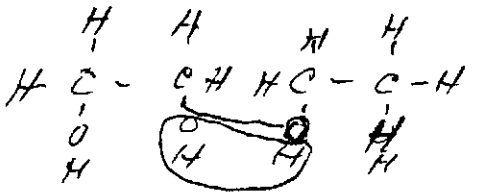

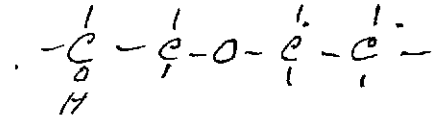

Sec. 562, P. L. & R.

DR. ARTHUR C. JONES
2640 S. W. PATTON RD.,
PORTLAND, OREGON

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol 3 - No. 6 Portland, Oregon March 25, 1937

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

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

LECTURES

March 26,1937(Friday)- Dr. Donald B. Lawrence of Hood River will address the members of the Society on the subject of "The Submerged Forest of the Columbia River Gorge". Dr. Lawrence has made extensive studies of the phenomena. The Society recently made a field trip to the vicinity of the Submerged Forest, and the address of Dr. Lawrence is very timely for the explanation of the huge slide of material which caused the Dam of the Gods and the Submerged Forest.

April 9, 1937(Friday)- Mr. Claire P. Holdredge, a member of the Society, and a professional geologist of considerable reputation, will address the regular meeting on "The Complete Geological Picture of Bonneville Dam". Mr. Holdredge has been acting Geologist for the U. S. Engineers during the period of construction and is well equiped to give a full resume of his findings. Those who have heard Mr. Holdredge before know that he is an able lecturer.

TRIPS

April 17 - 18, 1937 - Tenino Mounds
Leader: Ray Treasher.

May 1 - 2 , 1937 - Lower Columbia River
Leader: Claire Holdredge.

May 15 - 16, 1937 - Oregon State College
Leader: Dr. E. L. Packard.

May 29 - 30 - 31,1937- Bend and vicinity.
Leader: Phil Brogan and the Deschutes Geology Club.

June 19 - 20, 1937 - Saddle Mountain
Leader: Robert Layfield.

Complete details of the trips will be released later.

Reservations will be required for the Corvallis and Bend trips. These reservations may be turned in to any member of the Exploration Committee, namely:

Mr. & Mrs. Chester A. Wheeler - GA 8243

Mr. & Mrs. Leslie P. Newell - TR 7077

Joe Wimmer - TA 0597

Frank J. Bigler

H. Bruce Schminky - TA 2485

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D U E S A R E N O W P A Y A B L E - M A K E C H E C K P A Y A B L E

T O

T H E G E O L O G I C A L S O C I E T Y O F T H E O R E G O N C O U N T R Y

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OREGON'S AMATEUR GEOLOGISTS

Bend Bulletin-March 8, 1937

Like the Deschutes Geology club of Bend, the Geological Society of the Oregon Country, with headquarters in Portland, is doing a fine work in popularizing the Oregon outdoors, in bringing little known natural attractions to the attention of the public and in making discoveries that are of outstanding interest to scientists. General interest in the work of the society was attested by the attendance at the annual meeting of the organization recently in Portland. More than 250 people attended the meeting.

It is interesting to note that the Portland society since its organization in 1935 by Dr. E. T. Hodge, of the Oregon State college, visited Central Oregon on several occasions, attracted here by semi-precious stones, unusual geologic features and old volcanic phenomena. Last Memorial day, the amateur geologists were the guests of Lewis H. Irving in the Madras country and were taken on a tour of a region whose hills date back to the "dawn age" of mammal life. On that field trip, the Portland people proclaimed the Cove area, vast chasm carved by the Deschutes and Crooked River, to be one of the most astonishing features of the Oregon country.

The Portland group frequently goes far afield, under the supervision of trained geologists. On one occasion, the party was taken into the ancient Ochoco hills and to the wind and water carved basins of the John Day valley. There they learned of Oregon's ancient life, heard the story of the seas that once pounded against shores now elevated into mountains, traced the record of mammal life through millions of years and collected specimens of petrified wood in a region once covered by giant sequoias.

So greatly has the Central Oregon country impressed the society members that they have asked for an invitation to visit the Bend country this summer, to inspect volcanic features of an area that only a short epoch ago witnessed the destruction of massive Mazama and towering Multnomah and the eruption of hundreds of cones that ringed ancient Newberry with sentinel fires.

Through the Deschutes Geology club, the invitation sought by the Portland geologists has been extended. This summer Bend will probably have the opportunity of playi ng host to men and women who are reading the history of Oregon from its ancient sea shores, its elevated beaches and its once active volcanoes.

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A N N U A L B A N Q U E T

'Twas a merciless crowd of 227 Cenozoic Homo saps who stamped hungerily at the doors of the Congress Hotel dining room on the evening of February 26, 1937. It was the occasion of the second annual banquet of the Geological Society of the Oregon Country, an affair of wide portent. Many had traveled far, one distinguished gentleman having come all the way from the University of Edinburgh. (By the way that beautiful iron-gray beard did make him a handsome fellow.)

When at last the doors were opened those on the point of swooning were given a fleeting glimpse of heaven 'ere ????? There were myriads of lovely floweres, colors of every hue, golden lights shining, and soft music from the Eichenlaub Ensemble. There, in the midst of it stood Ken-Phillips beaming in his most beguiling manner. Those hardier more resistant "geodes" who had weathered many a storm found their places at the table and food, and 'twas said not such bad food at that, though at that moment they could scarcely be termed competent judges of the epicurean fancies.

At last that brave committee chairman rose from his place at table, and again in that most beguiling manner, bade us welcome. There were apologies, regrets, and due thanks expressed (done so ably in the Ken Phillips style). The floor was given to our president, Clarence Phillips, with all due grace and ceremony. A short but very interesting business meeting was conducted. We came to regret that instructions for briefness had been given. Many would have liked to know more about the splendid work the executive and other fine committees had done during the past year.

Again the good chairman rose to the floor, this time to introduce Buck Jones, that inveterate of the wide open spaces. Good looking, hard riding, with a clear blue eye and quick at the draw -- a man's man, but yet with a charm for the ladies, our toastmaster, Dr. Arthur Jones. He was ready for us, though some of us think for a moment he had a slight quaking at the knees. But his stories were pointed and his sallies were apt as he graciously called on our outgoing president for a few BRIEF words. Clarence Phillips responded and begged to remind us that his words would be BRIEF. That they were and packed full of meaning. " A right fine talk it was, and a mighty good president was he."

Now it was time for Buck Jones to use the gavel, and such a prized one, Dr. Condon's old geological pick which had served him so faithfully during

his years of geologizing in the Oregon Country. Mr. Vance, our new president, was called upon. In his shy but pleasing manner (rivaling Ken Phillips) he told us of his plans for the coming year.

Dr. Francois d' Trapperocque, K.B., F.R.G.S., Edinburgh University, was introduced. His address, "Travels and Experiences of a Geologist" was most illuminating. It was so intellectual and of such great geological import, and was delivered in such a distinguished and eloquent manner. It is feared there are no laurels left for the rest of us. Dr. Trapperocque left hurriedly as he had to catch a train. He had only stopped off in Portland to deliver his lecture to us. He was on his way to California where he was to give a lecture at the University of California. He had had rumors that a large reception awaited him there

The Limerick contest was opened. Ken Phillips used his chance to get at Mr. Vance:

Oh, whenever I get to reflectin'
On the beautiful shell of the pectin,
I remember how Vance
By an odd circumstance
Made a speech that no one was expectin'.

Before Mr. Phillips could sit down Mr. Vance was on his feet:

These limericks of course are in jest,
But I'll swear that Ken Phillips a pest
If he starts folks expectin'
To find a stone pectin
Tattooed on the front of my chest.

About this time Dr. Osgood returned minus the beard and the tonic, and we heard:

If a landslide tumbled on our friend Hodge
And though he is nimble he failed to dodge,
We'd feel bereft
But we'd have left
The world's best sample of Hodge podge.

There were many other fine limericks given.

The judges after a conference awarded first prize to Mrs. K. N. Phillips who gave us this gem:

Ken Phillips loves to hunt rocks
With which he fills box after box
His basements so full
It takes quite a pull
To make room to hang his shirts and socks.

The prize was a beautiful piece of polished opalized gingko wood. This was donated by Mr. Thomas Carney.

The G-men did their stuff! Used their talents to perfection providing us with many good laughs. There were limericks galore and poetry, what is more, but no song -- no geological extravaganzas! "But wait! What is that poking out from behind that screen over there in the corner?" someone cried. "Indians! Real Indians?" Suddenly all was quite. A young buck emerged followed by his squaw. This threw the G-men into an uproar, and we did have a song -- a real extravaganza, two of them in fact, and there were loud shouts for more. Indian Adams and his "brudder-in-law" had written their name in Geological History.

The hour was growing late and the main feature of the evening had not begun , so the lights were dimmed and Dr. Frank Jones gave us an illustrated lecture of his trip to Mt. Katmai with a group of scientists on a National Geographic expedition there. His slides were beautifully made combining the skill of the scientist and the touch of the artist. He showed some beautifully colored slides of flowers and gardens in Portland. These were exquisite but nothing could compare with the sunrise and sunset pictures of Mt. Hood. Truly, he is an artist. With the sunrise picture of Mt. Hood in the distance and the burnished gold of the little cocker spaniel in the foreground deeply imprinted in our memory the second annual banquet of the Geological Society drew to a close.

EVA CATLIN

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The following members have been appointed to serve on Committees for the ensuing year:

COMMITTEES

MEMBERSHIP: Leo F. Simon, Rose H. Jennings, Jane Hurst, H. Mildred Stockwell, Helen Brady, Leo Bissonnette.

LECTURE COMMITTEE: Dr. Edwin T. Hodge, Clarence Phillips.

EXPLORATION: Harold B. Schminky, J. Frank Bigler, Joe Wimmer, Mr. and Mrs. Chester A. Wheeler, Mr. and Mrs. Leslie Newell.

MUSEUM: C. F. Wiegand.

CLUB ROOMS:

PUBLICATION: Dr. Hodge, Editor; Raymond L. Baldwin, Business Manager.

PUBLICITY: Grace Poppleton.

CURATOR OF MAPS: Kenneth Phillips.

PUBLIC RELATIONS: Clarence Phillips.

LIBRARIAN; Raymond L. Baldwin.

HISTORIAN: Eva Catlin.

STUDY COURSES: Tracy Wade, H. F. Travis, Constance Endres, Florence and Helen Iverson.

EXHIBITS: Dr. Claude Adams, Mrs. Myra Adams.

RESEARCH COMMITTEE: Arthur Piper, Claire Holdredge, Ray Treasher, Ray MacKenzie.

SOCIAL COMMITTEE: R. R. Poppleton, Mrs. I. Poppleton, H. H. Hann, Mrs. Alys Hann, Carl Richards, Mrs. Hazel H. Haaser.

NOMINATING COMMITTEE:

COMMITTEE ON CLASSIFICATION OF BUILDING STONE IN PORTLAND BUILDINGS: Ormond R. Bean, E. B. MacNaughton, James K. Fudge, A. F. Pratt, Ray Treasher.

AUDITING COMMITTEE: Russell Collins, L. E. Kurtichanof.

COMMITTEE ON RELATIONS WITH MINERAL SOCIETY: A. W. Hancock.

COMMITTEE ON RELATIONS WITH U. S. ENGINEERS: Ray MacKenzie.

COMMITTEE ON RELATIONS WITH U. S. GEOLOGICAL SURVEY: Kenneth Phillips.

COMMITTEE ON RELATIONS WITH MAZAMAS: Carl Richards.

COMMITTEE ON GEOLOGIC MAP OF PORTLAND: J. C. Stevens, Dr. Thomas P. Thayer, H. L. Jennison, Arthur F. Samuelson, Sam Reichen.

COMMITTEE ON STATE OF WASHINGTON: Wm. W. Foster.

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A BIG HOLE IN THE GROUND

If it took a man a day to dig a 3 foot hole in the ground, how long would it take him to dig half a hole? Or just what is a hole anyway? There are some tall stories, such as being in this country when Mt. Hood was merely a little hole in the ground, but again we find that truth is sometimes stranger than fiction.

At a recent meeting of the American Institute of Mining Engineers, a mining engineer, Mr. J. B. Newsom told of drilling a hole that is a hole. Five feet in diameter, sixty inches. The repetition is to prove that it is not a typographical error. The drill is operated by a 40 h. p. motor and teeth located on the bottom of the drill-barrel do the cutting. At convenient intervals, pieces of the enormous core are hoisted up the tube. Mr. Newsom indicates that the hole is 1,125 feet deep. He intends to hollow out a room at this level, lower his drilling machinery, and continue drilling. He doesn't say what he is drilling for.

(RCT)

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OIL

We had nineteen field trips during the year 1936. It would be hard to say which of these was the best. They were all good and for the most part well attended. If any one questioned the interest in these trips, consider the kind of weather we had on our December trip, "The Dam of the Gods." It rained practically all day, still we had 14 cars and about 40 members on this trip. If we are to consider success of trips from an attendance standpoint, there were four or five which were outstanding:

McMinnville - 117
Sauvie Island - over 100
Madras - 85
Eagle Creek - 70
Upper Clackamas - 63
Vancouver - 60

STATISTICS

Longest trip: John Day-Ochoco Mts., August 31-September 2, 1935, 550 miles
Shortest trip: Portland, January 19, 1936, 20 miles
Greatest Turnout: Skamania, June 23, 1935, 120 persons. McMinnville & Vicinity, April 26, 1936, 117 persons.
Smallest Turnout: Heisson Trip, January 18, 1937, 18 persons. Blizzard weather.
Trip With Most Picture Book Geology: Warm Springs, September 28-29, 1935.
Best Field Laboratory Demonstration: Soil Study Trip, April 12, 1936.
Trip with Most Varied Interest: Corvallis, Oregon State College, November 23-24, 1935.
Trip That Cannot be Repeated: Buried Forests of the Columbia, December 13, 1936.
Hottest Trip: Pandemonium Creek-Ariel Dam, July 14, 1935.
Coldest Trip: Newberg and Vicinity, February 15, 1936.
Wettest Trip: Silverton and Silver Creek Falls, October 20, 1935.
Most Dusty Trip: Pandemonium Creek, July 14, 1935.
Best Fossil Find: Two Turtles, John Day trip, 1935
Most Important Geological Find: Troutdale (?) gravels, west of Buxton, Forest Grove and Vicinity, May 17, 1936.
Total Trips to Date: 34. Only one scheduled trip has never been held - The Lower Columbia River, October 10-11, 1936.

HEILITES

"Willamette Sound," lecture by Dr. Ira S. Allison, Jan. 9, 1936. Whether you subscribe to the Willamette Sound, Spokane Flood, Allison Flood, or some other theory, the many discoveries provide plenty for everyone to think about.
"First Annual Meeting," Feb. 27, 1936. Surprize and joy ruled the night.
"Geologic History of the Harney Basin," lecture by Arthur M. Piper, Mar. 12, 1936. High lights from the "High Desert".
"Soil Types in the Vicinity of Portland," field trip conducted by Prof. W. T. Powers, April 12, 1936. Dirt ain't dirt, its soil. Identification of soil types is an important geologic aid.
"Madras and Vicinity", field trip conducted by Joe Wimmer and Lewis (Turk) M. Irving, May 30-31, 1936. Who won't long remember Tue Cove, looking for a place to sleep in Madras after fishermen had beaten most of us to the hotels. The bonfire and "Turk" himself.
"Copper City, Silver Star Mt., and Vicinity," field trip conducted by Joe Wimmer and Claire Holdredge, June 14, 1936. Copper City wasn't a City; Silver Star wasn't a Star, but a thunderstorm was wet.
"Topographic Maps," lecture by Lewis McArthur, June 26, 1936. Everyone learned many new things about maps, and that Oregon is sadly lacking in its topographic mapping program.
"Mt. St. Helens and Spirit Lake," field trip conducted by Ray Treasher, July 4-5, 1936. The story of the Spirit Lake Apes and the walk we might have had across, or around the Lake.
"Diamond Mining in Africa," lecture by Claire Holdredge, July 24, 1936. Unfortunately he forgot to bring his gift specimens. Most anyone would like to stumble on a Hope Diamond or even a little bitsy one. After all Africans are real niggers.
"Upper Clackamas River," field trip conducted by Clarence Phillips, August 23, 1936. Everyone enjoyed the speeder with many special stops, the interesting Clackamas and the seven-foot cougar (thoroughly dead).
"Sauvie Island," field trip by Franklin J. Davis and George F. Shepherd, Nov. 15, 1936. Members will remember the Warrior Light Rock, Keeper Caldwell's and Mr. Shepherd's lectures, rough roads, and an hour's wait for the ferry that evening or were you more fortunate,

ANNUAL MEETING COMMITTEE

Kenneth N. Phillips, Chairman
Mr. & Mrs. Amza Barr
Thomas Carney
Miss Eva Catlin
Dr. & Mrs. Arthur C. Jones
Mrs. Nan Kurtichanoff
Ray E. Mackenzie
Leslie P. Newell
Dr. & Mrs. Edwin E. Osgood
Clarence D. Phillips
Mrs. Irene Poppleton
Ray C. Treasher

SECOND ANNUAL MEETING

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

FEBRUARY 26, 1937

Congress Hotel | 6:15 P. M. | Portland, Oregon

MENU

Miocene Molluscoidae
(Seafood Cocktail)

Friction Breccia
(Fruit Salad)

Elephas columbi et volcanic agglomerati
(Veal Roast and dressing)

Limonite pseudomorphs
(Brown potatoes)

Leolites
(Buttered peas)

Concretions
(French rolls)

Pleistocene glacial deposits
(Ice cream)

Beach shingle
(Wafers)

Pliocene Precipitation
(Coffee)

P R O G R A M E

Dinner.

Music by Eichenlaub Ensemble.

Business meeting.

ANNUAL MEETING

Introduction of toastmaster, Kenneth N. Phillips.

Toastmaster, Dr. Arthur C. Jones .

Address by retiring president , Clarence D. Phillips .

Address by incoming president .

Music by Eichenlaub Ensemble .

Geological limericks.

Special surprise .

Vocal duet - Dr. W.C.Adams and Dr. E.R.Abbett .

Hunting song .

Indian song .

Mrs. Adams at the piano.

Address , " Travels and experiences of a geologist ",

Dr. Francois d' Trapperocque,K.B.,F.R.G.S.,

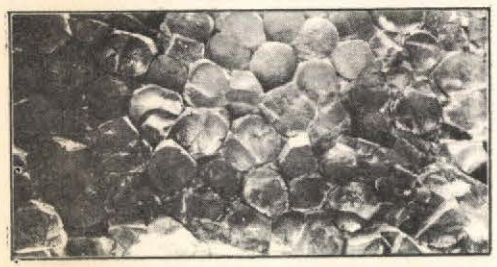
Edinburgh University.

Illustrated lecture , " Mount Katmai and the Valley of Ten Thousand

Smokes " , Frank 1. Jones.

G-SOC ers scramble around a big 150 -ton argillite erratic near Bellview,Oregon.

Geologists examine Diatomaceous earth deposit and quarry near Terrebonne,Oregon.



Vertical view of columnar basalt overhanging cliffs at Latourelle Falls along Columbia River highway.

Indian writings on bank of Columbia River near Wishram,Washington.

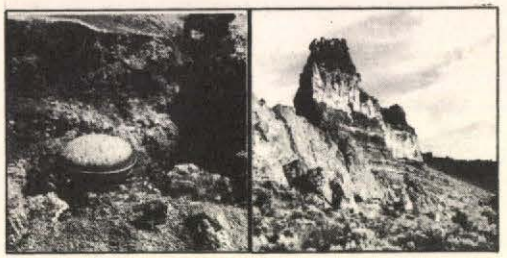
Our president in meditation.

Dr.Packard poses during John Day trip.

Davis,Dr.Hodge and Leo must be studying a map.

G-SOC ers looking down on something.

Must be the fumaroles in the Valley of Ten Thousand Smokes.



In the Valley of Ten Thousand Smokes Frank Jones enjoyed corn bread for breakfast cooked on the bare ground.

View of " The Peninsula " between Crooked and Deschutes rivers.

G-SOC ers on Rocky Butte listen to lecture. Must have been a cold day.

Light keeper E.N.Cadwell of Warrior Rock light delivering paper to G-SOC ers on navigation aids.

Two Stanleys on a speeder up the Clackamus.

Rev Treasher finds his hands useful in telling em all about it .

Two Madras groups , Leo Simon seems to be the point of interest in one and Turk Irving in the other .

TREASURER'S REPORT FOR YEAR ENDING FEBRUARY 28, 1937

Cash on hand as of March 1, 1936			$275.73
Receipts:			
Memberships		290.50	
Refund 1936 Banquet		4.50	
From Sales Bibliography		5.00	
Trip Fees		11.25	
Bulletins Sold		1.35	
One Subscription to Bulletin		2.00	
Total Receipts for Year			314.60
Total Cash Receipts			590.33
Disbursements:			
Bulletin:			
Printing	115.00		
Postage	53.39		
Maps & Charts	3.50		
Supplies, Ink			
Stencils & Staples	66.63		
Paper	56.12		
Total Cost of Bulletin		294.64	
Miscellaneous Postage		6.83	
Printing Bibliography		5.00	
Fidelity Bond for Treasurer		5.00	
Stationery, Letterheads & Envelop		11.75	
Labels for Cars. (Two Lots)		9.50	
Printing Membership Cards		2.00	
Printing Two Mailing Lists		2.50	
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Lecture Expense		20.50	
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Mabel C. Smith
Treasurer.

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PETROGLYPHS AND THEIR INTERPRETATION

Summary of the lecture before the Geological Society of the Oregon Country
Portland, Oregon, December 11, 1936

by
L. S. Cressman, Professor of Anthropology, U. of O.

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In Oregon, we find that there is a very distinct difference in the distribution of the pictographs and petroglyphs. The Willamette Valley is a petroglyph region, as is southeastern Oregon, south and east of the line running north through Warner Valley, which then bends northeast, running south of the Harney-Malheur Basin and continuing on to Idaho. The remainder of the state is a region of pictographs.

The Columbia Gorge probably needs to be treated as a separate region because there are series of both types of designs found in that area.

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The designs of the southeastern part of the state tend to shape themselves around a circle motif and in many cases are traceable to Arizona as their proper origin, although there seems to be a local point of diffusion on the Upper Owyhee about Watson.

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THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol 3 - No. 7 Portland, Oregon April 10, 1937

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

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

Bulletins issued semi-monthly on the 10th and 25th.
Yearly subscriptions..... $2.00
All material for publication in the Bulletin should be sent to the Editor.
Address all other correspondence regarding the Bulletin and changes of address to the Business Manager.

LECTURES

April 9, 1937(Friday)- Mr. Claire P. Holdredge, a member of the Society, and a professional geologist of considerable reputation, will address the regular meeting on "The Complete Geological Picture of Bonneville Dam." Mr. Holdredge has been acting Geologist for the U. S. Engineers during the period of construction and is well equiped to give a full resume of his findings. Those who have heard Mr. Holdredge know that he is an able lecturer.

TRIPS

April 17 - 18, 1937 - Tenino Mounds
Leader: Ray Treasher.

May 1 - 2 , 1937 - Lower Columbia River
Leader: Claire Holdredge.

May 15 - 16, 1937 - Oregon State College
Leader: Dr. E. L. Packard.

May 29 - 30 - 31,1937- Bend and Vicinity
Leader: Phil Brogan and the Deschutes Geology Club.

June 19 - 20, 1937 - Saddle Mountain
Leader: Robert Layfield.

Complete details of the trips will be released later. Reservations will be required for the Corvallis and Bend trips. These reservations may be turned in to any member of the Exploration Committee, namely:

Mr. & Mrs. Chester A. Wheeler - GA 8243
Mr. & Mrs. Leslie P. Newell - TR 7077
Joe Wimmer - TA 0597
Frank J. Bigler
H. Bruce Schminky - TA 2485

D U E S A R E N O W P A Y A B L E - M A K E C H E C K P A Y A B L E

T O

T H E G E O L O G I C A L S O C I E T Y O F T H E O R E G O N C O U N T R Y

NO BULLETINS WILL BE MAILED AFTER APRIL 25TH TO THOSE WHOSE DUES ARE IN ARREARS

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THOSE MEMBERS OF THE SOCIETY WISHING TO HAVE THEIR BULLETINS BOUND PLEASE GET IN TOUCH WITH THE BUSINESS MANAGER.

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ACTIVITIES OF OUR MEMBERS

APRIL 1, 1937

Claire P. Holdredge spoke before the Portland Federal Business Association on the subject "Geology of Bonneville Dam and Vicinity."

* * * * *

MARCH 12, 1937

Russell Collins spoke before the Mazamas on the subject "Geology of the Cascade Mountains."

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TOPOGRAPHICAL MAP OF COUNTRY PLANNED

(Morning Oregonian - March 31, 1937)

WASHINGTON, March 30, (AP) — Senator Steiwer of Oregon said today that Senator Hayden of Arizona had assured him that his sub-committee on interior department appropriations "would not object" to a nation-wide topographical mapping program.

The interior department has proposed such a program at an estimated cost of $100,000,000.

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EARTHQUAKES

Earthquakes, as well as wars, land purchase and treaties, have been known to increase considerably the size of a country. In 1822 an earthquake in Chile permanently raised its coast and added more than 100,000 square miles to its land area. -- By Mrs. Marrian Talley, Chicago, Illinois.

From Colliers Magazine of August 1, 1936

OREGON COUNTRY GEOLOGY

Northeastern Washington

The U. S. Engineers are conducting a Mineral Survey of the Pacific Northwest States. This work has been authorized by Col. Thomas Robins, Division Engineer of the North Pacific Division, and is under the immediate direction of Dr. Edwin T. Hodge, Consulting Geologist. The following notes were taken while the Party was in the field.

The following notes are impressions of the geology of an area somewhat beyond the reach of our usual G. S. O. C. field trips. Still, it is Oregon Country geology, and as such may be of interest to members of our Society. Our trip gave us a sort of cross section of geology east from Portland, through the Palouse region to Spokane, and northward through the Colville Valley to Kettle Falls.

Most of the country from here to Spokane is underlaid by the famous Columbia River basalt, which needs no introduction to G. S. O. C. members. As one goes eastward from Pasco to Pullman, through Kahlotus, Washtucna and Hooper, the flows of basalt appear to be nearly horizontal but some investigators feel that there is a regional dip to the southwestward.

The general trend of the highway east from Pasco to Kahlotus is upward. At Kahlotus, however, the road suddenly descends in sweeping curves to one of the "glacial channels" which were given considerable publicity by Betz(1) From here to LaCrosse the highway follows one of these channels and the traveler has an excellent opportunity to study the effects of erosion and erosional remnants. They are of a size and magnitude to stagger the imagination. The problem of the origin of these channels has not yet been definitely settled. Betz(1), Hodge(2), Allison(3) and others have offered hypotheses and it is understood that Dr. Flint of Yale is to break forth with another, at an early date.

Eastward from LaCrosse, the highway centers the true Palouse country, with typical Palouse topography, the famous "bread-basket of the world". The Columbia River basalt underlies the area and is practically horizontal. On top of the basalt is a 250 foot blanket of silt which has been eroded to smooth, rounded hills, with dendritic drainage, - the Palouse Hills. The major streams have cut deeply into the basalt, so there is a mature topography perched on a very youthful plateau.

Russell(4) first considered these Palouse Hills as residual from the underlying basalt. Later investigators, noting the smooth SW and steep NE slopes, the dust storms pushed by prevailing SW winds, concluded the hills were dunes, and thus of wind blown origin. Treasher(5) found a laminated, or finely stratified phase of the silt, which he named the Palouse formation and from various evidence concluded that they (the hill) cannot by any chance be formed by wind action. He further indicated that the silt is a true glacial loess. The controversy still rages. Mrs. Ralph Lupher(6) has recently conducted some investigations which may materially alter or prove some of the present ideas.

at any rate, this remarkable silt, which stands with vertical, loess-like walls in road cuts, and moves like a fluid when water soaked, has developed

a soil which has produced millions of bushels of wheat. In the early summer, these fields of waving grain present a beautiful sight, one long remembered, and a study for the color photographer.

Above the tops of the Palouse Hills rise a few prominent buttes, such as Kamiak and Steptoe Buttes. These are supposed to be composed of Pre-Cambrian and Paleozoic metamorphic rocks, or Mesozoic gneiss. They represent old mountain peaks of the terrain before the basalt flood. The lava lapped up the side of the old valley like water filling a reservoir, and these peaks remain as islands. Farther east, across the Idaho line, beyond the limits of the Columbia Basalt, rise the peaks of various ranges which ultimately flank the Bitter Root Mountains.

These Buttes have played an important part in the development of the Inland Empire. Steptoe Butte, north of Colfax, for example, was named after Col. Teptoe who had a rather unfortunate experience here. He and his detail of U. S. cavalry almost enacted a tragic "Custer's Last Stand" but escaped by the aid of faithful Indian scouts. He was opposed by cohorts of the wily Chief Kamiaken, who ranks with the famous Chief Joseph as a strategist. I. C. Russell(7) coined a word to designate buttes of this type which do not belong to the present erosional cycle, the word "steptoes", from Steptoe Butte.

Nearer Spokane, are the sediments of the Latah Formation(8), which are interbedded with some of the later basalt flows. These flows were supposed to have created lakes as they extended eastward and cut off westward flowing streams. These Latah sediments contain leaf impressions in great abundance and are fertile collecting grounds for paleobotanists. In certain localities the sediments are almost entirely composed of clay.

It might be mentioned here that the interest of paleobotanists in this Latah flora, was largely stimulated by a group of amateur geologists at Spokane. These amateurs made some valuable collections, and as a result a Professional Paper(8) of the U. S. G. S. was written. Their work was a material aid to the stratigraphers and paleobotanists of the survey. This same group also discovered some new minerals as cavity fillings in the basalt one of which is Sphaerosiderite.

This matter should be a stimulus to members of the G. S. O. C., as to the ultimate service they can render to science. So many discoveries are made by amateurs. Research men are so involved in their detailed investigations that they are unable to spend time prospecting for new localities. The amateur, like the prospector, gets his thrill from the search and the discovery, and science is permanently benefited.

There is a great deal of evidence of Pleistocene glaciation around Spokane. It will be remembered that the Cordeilleran ice sheet sent fingers of ice down the various valleys into Washington. The Spokane area is well covered with outwash material from these ice sheets. Almost any highway or railroad exposes these deposits in cuts and they offer the student of glacial geology some excellent pages for their note books.

The valley of the Little Spokane River has been filled with these glacial deposits to form a wide valley floor. Subsequent erosion has entrenched many of the streams in the gravels and exposed the underlying rocks.

A few miles north of Spokane on U. S. Highway #395, may be seen some of their underlying rock which proves to be a granite. It is deeply weathered and when dug out it frequently crumbles to a coarse sand. It is the Loon Lake Granite, so named by Weaver(9).

This granite is supposed to be part of the great Idaho batholith which was intruded in Mesozoic, probably Jurassic, time. The extent is enormous, being found in Idaho, southern B. C., northern and eastern Washington, and eastern Oregon. Farther south, there was a great intrusion of about the same age, which is well expressed in the Sierra Nevada Mountains. These may all be more or less related in age. The Jurassic probably has a time measurement in millions of years and these intrusions could still be separated by thousands of years and yet be the "same age".

This Loon Lake granite, thoughout the Spokane area, is unique in two ways; the depth of weathering, and the intruded pegmatite dikes. One excellent exposure of these pegmatite dikes occurs at Dartford, some 10 miles N. of Spokane on highway #395. The granite is well weathered and in some places, can be dug out with the fingers. Resistant pegmatite dikes cut the granite in many directions, and a study of them indicates that they followed joint planes. The dikes vary in width from 1 foot to 1 inch. Feldspar is the chief mineral, with subordinate amounts of quartz. "Books" of muscovite and biotite mica up to an inch in diameter are common. Other minerals are present, but these are the principal ones.

The highway takes the traveler out of the stream channel and up to the outwash plain. To the east are the hills of granite, Mt. Spokane the high peak. To the west are low hills of granite. At a point about 15 miles from Spokane, the Munroe or Wild Rose Prairie road takes off to the west. This will take us to Silica Hill.

Silica Hill is a low knoll, rising about 200 -300 feet above the outwash plain, and almost hemispherical in shape. It is composed of pure quartz, of dazzling white where not covered by lichens. The contact rock is granite and from field relations it must be concluded that the quartz is of pegmatitic origin. Near the contacts, the quartz contains spots of foliated biotite, small segregations of feldspar, and an occasional small bit of molybdenite. a few feet from the contact, the quartz seems to contain nothing but quartz, although the surface may be iron stained. On either side, parallel to the contacts, there is a wide "crack", filled with water worn pebbles of quartz, quartzite, granite and metamorphics, as well as a clay filling. Apparently the hill must have been covered at one time by water which would deposit this foreign material. The presence of occasional erratics over the surface of the hill leads to the conclusion that it was covered by glacial waters.

Silica Hill is truly a most unusual feature. The Hill and the surrounding granite ridges could well form the basis of many a day's field trip, with new things being found each trip.

Between Deer Park and Clayton there are many clay pits, most of the clay belonging to the Latah formation. The Washington Brick, Lime and Tile plant is located at Clayton. A trip through their plant is very interesting and well worth while. Some of their clay pits are located right around the plant, others are up to six miles away. A great deal of clay is stored around the plant.

Springdale is rather an imporrtant place, as far as topography goes. South of here, the drainage is southward, through the Little Spokane River. Northward, the drainage is north, through the Colville River which enters the Columbia just below Kettle Falls. Glacial ice came southward through the Colville Valley as is indicated by glacial strial on the bed rocks. But the drainage which finally developed is northward, toward the old retreating ice front.

The valleys tributary to the Colville Valley contain many beautiful lakes, of which Loon Lake is one of the larger and more accessible. It is a popular resort spot for Spokane vacationists, as well as being the type locality for the Loon Lake granite. Many of these lakes appear to be pockets in the old outwash material which must have filled the entire valley at one time.

Some of the tributaries have beautifully developed gravel terraces where they discharge into the main valley. Some of these terraces are of the by-pass type, especially prominent in the Chewelah area.

We are now definitely in the area of Paleozoic rocks, a new experience for many of us. The silts, muds, sands, calcareous materials were deposited in a Paleozoic syncline which lay west of the Rocky Mts. It is estimated that some 40,000 feet of material was deposited(9). Since that time the sediments have been folded repeatedly, on a general N.E. - S.W. axis, intruded by the Mesozoic batholith, until the sediments are now metamorphosed to argellites, slates, limestone and marbles, quartzites, etc. Faulting has played an important part also. In fact, the structure of the area is very complex and has never been satisfactorily worked out.

The first really close view of these metamorphics is just north of Valley. The highway follows along a ridge of quartzite for 1½ miles, around Inkler's Point. This quartzite is sandstone, cemented with silica until it fractures and "acts" like it were quartz. Near the N.W. end, the state highway has trapped and crushed this quartzite to make the road over which we travel. It is mixed with asphalt to form a type of surface called "armor-coat" and the quartzite makes an exceedingly durable road.

At the very top of the ridge are glacial chatter marks and strial. The grooves trend north-south and the chatter marks are convex to the south indicating that the ice was moving southward. The surface has many scattered "erratic" pebbles, some of them with glacial strial. So there is no hesitancy in saying that glacial ice completely overrode this ridge.

Around the nose of Inkler's Point, the highway has an east-west direction for ½ mile and road cuts expose rock which Weaver(9) has called the Chewelah argillite. It looks much like a slate, which it is, and is considerably iron stained. This rock has been sheared so much that it would be almost a waste of time to look for any megascopic fossil evidence.

The highway into Chewelah has a deep drainage ditch on the east side. A silt with peculiar banding is exposed here and is probably a varved clay. The laminations in a varved clay are supposed to indicate seasonal variation in deposition. A great deal of work has been done on varved clays in the East and Middle West.

The Northwest Magnesite Company has its plant a mile south of Chewelah.

There are only two localities in the U. S. where commercial quantities of magnesite are known to occur, - one in California, and the other in the area west of Chewelah. The magnesite is brought down from the quarries over an aerial tram, 6 miles long. It is ground and burned to produce MgO, magnesium oxide, and is used for making high grade refractories. A certain amount of iron ore is mixed with the magnesite before burning, for certain types of refractories.

An interesting by-product is their Thermax insulation board. The insoluble magnesite is treated with sulfuric acid, making the soluble magnesium sulfate. This is used as one of the ingredients to impregnate wood shavings. The mass is pressed into the shape of boards and dried. It is reported to make an excellent sound and heat insulation.

An oil well is in the process of being drilled, a mile or two north of Chewelah. So far as is known, the underlying rocks are Paleozoic and Pre-Cambrian rocks which have been intensely metamorphosed. It would appear that the chance of striking oil in commercial quantities is slight, but then ---.

Still more quartzite is exposed along the highway northwest of Chewelah. Near the railroad station of Blue Creek, a different rock appears in road cuts. This is a greenstone, and represents an altered basic igneous flow. The rock has a greenish cast on fresh surfaces, and is quite tough.

More quartzite at Addy. The mountain west of Addy is Iron Mt., and in this locality, some Paleozoic fossils have been found. It is reported that they occur in the quartzite. None were found by the U. S. Engineer party however. An interesting feature is the half mile long talus slope of quartzite blocks, that occurs just north of Addy.

Granite is the next rock which is found outcropping. This is some more of the Loon Lake granite, and it is exposed more or less continuously all the way to Colville. An occassional limestone outcrop is noticed along the highway however.

The highway turns westward at Colville, heading for the crossing of the Columbia River at Kettle Falls. These falls are particularly beautiful. The river writhes and twists and plunges over the upturned edges of a resisted quartzite and siliceous slab outcrop. When the high dam is completed at Grand Coulee, the falls will disappear, for the water level will be several feet above the floor of the present bridge.

These Paleozoic rocks, as exposed in the Colville Valley, present an interesting problem to the amateur and professional geologist alike. The structure is so complex, that only the most careful and detailed examination will produce results which can be verified. Here would be a wonderful field for a group of amateurs to carefully record dips and strikes, and make elaborate suites of specimens, to help unravel the mystery of metamorphism.

(1) Betz, J. Harlan, (see various articles in Journal of Geology, Geol. Soc. of Am. Bulletin 1923 -1934)

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"Origin of the Washington Scablands" (International Geologic Congress, 16th Session, 1933, v. 2, p. 1105, 1936. Northwest Science v. 8, no. 3, pp. 4-11, 2 figs., Sept. 1934. Abst Pan-American Geologist v. 62, no. 2, p. 155, Sept. 1934)

(3)Allison, Ira S., "New Version of the Spokane Flood" (Geol. Soc. Am. Bull. #44, pp. 675-722, 1933)

(4)Russell, J. C., "A Reconnaissance in Southeastern Washington"(U. S. G. S. Water Supply Paper #4, 1897)

(5)Treasher, Ray C., "Geology of the Pullman Quadrangle" (State College of Washington, Master's Thesis, 1925)

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Bryan, Kirk, "The 'Palouse Soil' Problem" (U. S. G. S. Bull. #790, pp. 21-46, 1927)

Kirkham, V. R. D, and others, "Origin of the Palouse Hills Topography" (Science, n. l., v. 73, pp. 207-209, Feb. 20, 1931)

(6)Lupher, Mrs. Ralph., personal communication.

(7)Russell, I. C., (see above)

(8)Pardee, J. P. and Bryan, Kirk, "Geology of the Latah Formation in Relation to the Lavas of the Columbia Plateau near Spokane, Washington" (U. S. G. S. Prof. Paper #140, Pt A, pp. 1-16, Feb. 19, 1926)

Knowlton, Frank H., "Flora of the Latah Formation of Spokane, Washington and Coeur d' Alene, Idaho" (U. S. G. S. Prof. paper #140, pt A, pp. 17-82, Feb. 19, 1926)

(9)Weaver, Charles Edwin, "The Mineral Resources of Stevens County" (Wash. Geol. Survey, Bull. #20)

Ray Treasher

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ROOT LENGTHS OF PRAIRIE GRASSES

The recent dust storms and drouth conditions of the Great Central Plains, the erosion of the rich soils in the Palouse region of Eastern Washington, and the central Oregon Valley, have increased the interest in vegetation which will take root, grow, and prevent the destruction of these areas as agricultural centers.

A crested wheat grass has been introduced into the Americas from western Siberia which has been remarkably successful in weed control, erosion prevention, and providing a good forage plant. Mr. T. K. Pavlychenko, of the University Saskatchewan, began an investigation of the root system of this crested wheat grass.

He very carefully dug up a bunch of this grass, the work taking a week. The soil was softened with a water spray and then began the arduous labor of uncovering and measuring the root system. Using a fine, brush-like spray of water, each little root and rootlet was exposed, measured and plotted. The results showed that the single column of roots had a total length of 319 miles, and originally occupied a soil mass 7 feet deep and 4 feet square.

While the striking fact to the casual observer is the enormous root system, the work of Mr. Pavlychenko may have some important biological developments. The same technique could be followed in studying nitrogen-capturing plants, such as legumes, and for a study of parasitic plant diseases.

(RCT)

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NORTHWEST GEOLOGY — Washington — Recent Bulletins

Glover, Sheldon L., "Preliminary Report on Petroleum and natural Gas in Washington" (State of Washington, Dept. of Conservation and Development, Division of Geology, Report of Investigations, No. 4, 24 pp., Olympia, 1936)

The purpose of this Report is to set forth in simple terms the essential facts of oil and gas occurrence as applied to the geologic conditions on Washington. Discussions, both verbal and published, have included so much sheer speculation without adequate factual basis, that the Report has been deemed necessary. As studies have been completed in but few areas, the result of this publication is that of a preliminary geologists and constitutes an authoritative report.

Conditions of origin and occurrence of oil and gas are considered as well as those unfavorable. Particularly as to the State of Washington, the areas and formations unfavorable for production. The favorable areas in eastern Washington exist in the Wenatchee region, and the Columbia basalt plateau. This latter region has a producing locality on the Rattlesnakes Hills in Benton County. Analyses of the gas from this field are given. In western washington, the areas considered are: Whatcom, Skagit, Snohomish, King, Pierce, Island, Kitsap counties; southwestern Washington; northeastern Jefferson, and northern Clallam Counties; West coast of Olympic Peninsula. There is a selected bibliography.

The Report will prove interesting to students of Washington's natural resources, and perhaps to investors in "wild-cat" operations. Copies may be obtained by writing the Department of Conservation and Development, as stated in the reference at the beginning. The cost is not known.

(RCT)

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NATURAL MOUNDS OF THE TENINO (Washington) AREA

Natural mounds are not an unusual feature of topography, but when a situation arises that puzzles the worlds best geologists, that is news. When these men, who have been interpretating physiography for years cannot agree on a simple (?) thing like the origin of a bunch of bumps, the bumps should be worth a short consideration.

The mounds in question are located in western Washington within an area bounded by Olympia on the north, town of Rainier on the east, Bucoda on the south. On the west the boundary extends down the Chehalis River valley to below Oakville. Most of this area lies within Thurston county, and is largely covered by the Chehalis quadrangle.

As early as 1842, Wilkes observed them with the view of human origin as burial mounds or the work of Indians. He found no evidence to support this contention however, and neither has anyone to this day. In 1873 Gibbs sent notes about them to the famous Agassiz who unhesitatingly stated that they represented nests of suckers or some other fish. In the same year LeConte decided that the sediments represented here were deposited in water, and then as erosion proceded, vegetation took root on the hummocks and further protected them. In 1884, Newberry frankly stated that their origin was inexplicable. In 1893, G. O. Rogers made a reconnaissance and concluded that the locality was covered with piedmont ice which was in turn covered by debris. Super-glacial floods heaped this material, and insulation caused the ice to melt thus dumping these heaps onto the ground. Shortly thereafter it was suggested that the mounds were developed sub-glacially; that escaping sub-glacial waters eroded the drift into a nature topography. Upham in 1904 decided that these mounds were similar to commonly hilly moraine belts of other drift areas. Other modes of origin which have been suggested are that trees occupied the center of these mounds and that leaf mould and dirt collecting around the trunk caused the elevation. Later the trunk decayed out. This idea still attracts considerable attention and it is suggested that Society members be on the look-out for this feature. Another suggestion is that the mounds are the work of ants. They have also been identified as kames, and as kettles.

All of these hypothesis have difficulty in remaining in the picture. Plenty of evidence seemingly can be presented to disprove any or all of them. J. Harlan Bretz in his paper "Glaciation of the Puget Sound Region", pp. 81-108, Bulletin #8, Washington Geological Survey, 1908,(this bulletin is in the Portland Library) sets forth the following limitations of these hypotheses:

1. They were formed at the time of the gravel outwash with an absence of kettles.

2. They were formed during the last stages of outwash and are not stratified. The earlier material is all stratified.

3. The mounds are constructional. Channel origin is impossible.

4. Intermound pebbles were not deposited by agencies which formed the mounds. The mound-areas have a cobble strewn floor. He suggests that the mounds may be due to:

   a. reworking of the upper gravel, and heaping of the fine material.

b. additional deposition after the cobble pavement was formed.

c. possible formation at a time when the upper few feet of gravel was first deposited.

5. Origin of the black silt not intimately related to the mounds. It occurs from Montesano to San Juan Islands. It is not humus. The mounds are virtually till, but is much more "open" than the other till.

6. The various levels of the prairie mounds throws difficulties in the way of their being formed in connection with an ice sheet.

Bretz further sets forth conditions controlling the construction of acceptable working hypotheses. These conditions give an impression of the Mima type mounds gained from a careful field investigation:

1. The mounds are regular in form, symmetrical, with a height of 7' - 8', and a diameter of 7' - 60'. However, in any one area, the size and shape is uniform.

2. There is almost invariably an accumulation of pebbles between the mounds. Sometimes the pebbles may also be found within the mounds and sometimes not. There is no particular accumulation at the base of the mounds as would be expected if the pebbles were eroded out of the mounds themselves.

3. All prairies of the region bear superficial black silt. This silt however is not organic as was found when the black material was ignited. In some cases the silt is as thick as the mounds are high with a thin layer in the inter-mound area.

4. In relation to the morainos, at Mima they are outside the terminal moraine and are developed at two levels. The mounds on the lower surface have the best development. At Rocky Prairie they have formed between the terminal and recessional morainos. They never occur on surfaces other than those of glacial gravel and are best developed on plane surfaces of slight grade.

5. The mounds are structureless.

On this field trip, we will have an opportunity to study these mounds in their natural surroundings. It is reasonable to expect that some member of the Society may find some small feature which may serve as a clew to the final identification of the origin of the hummocks. Evidences of the glaciation of western Washington will also be discussed and observed. A brief inspection of the older formations, with fossils for the "fossil-hunters", will be provided.

Hotel Accomodations:

Centralia:

Lewis-Clark Hotel:	Without bath,	$1.50 single; $2.00 double
	With bath	$2.00 single; $2.50 double
Centralia Hotel:	Without bath	$1.00 single; $1.50 double
	With bath	$1.50 single; $2.00 double

Meals: There are numerous eating places, and rates vary as one wishes. Lunches will be in order, for Sunday. There is no place to buy a lunch at the noon stop.

LOG OF TENINO NATURAL MOUND TRIP

Leaders: Ray Treasher and Reg Reynolds

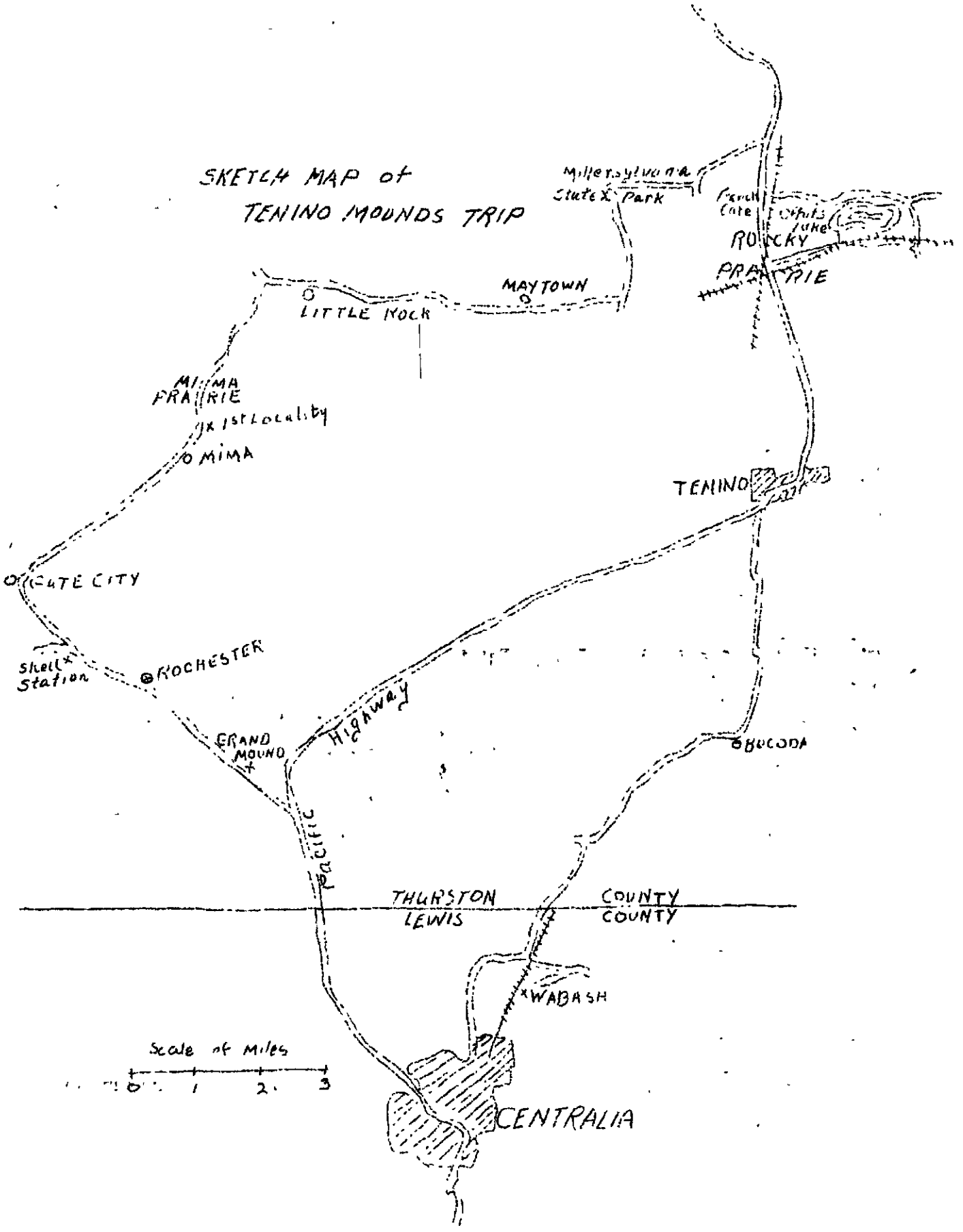
Saturday, April 17; leave Portland 1:30 P.M. from 6th and Yamhill. Meet in Centralia, at Lewis-Clark Hotel, 5 P.M. - 103 Miles.
Short trip to Wabash mine (now abandoned) to visit an Eocene locality. 7 coal seams exposed. Sedimentary strata contains some excellent fossils, oysters and Turritella and others.

Sunday, April 18: Leave Centralia, Lewis-Clark Hotel at 8:30.

0.0	Centralia, leave by Pacific Highway north
5.7	Junction Grays Harbor Highway, turn left
7.4	Grand Mound, famous landmark. Interesting gravels and sediments.
10.4	Rochester
12.4	Turn right, at Shell Station, to Gate City
13.7	Gate City, turn right along R.R. track. Cross track to left-hand side about 200 yards farther on
18.2	Mima station, beginning of natural mounds. This area from Gate City, northeastward is one of the main channels used by Vashion glacial water
18.6	Gravel Pit, Highway and R.R. Mounds of both Mima and Ford type beautifully expressed
21.9	Little Rock. Just before entering town in a road cut. Decision to be made whether it represents terminal moraine or not
25.2	Maytown. Most of this area covered is glacial drift
27.4	Turn left
28.2	Millersylvania State Park. Eat lunch
29.2	Turn right
31.8	Pacific Highway. Note Mima type mounds on either side of hwy. Turn right
32.4	Turn left at "french cafe". This road swings around Offut Lake. R.R. cuts expose relations between mounds and underlying gravel in an excellent manner. Examples of kettles. Offut Lake.
39.4	Pacific Highway. Turn left, toward Tenino
42.5	Entering Tenino
43.7	At south city limits, Tenino. Quarry of Western Quarry Co., producing Hercules-Tenino Sandstone. Examples of quarry methods for building stone, and machinery for producing same. Take road to Bucoda
47.5	Bucoda. This valley is the southermost channel of escaping glacial waters
52.9	If trip is made to Wabash mine Saturday evening, continue on paved road to Centralia. If we have this stop to make, turn left at this point.
53.3	Turn right
53.7	Leave cars. Short hike to Wabash Mine-abandoned-and Eocene section.
57.6	Centralia

Party will disband approximately at 4 P.M. at Centralia. Members return to Portland, as they wish. There will be no "dirty" hiking. Dress for the prevalent weather, and you may get sand in your shoes.

Total: 264 Miles


SKETCH MAP of
TENINO MOUNDS TRIP
Millersylvania State Park
French Cafe
Tolmie Lake
ROCKY PRAIRIE
MAYTOWN
LITTLE ROCK
MIMA PRAIRIE
1st Locality
MIMA
TENINO
CUTE CITY
Shell Station
ROCHESTER
GRAND MOUND
HIGHWAY
BUCODA
PACIFIC
THURSTON COUNTY
LEWIS COUNTY
WABASH
Scale of Miles
0 1 2 3
CENTRALIA

Sec. 562, P.L. & R.

DR. ARTHUR C. JONES
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PORTLAND, OREGON

THE GEOLOGICAL NEWS LETTER

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of the
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LECTURES

April 23, 1937 (Friday)- The lecture evening of April 23rd will be devoted to the showing of two motion picture films supplied through the courtesy of the Union Oil Company of California. These films, entitled "Tree of Life" and "Petroleum Geology" are of high scientific and educational value

The "Tree of Life" presents a detailed study of the gradual development of living organisms from the earliest age to the present. The formation of the earth is first illustrated by miniature models operated in accordance with the planetesimal theory and excellent microscopic photography is a feature of the picture.

"Petroleum Geology" shows the changes in physiography which have taken place in the North American continent since the deposition of the earliest fossil bearing sediments through the medium of animated paleogeographic maps and diagramatic cross sections. Deposition of sediments, folding, fault action and the accumulation of oil in an anticline are all made clear by animated sequence and a vivid concept of mesozoic life is pictured by dinosaur scenes from the motion picture "The Lost World".

May 14, 1937 (Friday)- Ben S. Morrow, Chief Engineer of the City of Portland Water Bureau on the subject "The Geology of the Bear Creek Dam Section as determined by the Ira A Williams Report.

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TRIPS

May 1 - 2, 1937 - Lower Columbia River
Leader: Claire Holdredge
Complete details of the trip will be given at the meeting of the Society, Friday, April 23, 1937.
Watch daily newspapers.

May 15 - 16, 1937 - Oregon State College
Leader: Dr. E. L. Packard

May 29 - 30 - 31, 1937 - Bend and Vicinity
Leader: Phil Brogan and the Deschutes Geology Club

June 19 - 20, 1937 - Saddle Mountain
Leader: Robert Layfield

Reservations will be required for the Corvallis and Bend trips. These reservations may be turned in to any member of the Exploration Committee, namely:

Mr. & Mrs. Chester A. Wheeler - GA 8243 Frank J. Bigler
Mr. & Mrs. Leslie P. Newell - TR 7077 H. Bruce Schminky - TA 2485
Joe Wimmer - TA 0597

- - - - -

D U E S A R E N O W P A Y A B L E - M A K E C H E C K P A Y A B L E T O T H E G E O L O G I C A L S O C I E T Y O F T H E O R E G O N C O U N T R Y.

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THOSE MEMBERS OF THE SOCIETY WISHING TO HAVE THEIR BULLETINS BOUND PLEASE GET IN TOUCH WITH THE BUSINESS MANAGER.

- - - - -

On Monday April 12th, 1937, Mrs Ina Condon Bean passed away at the age of 79.

She was a daughter of Dr. Thomas Condon, pioneer geologist of Oregon, and mother of Ormond R. Bean, Portland's Commissioner of Public Works who is an active member of this Society.

The Geological Society of the Oregon Country extends its sincere sympathy to Mr. Bean and his family in this their hour of great loss.

DROWNED FORESTS OF THE COLUMBIA RIVER GORGE

Donald B. Lawrence

In searching through the abundant literature on the origin of the Cascade Rapids one begins to discover as did Barry (3), that there are two main forms of Indian legend concerning it. The earlier of these two (before 1850) and hence probably the more authentic, certainly the more accurately suited to the present known facts, is given in the account of Daniel Lee (13). It is as follows: "The Indians say these falls are not ancient, and that their fathers voyaged without obstruction in their canoes as far as The Dalles. They also assert that the river was dammed up at this place, which caused the waters to rise to a great height far above and that after cutting a passage through the impeding mass down to its present bed, these rapids first made their appearance". (See also De Smet's account (5)).

The later and better known version which brings in the rim-to-rim bridge idea is much more elaborate in detail and quite probably arose at first as the white man's misinterpretation of the story. Some students have suggested that the Bridge of the Gods legend in its most elaborate form may have been largely invented by the white man, or at least for his benefit.

Since the first historic records were set down by Lewis and Clark 132 years ago (14), over 50 articles have been written which bear entirely or in part on this fascinating problem of the formation of the Cascade Rapids and the drowning of the submerged forest stumps. In these various articles four main hypotheses are advanced concerning the kind of geographic change that ultimately caused the drowning of the trees. These are: [1] A dam at the Cascades causing the river above it to rise and encroach upon the tree-covered shores. [2] A subsidence of the gorge floor as a whole which lowered the trees into the water. [3] A series of landslides from various places on the gorge walls carrying upright trees into the previously ponded river. [4] The undermining of the shore at time of freshet, causing the root systems of the trees growing thereupon to settle down into the water. Most of the writers followed the first hypothesis and concluded that the river had been dammed at the Cascades, but at least seven distinct theories were evolved regarding the nature and origin of the impediment.

That the opinions of geologists concerning the nature of the dam were not in agreement even as late as 1915 is evinced in an article by Diller and his associates (6) who suggested three possible causes of the dam: an uplift, a fault, or a landslide. Even Fenneman's text (8) published in 1931, shows that the landslide explanation of the dam had not yet received wide acceptance at that recent date.

Many of the authors who dealt with this problem concluded that the damming must have occurred since about 1750, and even our Dr. Condon writing in 1874 (4) supposed that the submerged trees had died "within a century or so".

It seems evident now that most of these estimates which indicated a very recent formation of the Cascade Rapids were based largely on the fine condition of preservation of many of the submerged forest stumps; an interpretation which developed probably because of lack of information concering [1] the geological processes that were responsible for their preservation and [2] the rate of decay

of wood that is usually almost completely submerged and so protected from decay throughout a large part of the summer season when rotting would be most rapid under normal subaerial conditions.

# # #

It may be well now to review the probable course of events that led up to the drowning of the submerged forest trees. #(Note:-This account is taken partly from the writer's previous article (12) on this subject but has been revised to fit newly ascertained facts.)

At some former time the Columbia River flowed smoothly throughout the entire stretch from The Dalles to the sea, for there were then no Cascade Rapids. From the vicinity of the present town of Moffetts (which is situated about one mile northwest of North Bonneville), the north bank of the river rose steeply to an elevation of perhaps 3500 feet, for there existed then a southeastward continuation of the top of Table Mountain that extended probably three quarters of a mile beyond the great scarp which forms that mountain's present southeastern face. (See U.S. Topographic Map (15) of this region.) There probably was also at that time a cinder cone rising to an elevation of about 2500 feet and located somewhat to the east of the present face of Red Bluffs, and southeast of the summit of Greenleaf Peak. Both these structures rested on the easily eroded Eagle Creek formation whose bedding planes slope in a southeastward direction toward the river. The summit of the Table Mountain extension was, as is its remnant today, capped by a layer of Columbia River Basalt 1500 feet thick. The river's north edge then was located approximately on a straight line drawn from Stevenson to Beacon Rock, and was gradually cutting into the Eagle Creek foundation and thus undermining of the basaltic cap.

Upstream from this place for a distance of 38 miles the channel lay about as it does now but it was deeper and in many places narrower at high water by at least 70 yards than it is today at low water. Upland trees grew down to the edge of this ravine, where their roots were seldom or never flooded by spring freshets. At a lower elevation, on the flood-lands of that time, lowland trees grew.

Finally there came a time when the undercut extension of Table Mountain could no longer sustain itself and toppled over into the channel at a point about two miles due west of the present town of Cascade Locks, initiating a landslide that carried millions of tons of rock and soil into the channel, across the floor of the gorge, and even a little distance up the south wall, completely damming the river.

This "Cascade Landslide", or "Dam of the Gods", as it has been called (10), was, along its main axis quite surely cataclysmic in nature and not a slow creeping motion as some authors have suggested. This fact has been ascertained by the present writer's comparison of the topography of the Cascade Landslide with topographies resulting from both [1] creeping, and [2] almost instantaneous (1, 2, 7) historic landslides of the Gros Ventre River Canyon in Wyoming.

In describing the Cascade Landslide it is important to distinguish the

terrain lying along the main axis (a line drawn from the summit of Table Mountain through the present "Bridge of the Gods" approximates this axis), from portions lying to the north of it since the latter terrain has all the characteristics that result from creeping motion, and is quite likely the result of a series of secondary slides that probably did not take part in the damming of the river.

To judge from present topography along the main axis of the Cascade Landslide, the crest of the great dam that was thrown across the river must have been between 200 and 300 feet above present sea level. If the dam held water until it overflowed at the 200-foot elevation, the lake above the dam must have been at least 90 miles long, its area more than 88 square miles, and its volume more than 5,200,000 acre feet. We cannot be certain about its maximal extent, for no visible shorelines have yet been found; but we may be sure that for 38 miles above the dam the water rose on the floor and walls of the gorge and drowned thousands of trees in that region, and that it extended beyond the eastern portal of the gorge far into the treeless region of the Columbia Basin. With overflow of the dam, the surface of the lake was probably lowered so rapidly that the whole gorge floor below may have been flooded with water and the former deep river channel downstream even to beyond the vicinity of Beacon Rock was doubtless partly filled with rock fragments eroded from the landslide. Thus began the cutting of a channel in the slide material and the present great bend of the Cascade Rapids, as much as a mile and a half southeast of the previous course, was formed. This new channel did not skirt around the southern terminus of the landslide as some writers have suggested but cut directly across the lowest part of the main axis of the slide leaving its toe (which is now known as Ruckel Slide) completely isolated from the rest of the slide and without support.

The lake persisted long enough to permit sediment to accumulate to a depth of at least 25 feet around the trunks of many of the drowned trees, especially at the mouths of tributary streams where alluvial cones were built up. As the dam was eroded and the lake partly drained, portions of the lake floor became exposed, and the drowned trees were left standing in the mud. Then their exposed parts rotted down to the surface of the silt, a process that takes about 75 years for a dead but erect Douglas fir under usual forest conditions in western Oregon. Subsequently the river eroded the silt in places and partially exhumed the unrotted stumps, and as this erosion of the lake bed continues, stumps that have remained wholly or partly buried and thus protected are gradually brought into sight. The tallest stumps, as much as 25 feet in height, are found near the west end of the ancient lake where deposition by tributary streams was greatest. Near the eastern limits of the gorge where less tributary deposition occurred, many of the stumps are so short as to be visible only at ver low water. Beyond the east portal of the gorge no stumps have been found, probably because the climate, as at present, was unfavorable for tree growth in that region. In places where the lake deposit is composed of fine silt with a large content of organic matter the buried parts of the stumps are beautifully preserved, even the bark remaining in place, but where the stumps are surrounded by coarse gravel, both bark and sapwood are gone. None of the vertical stumps bear branches but occassional trees that fell over as a consequence of the softening of the soil about their roots with the rising water in the lake have been preserved almost in their entirety by the subsequent deposit of silt. The wood of many of the stumps is sound and hard and when cut gives off the characteristic odors by which wood from living trees of the same species may be recognized. There is no evidence of petrifaction.

As the protective lake deposit about the stumps is eroded by the river decay begins again. It is still in progress, but the rate of decay is very slow indeed as may be seen from photographs showing stumps at Wyeth in 1909 and again in 1936. In the 27 years lapse of time the stumps seem to have undergone very little alteration; even mere slivers in some cases remain almost identical. One very evident difference that is to be noted in the two photographs is that a depth of from 26 to 30 inches of shore silt has been eroded from about the bases of the stumps in these 27 years. If this can be considered to represent the average rate of erosion since the time of Lewis and Clark's visit, it is quite possible that stumps whose tops now stand, for example, about 16 feet above the surface of the shore, may have protruded only about 4 feet above the silt in 1805. As has been suggested above, the slowness of the decay of the stumps is probably the result of their having been water-soaked for so large a part of each frostless season when rotting would normally have been most rapid, and exposed chiefly during winter months when temperature is unfavorable for the processes of decay.

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The work of the writer on this problem in the summer of 1934 is reported in his previous article (12). At that time he ascertained by comparing the growth-ring patterns of submerged forest stumps of Douglas fir near Wyeth with the patterns of old living trees of the same species growing on the adjacent gorge walls, that the ancient trees had died at some date previous to 1732.

In the fall of 1936 the writer received a grant-in-aid-of-research from the Sigma Xi Society which with the additional financial aid from the writer's parents Mr. and Mrs. W. C. Lawrence of Portland, enabled him to continue research on this problem in the low water period of 1936-37. In this work Elizabeth Gay Lawrence, the writer's wife, has helped continuously. Four major phases of the problem have been attacked during this recent study. They involve: 1. The character and extent of the Cascade Landslide. 2. The detailed distribution and species-composition of the submerged stumps. 3. The rate of decay of the stumps. 4. The collection of cross-sections of Ponderosa pine stumps of the eastern portion of the submerged forest in the hope of eventually, with this new material, being able to date exactly the occurrence of the Cascade Landslide.

At the present writing the field work is practically complete but the date gathered is still to be correlated.

Several interesting features that have been noted in connection with the study of the Cascade Landslide may be worth considering here. Perhaps most important with respect to the whole problem involved was the finding on the Northwestern Electric Company's power line right-of-way, where it crosses the main axis of the slide, a number of stumps of trees that had produced over 300 growth rings before they were cut down in 1912. One of these stumps showed 342 rings at a height of 10 feet above the ground, which seems to indicate that the life of that tree began about 375 years ago. The character of the rings of this tree showed definitely that the slide had not happened during its lifetime; it is reasonable to assume, therefore, that the slide occurred at least more than 375 years ago, or before 1562 A.D. This is

within a few years of the date arrived at by G. K. Gilbert (9) in 1899 for the minimum age of the landslide.

Another observation of interest is the discovery of forest wreckage partly imbedded in the landslide material in several places just above the level of lowest water of the river. One of these sites is a small island just above the rapids, and another is on the north bank between the present "Bridge of the Gods" and the mouth of Rock Creek, Washington. These bits of debris were undoubtedly transported with the other landslide material to their present locations from their original habitat on some former portion of the north wall of the gorge.

A third consideration, less specifically related to the landslide but nevertheless of interest here, is the observation that the cinder cone, parts of which are to be seen in and about Red Bluffs is probably not contemporary with the Eagle Creek formation as Williams (16) suggested but rather occured after the laying down of the Columbia River Basalt and even after the erosion period in which Table Mountain and Greenleaf Peak were sculptured to approximately the shapes that they possessed before the occurrence of the Cascade Landslide.

The recent study has enlarged the region of known distribution of the stumps along the river from about 25 miles as is indicated in the map of figure 4 of the writer's previous article (12), to 38 miles at present; the number of known stumps has increased from 1800 in 1934 to over 3000. The easternmost stumps found to date are in the vicinity of Crates Point at the eastern portal of the gorge. It is interesting to note that that point is approximately the present eastern limit of living trees in this region. In studying the distribution of the stumps many photographs have been taken, and small samples of wood for the purpose of identification have been gathered from about 200 different stumps, and the depths of water about many stumps that are still partly submerged at lowest river stage have been measured.

A photographic method of measuring the rate of decay of some of the stumps at Wyeth, Oregon has been devised but a detailed report on this portion of the problem is not yet complete.

The fourth phase of the problem, that of collecting additional material in the form of complete cross-sections of Ponderosa pine stumps from the vicinity of Bingen, Washington, was made possible through the cooperation of Messrs. V. Miller and Foster Steel of the Mt. Hood National Forest Supervisor's Office in Portland, and was accomplished by a group of Civilian Conservation Corps workers from Camp Wygand under the direction of Mr. A. M. Johnston. It is within the realm of possibility that the annular growth patterns of these stumps may be found to overlap the 667-year record obtained by Mr. F. P. Keen (11) from aged trees of that species in eastern Oregon. We may therefore eventually be able to find out the exact date of the death of these stumps and of the occurrence of the Cascade Landslide if these events took place since about the year 1300 A.D.

It may be of interest to add that in the process of excavating about these stumps at Bingen, Washington, the old forest floor of pre-Cascade Landslide days was exposed and much of the forest litter including carbonized pine needles was found intact.

The writer wishes to express his appreciation here to Mr. James Kearns, whose expert advice and assistance made it possible to obtain such remarkably fine sections of the stumps.

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CLIMATIC CYCLES IN EASTERN OREGON AS INDICATED BY TREE RINGS

By F. P. Keen, U. S. Forest Insect Laboratory, Portland, Oregon

taken from
The Bulletin of the American Meteorological Society
November, 1936

A detailed study of annual growth of ponderosa pines was started in 1923 to determine the relationship between tree rings, climatic cycles and the periodicity of bark beetle epidemics. Up to the present time, micrometer measurements of radial sections from 1,240 ponderosa pines, taken in 44 different localities of eastern Oregon, have given a satisfactory statistical basis for certain preliminary conclusions.

The uniformity with which fluctuations in growth are found throughout eastern Oregon shows that a broad climatic influence has dominated this growth pattern over a wide area. Any sample of ten selected trees is sufficient to show the same fluctuations of good and poor growth and of outstandingly good or poor years, unless affected by such local influences as fires, windfall, or defoliations.

The growth pattern summates all the climatic and nutritional influences which affect tree growth, but in the arid ponderosa-pine region, moisture is such a dominant factor that the width of each annual ring shows a high degree of correlation with precipitation. The coefficient of correlation between current growth and current seasonal precipitation, (September 1 to September 1), was found to be $+.50 \pm .09$. By comparing growth with a two-year cumulative departure from normal, a coefficient of correlation of $+.82 \pm .04$ was found. Thus, tree rings show the effect of water conservation and a one-year lag in growth response.

Ponderosa pines up to 755 years of age were studied and the fluctuations in growth determined for the past 650 years. This record indicates no general trend toward drier or wetter years, but marked fluctuations of good and poor growth periods always return to the common average. Average growth for the 20-year period 1900 to 1919 was found to be identical with the average of the full 650 years.

All tree-ring measurements agree in showing that a very critical subnormal growth period has existed in eastern Oregon since 1917. This slowing down of the growth rate is undoubtedly the result of deficient precipitation and lowered water tables. As compared with other drought periods, the present one is the most severe experienced by the present living forests. Other periods during the past 650 years have exceeded the present one in duration of subnormal growth, but none have approximated it for severity. Growth in 1931, the poorest year, was 68 per cent below normal.

The pattern and amplitude of growth fluctuations in the pine region of eastern Oregon have been worked out for the period 1268 to 1935. As far as can be determined from preliminary analysis of this 667-year period, there is nothing to indicate that the apparent cycles of growth are anything more than chance fluctuations. Rhythmic cycles may be found, however, upon further analysis. --Abstr. by Author's Secry., Nov. 20, 1936.

RIVER RUNS OVER ANCIENT FOREST

Wenatchee Herald-Oct.9,1936

Submerged Trees Near Bonneville Believed to be 200 Years Old - Geographical Review Tells Interesting Story

There is a submerged forest in the Columbia river along the Washington-Oregon boundary near Bonneville more than 200 years old, according to an article in the October Geographical Review, owned by Wellington Pegg.

The trees were drowned by the lake formed when a slide occurred near the present site of the Bonneville dam. The former river channel was two miles to the west.

The story is told by Donald B. Lawrence, Johns Hopkins university:

"The great gorge of the Columbia River has been cut to a depth of more than 4,000 feet directly across the axis of the Cascade Range".

Seen 130 Years Ago

Moist bottom lands now border the river seen there, and are occupied by cottonwoods, willows and ash trees. Numerous decayed stumps of Douglas fir, giant cedars, Garry oaks and Ponderosa pines stand upright in the river bed above the Cascade Rapids. This submerged forest was first observed by Lewis and Clark 130 years ago.

At some former time, the north side of the gorge, 3,400 feet high, was capped by a hard layer of basalt, 1,500 feet thick. The river undermined the softer material, so the undercut north wall toppled into the channel. A lake 200 feet deep and 90 miles long was formed.

The huge forests on each side of the gorge were drowned and sediment collected around the tree trunks to a depth of 25 feet. When the dam broke and the lake subsided, the drowned trees were left standing in the mud. The present river channel is two miles west of the old one.

Stumps Preserved

This silt has preserved the stumps. As the protective lake deposit is eroded by the river, decay begins. So the stumps are decayed on top, and preserved underground.

The slowness of the decay of the stumps is accounted for by their having been water-soaked for so large a part of the frostless season.

The tree rings of the submerged forest are not similar to those of 260-year-old growing trees in the same locality, so the slide must have occurred before the time of the present live trees, the writer believed.

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SOME SUGGESTIONS FOR THOSE WHOSE AVOCATION IS GEOLOGY

Do you have or wish to develop some program for constructive field work in geology? Then let your wishes have free rein and cast aside any trace of hesitancy because your technical training is scant. That formal training is neither essential nor always adequate would be shown by two biographies; one of a salesman who trained himself and became a world-known authority in paleobotany although he had studied in no university; another of a geologist of metalliferous deposits who mapped a mining district by classifications so commonplace as "green spotted rock" and "pink banded rock" because he knew enough to despair of making precise technical classifications in the field.

Attention is called to the standard handbooks on geologic field methods:

Hayes, C. W., Handbook for field geologists, 3d edition, 166pp., John Wiley & Sons., 1921

Lahee, F. H., Field geology, 3d edition, 789 pp., McGraw-Hill Book Co.

The geology of the region within 50 miles of Portland, or even within 10 miles, is only imperfectly known and entails many intriguing problems. Choose a problem that is to your liking and attack it systematically. The answer, as in all geologic problems will come from (1) unbiased examination of outcrops and a record of the facts there disclosed; (2) analysis and generalization of the facts gathered in the field; and (3) sound conclusions by which the stratigraphy, structure and geologic history may be reconstructed. The research committee of the Society will advise you as to methods for your field examination and will help in analysis and conclusions. Suggestions follow.

1. Keep in mind the "dimensions" with which the field geologist works, as follows: (a) location on the land surface, which is most easily recorded on a map; (b) altitude above sea level, which is shown by topographic maps for part of the area near Portland; (c) stratigraphic horizon or formation; and (d) dip or inclination of the strata.

2. Make an accurate map your constant field companion and mark on it the position of each "locality" you study. If you travel by auto, keep a written log of each field trip with road mileage from some definite point such as a highway junction (calibrate your speedometer for error.)

3. Take copious notes describing each locality, recording the date, location (by township, range, section, and subdivision preferably), and features seen. In taking notes, discriminate visible facts from inferred relations and interpretations. Also, describe all the facts that might be pertinent to the problem when you analyze it. An absence of some feature may prove critical. The field geologist who seeks proof for a favored hypothesis can see proof in every exposure. Therefore, challenge each entry in the note book by this test: the facts will be seen alike by every observer the inferences from those facts may be as many as the observers. Be more critical of yourself than another possibly can be. When you have gathered as many facts as possible weigh them calmly and without bias; if a favored

hypothesis then becomes untenable you have suffered no material loss. But, geologic knowledge advances by the formulation of hypotheses and the testing of those hypotheses as further facts accumulate. So, if your observed facts lead to one or more hypotheses, do not hesitate to make those hypotheses known as such and open your problem to constructive criticism and further investigation by others.

4. Consider whether each outcrop is of rock in place, also the extent to which its initial features have been modified by weathering and other local or transient agencies.

5. If you are a collector, keep in mind two correlative principles: first, each specimen, so long as it is in place, may be the key to some critical geologic problem; second, in removing the specimen, you become the sole possessor that key. So, lest constructive information be lost, record the location at which the specimen is found so that another worker could identify the precise spot at some later time (specific distances and dimensions in miles or feet, and whether estimated or measured). Also, before you remove the specimen, observe and describe its orientation and its relation to the enclosing material. For example, if you are collecting facetted cobbles in place, do you find that the largest facets are always horizontal and at the base of the cobble? Are your invertebrate specimens found scattered through massive strata or do they occur only in earth partings between strata?

The research committee of the Society aims to coordinate the field programs of individual members and to take some constructive steps toward unraveling the geologic history of the region about Portland. For the present, it would like each member to file a written description of the localities at which he finds fossils, erratic boulders, good exposures of strata or structure, and like geologic features. Also, it will advise any member who cares to submit a written summary of a problem that he finds baffling. Ultimately the committee plans to outline specific problems in the vicinity of Portland and to invite volunteers for investigating them.

Research Committee:

Claire Holdredge

Ray MacKenzie

R. C. Treasher

Arthur M. Piper, Chairman

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THE FIRST RULE OF MENTAL HEALTH

In a contest conducted by the Cleveland Academy of Medicine for a set of rules for mental health, the prize set gives as rule number one "Have a hobby, acquire pursuits which absorb your interest. Sports and nature are the best".

Thus is confirmed the intelligent selection by our members of Geology as a hobby - probably the most widely embracing nature subject one could choose.

DEVELOPMENT OF MINE PROJECTED

Wenatchee, Washington, March 25. (UP) — A new town, to called Chelop for chelan and copper, will rise soon on Lake Chelan with the construction of a 1000-ton gold, silver and copper concentrating plant, a major mining development, it was announced today.

Population of the now mining town is expected to reach 15,000, with at least 600 men employed at the Railroad Creek copper mine of the Howe Sound Co., C. P. Browning, manager, said.

Investment in the concentrator will run between $3,000,000 and $4,000,000 Browning said.

Ore will be shipped to the Tacoma smelter as is done from the company's mine at Britannia Beach, B. C.

Construction of a 55-mile power line from the Washington Water plant at Chelan, to the mine, will start at once. The mill will be built at the portal of the main tunnel on the 5000-foot level and 18 miles of railroad tracks will be laid from the mine to the lake. The ore will be loaded on barges and later transferred to railroad cars. Docking facilities have been purchased at the lower end of the lake.

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STUDENTS FIND GOLD

Salt Lake City, Utah, March 24. — A geology class under Frank Gunnell learned fast while gold prospecting near Mercer, Utah. The class discovered ore promising to be as rich as the $2,000,000 Hidden Treasure mine 10 miles away.

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3623 S.E. Carlton

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PORTLAND, OREGON

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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LECTURES

May 14, 1937 (Friday) - Ben S. Morrow, Chief Engineer of the City of Portland Water Bureau will speak on the subject "The Geology of the Bear Creek Dam Section as determined by the Ira A. Williams Report.

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TRIPS

May 15-16, 1937 - Oregon State College
Leader: Dr. E. L. Packard
Complete details of the trip will be given at the meeting of the Society, Friday, May 14, 1937.
Watch local newspapers.

May 29-30-31, 1937 - Bend and vicinity
Leader: Phil Brogan and the Deschutes Geology Club

June 19-20, 1937 - Saddle Mountain
Leader Robert Layfield

Reservations will be required for the Corvallis and Bend trips. These reservations may be turned in to any member of the Exploration Committee, namely:

Mr. & Mrs. Chester A. Wheeler - GA 8243, Frank J. Pigler, Mr. & Mrs. Leslie P. Newell - TR 7077, H. Bruce Schminky - TA 2485, Joe Wimmer -TA 0597.

PERSONNEL NOTES:

J. C. Stevens, nationally known for his hydraulic studies, has recently been appointed as Regional Water Consultant to the National Resources Committee for the Rio Grande Basin. This is in addition to his work in the same capacity for the Colorado River Basin. He reports that the Rio Grande carries its share of silt. On April 16 he left Portland to make a tour of inspection below Santa Fe.

* * * * *

A. M. Piper is spending a month in Arizona and New Mexico, making geologic investigations of dam sites.

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SNOW DEPTH AND DENSITY ON MT. HOOD

For several years, the Bureau of Agricultural Engineering and other agencies have been obtaining data each spring on depth and density of snow in the mountains, in order to be able to forecast the stream flow for the following summer. This work is carried on chiefly in areas where irrigation of other use demands all the low-water flow. This year a new snow course was established on the south side of Mt. Hood near Timberline, where the snowfall is probably greater than at any other measuring station in the state. Observations were begun April 5, 1937, at a point about half a mile southwest of the new Timberline Hotel. Over a measured course 560 feet in length, the snow was measured at regular intervals in 11 places. The snow depth varied from 142 inches to 161 inches with an average of 153 inches. (The snow depth at the hotel on the same day was 156 inches.) At each station a duralumin tube was used to cut out a core of snow, which was then weighed to ascertain the water content. The average density was found to be 44.1%, which is equivalent to an average water depth of 67 inches. Observations over a period of years should be of value not only as an index of skiing conditions and a basis for forecasting run-off, but also in connection with observations of annual advance or recession of the glaciers on Mt. Hood.

K.N.P.

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A GOOD RACKET

It is as old as the hills, but evidently still pays dividends. Science, Dec. 11, 1936, p. 527 reports that a Academia De Sciencias e Artes at Rio de Janeiro has been inviting American scientists to become members of the Society. They confer a "Diploma of Doctor in _____, in Honoris-Causia". Now comes the touch. The cost of graduation with a diploma, credential and Gold Medal of Merit is Ten Dollars. The communication specifies American bank notes.

Ho Hum! Here we of the G.S.O.C. are struggling to establish a most worthy organization, constantly searching for financial assistance, and here is an idea knocking right at our door. We could issue a degree, oh say, Master of Amateur Geology, or Doctor if that would sound better (much better), complete with embellished, gold scrolled diploma, etc., etc., for any sort of a nominal fee, say $50 to $100. The possibilities are enormous. Why send your money to Brazil? Patronize home industries. (RCT)

The McMinnville, Willamina, Dallas and Amity trip held on Sunday March 21st was under the leadership of Wessley Paulsen of Linfield College.

The start from Portland was anything but auspicious. Only a few cars meeting on Yamhill Street but before the trip was over, twenty two cars were registered carrying 75 geologists.

At the junction of the Coast Highway with the west side Pacific Highway the group waited for Ben Smith to catch up with the caravan so he could deposit his wife amongst the good members of the Society while he returned to his bridge game.

The first stop was made at the plant and pit of the Willamina Clay Products Company near Willamina. Mr. Brant, Ceramics Engineer at the plant guided the members of the Society and their friends about the property and through the plant. The structural features of the pit are extremely interesting. The dip of the strata is northeast. As we all know the general dip of the sedimentary rocks lying west of the Cascades is to the westward. Here we could plainly see why these clay strata did not follow the general rule. On the northwesterly end of the pit a basaltic neck is exposed. Apparently the basal issueing through this vent has tipped the clay beds so that they northeasterly. The lava flowed over the surface covering the clay beds, where it lies a decomposed mass through its entire thickness.

Beneath the basalt lies a layer of ferric clays, the iron probably having been leached out from the overlying basalt. The second layer of clay is a zone of concretions some of which are very large. The third layer is composed of blue clay, the fourth layer of black highly carbonaceous clay and the fifth and lowest layer is composed of whitel clay. An interesting thing to note is that the whitest bricks are burned from the black clay. The carbonaceous material burning to a fine white ash. The beds directly in contact with the basalt are very hard and to the uninformed appears to be decomposed basalt. The resemblance is so close that an enterprising roadmaster used material of this nature to rock some of his roads. The first fall rains and a little traffic played havoc with his roads. A few fossils have been found in the clay beds none, however, by members of our party.

After our trip around the pit and through the plant the caravan was led to a small anticline on the highway leading from Willamina to the coast. The base of the anticline is two hundred and fifty feet long at the elevation of the highway. At its eastern end then appears to be an overthrust and a small closed fold. There small seams of coal and crystals of selenite are said to occur in the strata comprising the folds. the formation is oligocene.

Leaving these folds the group was taken westward along the same highway to Wallace Bridge. Here is exposed a very excellent unconformity of the type known as nonconformity or angular unconformity. Here the underlying rocks dip gently to the westward. The overlying shale lies practically horizontal. The older layer is thought to be miocene, but no fossils were obtained. The writer has dentalium taken from the upper stratum but nothing to fix the age. This nonconformity is well worth stopping to see by anyone interested in structual

geology, especially new members or beginners in the study of geology.

From Wallace Bridge the caravan was led to Dallas where lunch was eaten and a rest was taken. Mr. Davis missed Mrs. Henshaw's pie, as did the writer.

After lunch the run out to the lime quarries was made. The smaller quarry and grinding plant is that of the Limestone Products Company. The larger quarry is that of the Oregon Portland Cement Co. This latter quarry is the one we visited. Not knowing before-hand that I was to be called on to write up the trip very little study was made of this deposit, most of my time being spent breaking rock with very little luck. However, from a superficial examination of the small arc within the pit, I would say that the deposit was made in fairly shallow water, possibly a more or less protected bay or cove. Fossil fish, sharks teeth, leaves, lobsters, crabs and similar crustacea have been found in this limestone. The party as a whole had very little luck due to the fact that no new faces were exposed and the pit had been gone over rather thoroughly before we arrived. However, a fine specimen of a shark's tooth taken from this section was presented to the Society by Mrs.Roy Baker wife of the foreman of the Oregon Lime Products Company, Dallas, Oregon.

This deposit is miocene in age and is said to be covered with fresh water silt. Where this silt has been washed away, hoodoos and balanced rocks are exposed showing that at one time the upper portion of the limestone was exposed to the action of wind and waves.

On the way home the party stopped at Amity to look over a deposit of oligocene tuff. This tuff contains fossil molluscs of several classes and species.

To complete the story of our trip a few facts about the gas wells located near McCoy will not be amiss. These wells are situated on the Cecil L Riggs farm and the adjoining property. As near as Mr. Riggs could find out the gas was first found in the early eighties. A well was being drilled for water, when it was bailed out, a bubbling or boiling noise could be heard. A lighted candle was lowered and gas was discovered just like stricking a match in your gas tank. This well flowed about 1000 cubic feet per day and was used on the farm. The present tenant is afraid of gas, so does not use it. Three other wells were drilled in 1930; one on the Riggs farm and two on the adjoining place. All are within a radius of five hundred feet. Mr. Riggs is of the opinion that any of the new wells would flow four or five times as much as the original well. I do not think an analysis was ever made of the gas but it is probably marsh gas.

The Society members and their friends extend thanks to Mr. Paulson, who planned the trip, and to Mr. Brandt of the Willamina Clay Products Company for courtesies shown us at their Willamina plant and to Mr. Schminky and his staff for a well organized and profitable excursion into the plant.

A. F. Pratt

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A CHEMICAL STUDY OF THE FUMAROLES OF MOUNT HOOD

A review of a thesis dated may 1936, by John Fred Facer, Reed College.
(Reprinted from Mazama, December 1936.)

Any one who climbs Mount Hood by the usual south-side route can not fail to have at least a passing interest in the nauseating volcanic gases which issue as fumaroles on or near Crater Rock. The chemical nature of these gases has long been the source of much speculation and occasional dispute; but it was not until 1935 that a study was begun by the Mazama Research Committee to ascertain the facts. After preliminary qualitative tests*, the cooperation of Reed College was enlisted. On Oct. 6, 1935, Dr. W. R. Carmody, head of the Chemistry Department, and John Fred Facer, senior student in chemistry, accompanied by the writer, visited these fumaroles with equipment for taking gas samples for later laboratory analysis. Subsequently Mr. Facer made careful laboratory studies under the direction of Dr. Carmody, to determine the nature and amount of all gasses present in the samples, and wrote a thesis describing the methods used and results obtained. Because of the fact that no such studies have heretofore been made on volcanic emanations in the Cascade Range north of Mount Lassen, the results obtained are of much scientific interest.

The essential parts of the collecting apparatus consisted of a pyrex sampling tube, a condenser, an evacuated Woulff bottle containing barium hydroxide, free from carbon dioxide, a copper gas holder, and an aspirator bottle, in that order. Most of the water in the fumarole gas was collected in the condenser, and then drained into the Woulff bottle, where the barium hydroxide precipitated the hydrogen sulphide and most of the carbon dioxide. The residual gas was collected in the copper container by displacement of water, and the containers sealed for return to the laboratory. The analysis called for quantitative determinations of the components of both the residual gas and the precipitates in the Woulff bottle, for each fumarole sampled.

In the following tables, analyses are given of samples taken from fumarole "D", a large and active vent at the base of Steel Cliff, about 400 feet northeast of the shelter cabin at Crater Rock, from fumarole"A" (The Kitchen), 125 feet southwest of the cabin, and from fumarole "B", on top of a rocky ridge on the north side of Crater Rock. Temperatures on Oct. 6, 1935, were as follows:

Fumarole "D", 193° F. (boiling point at 9,700 feet elevation).

Fumarole "A", 193° F.

Fumarole "B", 160° F. (erroneously published as 106° in Mazama, 1935).

* Mazama, December, 1935: p. 19.

TABLE 1

Complete Analyses, % by volume

Component gas	Fumarole D	Fumarole A	Fumarole B
Water	98.7	98.6	------
Carbon dioxide	1.13	1.27	0.68
Hydrogen sulphide	.038	.024	------
Nitrogen	.116	.057	78.5
Oxygen	.011	.0017	19.5
Argon	.0014	.0007	(with nitrogen)
Hydrogen	.0033	Trace	0.58
Methane	.0011	-------	-----
Total	100.0008	99.9534	99.26

In the above table, the apparent absence of water in fumarole "B" is misleading. Water is actually present in considerable quantities; but it was condensed in a length of pyrex tubing and rubber connection which permitted it to drain back into the vertical vent. The percentages of oxygen and nitrogen suggests that the gas collected here is almost entirely atmospheric air. However, the sampling tube was inserted about 5 feet down into the vent, from which a steady column of vapor was rising, so that there should have been little or no contamination from outside air.

TABLE 2

Complete Analyses, % by volume (on a dry basis)

Component gas	Fumarole D	Fumarole A
Carbon dioxide	86.9	93.8
Hydrogen sulphide	2.92	1.77
Nitrogen	8.99	4.21
Oxygen	.85	.13
Argon	.11	.05
Hydrogen	.25	Trace
Methane	.09	-----
Total	100.11	99.96

The fact that in both samples the ratio of argon to nitrogen is almost exactly that of air (1.18%), strongly suggests that the nitrogen is of atmospheric origin. In other words, air enters the fumaroles at a considerable depth below the surface, presumably owing to the aspiratory effect of the rushing gas.

The presence of a small amount of methane is of interest. This is the cheif component of the dreaded "fire-damp" of the coal mines, which, in concentrations, is highly explosive when mixed with air. There is little possibility of its becoming concentrated in the snow caverns around Crater Rock, as it is lighter than air, and these caverns are in general well ventilated at the top.

Mr. Facer presents a comparison with other fumaroles of the Pacific Coast between Mexico and the Aleutian Island, which indicates that all those with temperatures between 194° and 212° F. are surprisingly similar in composition to those of Mount Hood.

TABLE 3

Composition range of fumaroles of the Pacific Coast, having temperatures from 194° to 212° F. (90-100° C.)

Component	Percentage
Water	98. - 99.9
Carbon dioxide	1. - 1.5
Hydrogen sulphide	0.025 - 0.050
Nitrogen and argon	0.02 - 0.10
Oxygen	0. - 0.1
Hydrogen	0. - 0.5
Methane	0. - 0.5

To quote Mr. Facer's conclusions: "During the past ten years several people have lost their lives in the crater of Mt. Hood, and others have suffered ill effects. The analyses show that the non-condensable gases from this locality contain less than 1% of oxygen. This would indicate that people with gas masks, who have succumbed, must have been suffocated. Others were probably overcome by the toxic quantities of hydrogen sulphide which are present. Neither carbon monoxide nor sulphur dioxide was found.

Finally, the results of the analyses indicate something of the condition of volcanism in this region. The gases found in these fumaroles have been found elsewhere only in the most decadent vents. One may conclude, therefore, that the volcanism of Mt. Hood is in a very advanced state. This is substantiated by the fact that over a period of nearly one hundred years no authentic evidence of an eruption has been obtained."

Mr. Facer deserves a great deal of credit for the care and skill with which he planned and carried out this bit of volcanologic research. It is hoped that his work will stimulate research on the fumaroles of other mountains in the Pacific Northwest.

Kenneth N. Phillips

FUMAROLES AT BONNEVILLE

By Claire P. Holdredge

During the cold weather in January and February of this year, while the ground was covered with more or less snow, three small areas were found at Bonneville where the ground did not freeze, where the snow melted as fast as it fell, and where small amounts of steam were issuing from the ground. All three of these areas were upon the project in close proximity to the main structures.

One of these so called fumaroles was found on the west, or downstream, leg of the north spillway coffer-dam near the point where the coffer-dam touched the Washington shore. Here the steam was coming up through the coffer-dam crib and it was evident that it emerged from the bedrock beneath the crib and thus beneath the river.

Another area where steam was seen issuing from the ground was about 100 feet north of the east end of the power house wing wall which extends upstream from the forebay of unit No. 6. At the point where the steam issued it was coming up through hand placed rock rip-rap which extends upwards from bedrock behind the impervious fill between the wing wall and the abutment ground. The ice and snow was melted away from an area a few square feet in extent only. A thermometer placed a foot or so below the surface between the rocks registered a temperature of 60 degrees when the outside temperature was about 20 degrees. When the bedrock was exposed in this area before pouring the foundations for the wing wall and the adjacent portion of the power-house no steam was in evidence but the rock was exposed in the summer time and any warm air or steam might well have been overlooked. The adjacent portion of Bradford Island is underlain by a blanket of impervious landslide material and the steam might possibly come up from the bedrock somewhere beneath it and issue from beneath it where the rip-rap comes in contact with the landslide. This seems unlikely because the river deposits below the landslide are everywhere filled with water and the steam would be condensed in passing through it. If it issues from the bedrock where the rip-rap overlies it, it issues from the intrusive rock upon which the power house rests or along the contact between this rock and the intruded Eagle Creek sediments.

The third area was a short distance east of the upstream end of the upper lock guide wall along the south shore of Bradford Slough. The area from which steam issued and from which the snow and ice were melted was similar in extent to that near the power house wing wall. The sub-surface geology at this point indicates impervious landslide material separated from Eagle Creek sediments by buried river deposits. The landslide deposits are exposed in the bank of the slough but it is not known whether the bottom of them has been exposed or not at this point by erosion in the bottom of the slough. Probably it has been. However it is difficult to see how the steam could come up through water-saturated gravels without condensing. It may come laterally through channels in the impervious landslide material from some point to the south where the bedrock is higher or it might be that bedrock below the point where

the steam issues is higher and the buried river gravels are absent. In the latter case the steam must come from the bedrock directly into the landslide material and ascend through channels in the latter to the surface.

The warm gas and steam issuing from these three places has a sort of earthy odor. No trace of sulphurous odors could be detected. It is just possible that in the two latter cases the gases might come from decaying vegetation beneath the landslide but this is impossible in the first case. Therefore it is thought that the warm gases and steam have a magmatic source and issue from the bedrock at no great distance horizontally from the points at which they issue from the ground surface.

The presence of such phenomena in this area is not surprising in view of the fact that Moffit Hot Springs are located only a mile or two to the northward. In fact the three points are almost in line with Moffit Springs. Hot springs are also found a short distance to the east in the vicinity of Wind Mountain and Mr. Joe Wimmer has reported issuences of hot steam from fissures in the vicinity of Bridal Veil.

It is not known just what the source of these magmatic gases at Bonneville might be. The proximity of the Bonney Rock intrusive suggests it as the source but it appears to be of considerable antiquity. It may well be older than the Columbia River basalts and if so it is doubtful if it could have kept up its heat so long. It seems more reasonable to ascribe their origin to later (Pliocene or Pleistocene) volcanic activity the intrusions from which did not ascend far enough to be now exposed in the Columbia Gorge at this point.

The presence of these steam vents so near the main structures of the Bonneville Project presents no particular menace to these structures. The pressure of the gases does not appear to be strong enough to exert any considerable uplift and the quantity is so small that it would have little trouble in finding channels through which to escape if it came up directly beneath these structures.

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NEW SEA-URCHIN FROM THE "OLIGOCENE" OF OREGON

By Hubert Lyman Clark, Cambridge, Massachusetts

A new species of Brisaster comes from the Pittsburgh Bluff formation of Washington County, Oregon, center of the south line of section 12, Township 3 North, Range 4 West, collector John T. Holman. It resembles the Recent species Brisaster Townsendi (A. Agassiz), 1898, described from the Gulf of Panama. Specimens doubtfully referable to the Recent species are reported by L. G. Hertlein and U. S. Grant from the Pliocene of California. The Oregon specimen is the first record of the genus in the older Tertiary of the Pacific Slope of North America.

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THE GEOLOGIST'S DIGEST

Mt. Mazama: Explosion Versus Collapse*

Mt. Mazama is the name applied to the ancestral Crater Lake. Early investigators readily recognized that the present lake is merely a remnant of a once towering mountain peak, and the name Mt. Mazama is now accepted by all.

Each year thousands of people thrill to the beauties of this wonder-spot and listen to the story of Crater Lake as told by the Park Naturalists. They get the main points, but some of us are priviledged to look behind the scenes and study some of the reasons.

For the destruction of Mt. Mazama, there are two theories. One, that the mountain blew its head off, scattering debris far and wide, the explosion theory. The other, that the solid rock was melted and fused, and caved-in, into the crater, the subsidence theory. Clarence Dutton in 1886, suggested the explosion theory. J. S. Diller, in 1896, fired one of the first heavy guns for the subsidence theory. He supported his arguments with such careful and scientific observations, that his theory remained practically unchallenged for a number of years. With recent excavations for road and trail work, easier means of access into various areas, new data is constantly being collected to support one theory or the other.

Smith* and Swartzlow have recently presented data in support of the explosion theory. The full article may be found in the technical room of the Portland Library. The following is a digest of their article.

A brief review of Diller's criteria for collapse is given. It is pointed out that this article is no condemnation of Diller's work, as new road cuts and a network of roads and trails has facilitated exploration of all parts of the area. The 6 points which appear to be critical ones in Diller theory are as follows:

1. Distribution, character, and amount of erupted material.
2. So called "backflow", in Cleetwood Cove.
3. Shape and character of the crater itself.
4. Absence of molten material, which should have issued at some lower point, if the mountain collapsed and the superstructure had been engulfed.
5. Glaciated surfaces about the rim.
6. Mechanics of collapse.

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*Smith, Warren D. and Swartzlow, Carl R., "Mount Mazama: Explosion Versus Collapse" (Geological Society of America, Bulletin, v. 47, no. 12, pp. 1809-1830, 6 pls., 5 figs., December 31st, 1936).

1. Diller failed to find sufficient erupted material in the form of pumice, bombs, and coarse debris to account for the 17 cubic miles of Mt. Mazama which have disappeared. New road excavations show a thin veneer of finer pumice which masked the underlying coarser pyroclastics, up to 225' thick. While Diller felt that the rupted material should be found within 3 miles of the crater, it actually is found many miles distant, as illustrated on B. N. Moore's map.

The discovery of hitherto unrecorded old fumeroles in the Pinnacles area in Wheeler Canyon attest the high temperatures of the deposit, - of nuee ardente origin. Diller found the explosive material about the rim was of different composition than the bulk of the mountain, but as Smith points out, the later extrusions were dacitic instead of andesitic. The coarser, underlying material is decidedly andesitic.

2. In Cleetwod Cove there is a lava flow which dips in toward the crater. Diller suggested that this flow was in process of extrusion at the time of collapse of Mt. Mazama, and the still motile lava poured back into the crater, forming a backflow. It is concluded that the so-called "backflow" is due to combined outflow and some faulting and that it antedated the destruction of the Mountain.

3. The crater has been called a calderaand compared to the caldera of Kilauea. However, there are decided differences, Kilauea being a regular slag pot, with fused material and peripheral faulting, and vertical walls. Crater Lake is typically explosion type, little peripheral faulting and no fusion. Furthermore, subsidence craters are very rare on the Pacific Rim. The configuration of the crater itself is very similar to mine craters, and the bottom appears to have been "scooped out" instead of filled in.

4. No recent flows of lava are found as having issued from the side of Mt. Mazama in recent times. If 17 cubic miles of material were collapsed and fused, the material should have spilled out somewhere.

5. Diller felt that the outer rim "exposes everywhere either glaciated rock, glacial moraine, or pumice -- belonging to Mt. Mazama before its destruction." It is true that the western portions of the Mountain tend to show the work of glaciation, but it must be remembered that the prevailing winds are from the west and consequently the bulk of erupted material would be found to the eastward. These westward canyons were probably ice filled during explosions; the ice would have carried away great quantities of the debris. The whole eastern rim is covered with layers of pumice, masking coarser deposits and any glaciated surfaces. Most of the glaciation occurred during the destruction of the Mountain, probably in 3 epochs. The destruction was not as one great catastrophy, but as a series of explosions.

6. From the bottom of the crater to the rim is 4000'. The top of Mt. Mazama was 6000-7000' above the rim. This gives a quantity of 17 cubic miles of material to be lost by explosion or subsidence. If absorbed, a hole 44,000'

deep would be required to contain the absorbed material. The bottom of this hole would be 55,000' below the mountain top. Such a cavity is impossible. And there is no evidence that the fused material escaped as flows. The 3 volcanoes built up on the crater floor, including Wizard Island are composed of basic andesitic fragments. Material at the time of explosion were dacitic. Had the volcanic neck been choked with dacite, these later volcanoes should have been ore acidic. The "stoping" theory is rejected on account of the absence of fused materials within the crater rim, and the presence of caves in the andesites. If the caves had been formed by stoping, there should be approximately the same number in the dacite.

The material in this paper is well presented but the reader should remember that the final chapter has not yet been written.

(RCT)

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VOLCANIC HEAT MELTS SNOW ON BUTTE, GEOLOGISTS SAY
(Oregon Daily Journal-Jan.28,1937)

Bend, Or., Jan. 28. — Deschutes Geology club members will be called on in the near future to determine whether volcanic fires still burn in the Fort Rock country, as the result of the discovery of barren spots on Polly Top butte, an aged parasitic con of the Newberry crater formation.

Although the region is under approximately four feet of snow, packed by recent sub-zero temperatures, there are barren spots on the side of the butte, forest field men report.

These spots, believed to fumaroles cover about an acre. When other parts of the country were in the grip of Arctic cold, the surface of these strange spots was muddy and warm air appeared to issue from the ground, Nelson Harlan, foreman of a pine beetle control camp in the Fort Rock woods reported. The barren places are believed to mark the openings of vents leading to rocks still warmed by volcanic fires.

John Crampton, old-time resident of the Fort Rock valley, reports that these barren places on the snow covered butte have appeared in former winters.

Fumaroles are common in volcanic areas, geologists say. Fumaroles have been discovered on Mount Hood and on Mount Rainier.

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CORVALLIS AND NEWPORT TRIP - MAY 15-16

Dr. E. L. Packard, Leader

Saturday May 15th is open house on the campus of Oregon State College for members of the Geological Society. The geology class rooms, laboratories and museum will be open for your inspection. Various laboratory experiments will be demonstrated by students. Drive down at your convenience Saturday but try and be there in time for the lecture at least. A special dinner will be served in the Memorial Union Hall at 6:30 P.M -price 75¢ per plate - reservations close May 12. The drive to Corvallis is 85 miles by the West Side Pacific Highway.

Following the dinner will be a lecture on the "Vertebrate Fossils of the Grand Canyon" by Professor Anderson of the Eastern Oregon Normal School. Professor Anderson worked in this section before coming to Oregon and his lecture will cover some of the recent discoveries. The Grand Canyon offers a big cross-section through the geologic column so that Professor Anderson's lecture should be of much interest to the Society Members.

Sunday morning at 7:30 A.M. the party will leave for Newport (58 miles) under the leadership of Dr. E. L. Packard. This trip will take the party through a cross-section of Eocene, Oligocene and Miocene beds. The Newport beds are prolific in marine fossils so everyone should secure many good type fossils for their collections. It is 117 miles to Portland from Newport by way of the Salmon River cut-off.

Saturday drive..... 85 miles

Total Sunday..... 175 miles

Total trip..... 260 miles.

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THE GEOLOGICAL NEWS LETTER

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of the

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LECTURES

May 28, 1937 (Friday) - Dr. H. C. Dake
Subject: Fluorescent Minerals and Gem Minerals.

TRIPS

May 29 - 30 - 31, 1937- Bend and vicinity.
Leader: Phil Brogan and the Deschutes Geology Club.

June 19 - 20, 1937 - Saddle Mountain
Leader: Robert Layfield.

Resprvations will be required for the Corvallis and Bend trips. These reservations may be turned in to a member of the Exploration Committee, namely:

Mr. & Mrs. Chester A. Wheeler - GA 8243
Frank J. Bigler
Mr. & Mrs. Leslie P. Newell - TR 7077
H. Bruce Schminky - TA 2485
Joe Wimmer - TA 0597

Dr. and Mrs Adams who were seriously injured in an automobile accident on Salmon River Cut-off, Sunday May 16th, are now at Good Samariton Hospital, Portland, Oregon.

As this Bulletin goes to press we are glad to report to the many friends of these active members of our Society that Mrs. Adams is making rapid strides toward recovery and that Dr. Adams is resting comfortably and is slowly improving.

Visitors are not as yet permitted.

All members of this Society join in wishing them speedy recovery.

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EARTHQUAKES AT BOULDER DAM

Engineering-News Record, May 13, 1937

Earthquakes at Boulder Dam have been frequent of late. On April 28 and 29 there were eight in two days. The intensities of some of these were estimated to be 4 or 5 on the Rossi-Forel scale. Sounds like explosions or blasts have accompanied the quakes.

Because of the frequency of shocks since Lake Mead has begun to fill and the inference that this new water load on the earth's crust may be causing the quakes, suggestion has been made that the U. S. Coast and Geodetic Survey install a group of instruments for studying these seismic disturbances. One instrument at the Dam and one on either side of the lake some distance up-stream from the Dam would roughly form an equilateral triangle with which an attempt could be made to locate the epicenters of the shocks for comparison with the water load of the lake.

K.N.F.

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TRIP TO STEENS MOUNTAINS

Members of the Society who are prone to develop an itching foot at this season of the year may wish to join a caravan trip to the Steens Mountains and other points of interest in southeastern Oregon, under the sponsorship of the Educational Committee of the Mazamas.

The party will leave Portland Saturday, June 5, and return to Portland Sunday, June 13. The route will be by way of Antelope, the Painted Hills, the scenic section of the John Day Canyon, Picture Gorge, Burns, around Steens Mountains, to Lakeview via Hart Mountain, and return to Portland via Silver Lake and Bend. Stops will be made to inspect features of scenic, geologic, historical, or botanical interest, including Malheur Bird refuge and the Antelope Preserve; also to hunt arrowheads at Silver Lake. Steens Mountain will be climbed from the east side, near Andrews; but those who prefer to study their geology from lower levels will have that opportunity. Talks on local history, geology, botany, and wild life will enliven the campfire sessions.

Transportation will be by private car. Individuals will provide their own camping equipment, including canteens for dry desert camping if that should be necessary. Registration is required; the size of the party may be limited.

For further information, call Earl Marshall, leader of the trip, at 1172 SE 55th Ave., TAbor 5953.

K.N.P.

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UMATILLA COUNTY ELEPHANTS

By Major Joy T. Arneson

In the Great Ice Age glaciers which had their source in the mountain regions covered most of Umatilla County, their moraines being clearly seen in many places. As the ice began to recede, the run-off of water must have been tremendous for we find deep water-cut gorges where today no water flows.

Migrating northward, following closely on the receding ice, came the mastodon, the huge ancestor of the modern elephant. They browsed the succulent grasses along stream banks and wallowed in glacier-formed lakes and marshes. Their distribution was confined principally to the alluvial fan which extends westward from the foothills of the Blue Mountains and which today comprises Umatilla County's choicest wheat land: This area during this period must have been exactly suited for the existence of these great beasts for their remains are found plentifully scattered. They are always found close to the basaltic lava bedrock which are overlain by a covering of glacial till of varying depth.

To the west, in lands of lower altitude the country was becoming desert. Where the mastodon, and the later elephant, died and left their bones to whiten on upland slopes. Sometimes the great tusks reveal clearly, sun cracks or weather checks from years of exposure to the elements. The encroaching desert finally crept over them with its covering of aeolian material And the waters of this period being of surface nature did not contain the essential minerals of petrification and well preserved bones are rare. The great tusks, being of ivory and highly compact, endured long after the other bones decayed.

On the discovery of a tusk, one naturally looks immediately for other skeletal parts, particularly of the skull. Usually this has entirely decayed, its outline being traceable only by a slight discoloration of the ground mass, showing how infiltrating waters have filled the cavity left by the decomposition of the original bone. If encountered soon after exposure, the teeth and tusks are frequently found well preserved, large segments being quite numerous. If long exposed to the air they disentregate. They must be immediately treated with several coats of heavy shellac or similar covering to cement out the air.

Remains of the elephant have been found in many parts of Oregon but no where more plentiful than in the northwestern section of Umatilla County, the region described in this article. This region, which may be broadened to include the Walla Walla Valley in Washington appears to have been plentifully stocked with these giant beasts. Their range was limited to the east by the Blue Mountains with its icy mass and frigid heights and to the west by a wide expanse of desert.

THE SAGE OF THE DESCHUTES SPEAKS

Mile-long lava river tunnels, extinct volcanoes holding nicely preserved craters and, among other things, a strange lava cast forest only recently discovered will be included in attractions awaiting members of the Geological Society of the Oregon Country on their Memorial Day week-end visit to the Bend country. Deschutes Geology club members are to serve as guides and Bend will be the "base camp" during the visit.

The Bend committee in charge suggests that the Portland geologists on their excursion into the volcanic region of the upper Deschutes not only bring their picks, but also mirrors -- either those in vanity cases or pieces of silvered glass that will serve to reflect sunlight. Mirrors, the committee stresses, will be necessary if the geologists of the Oregon country wish fully to examine one of the outstanding wonders of the Pacific Northwest -- the hundreds of lava casts strewn over a volcanic terrain in the Paulina foothills, only a short distance from The Dalles-California highway.

Mirrors will be used in reflecting sunlight far back into the perfectly preserved casts or in directing light down into lava molds, formed ages ago when molten rock flowed against and through a forest of pines.

Deschutes Geology club members are certain that the Lava Cast forest of the Paulinas, first brought to the attention of the public by Walter J. Perry, forester and naturalist, will prove one of the outstanding attractions of the visit of the Portland geologists to Central Oregon on May 29, 30 and 31. The casts, or molds, lend themselves to photography, and visitors should be well repaid if they bring along their cameras.

The entrance to the lava cast field is within an hour's drive from Bend. Between mile posts 155 and 156 on The Dalles-California highway south of the city, and less than a mile south of the Lava River caves state park, a sign indicates the road leading southeastward nine miles distant, over a forest road.

The casts stand in a comparatively recent lava field, covering several square miles. This flow is spread over others, of much greater age, it has been ascertained by E. C. Alford, Bend's pastor-geologist and founder of the Deschutes Geology club.

"At the time of the last eruption, much of the area was covered with a dense forest of pine," Mr. Alford wrote. Into this forest the molten lava plunged, engulfing it to a depth of 20 feet. Some of the trees were able to withstand the impact of the flow, which splashed upward for ten feet, and, congealing there, formed a half cast on that side of the trees. The burning of the trees left wells, measuring the depth of the lava. Some of the trees were tilted, leaving the casts in inclined positions. Many of the trees, however, were prostrated, encased with lava and floated as on a torrent stream and left in confused drifts along the margins. The casts of these are seen as horizontal tubes or tunnels. They reach a diameter of five feet, and have been traced back into the lava more than 100 feet. In some the furrows of the bark are visible."

Sunlight reflected into these strange tree-mold tunnels with mirror will bring out in striking detail the form of the ancient trees.

Because of its general interest, the Lava Cast forest of the Paulinas has been set aside "as an area possessing features and objects of special scientific interest." Now under protection of the Forest Service, its specimens are to be preserved from molestation. Trails are being extended to reach the tree drifts. At the entrance, a rustic museum has been constructed.

Bend is to be the concentration point for the visitors from Portland on the evening of May 29, and a sunset get together on the top of Pilot Butte, ancient steptoe at the eastern city limits of Bend, will be arranged. All visitors will be asked to be at the summit of the lofty cone, reached by an oiled, spiral highway, at 7 p.m. Visible from the butte are 11 major snow capped peaks, reaching from Mount Hood on the north to needle-like Thielsen far to the south. As the sun sinks behind the western mountains, an informal lecture on the vast region of the interior plateau will be given. While in Bend, headquarters for the geologists will be at the Chamber of Commerce office, where all necessary information will be available.

Information relative to camping places, hotels and campgrounds can be obtained from Mr. H. B. Schminky before the geologists leave Portland.

Sunday morning, May 30, the group will leave Bend at 8 a.m. and the first stop will be at Lava Butte. There will also be a trip through the Lava River cave state park tunnel, a mile long. The group will spend the remainder of the day in the Lava Cast forest and the volcanic area of the upper Deschutes.

Monday, the visitors are to be permitted a leisurely trip homeward, but will have ample opportunity of visiting other points of interest either north or immediately east of Bend. A side trip into the Lower Bridge diatomite mines at Lower Bridge will be arranged, if permission from the operating company can be obtained.

From the diatomite quarry, the group will be routed to the Crooked River gorge for a view of the contact of lavas and the underlying sedimentary formation. Gem hunters will have an opportunity of looking over the Smith rocks and Gray buttes areas, where agates and other material are abundant.

Phil F. Brogan,
Bend Bulletin,
Bend, Oregon.

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ACCOMODATIONS AT BEND

The following auto camps are available at Bend:

The Pine Tree - - - - - - - - 24 cabins

The South City Limits - - - - 15 cabins

City Center - - - - - - - - - 10 cabins

Bend Auto Park - - - - - - - - 23 cabins

Rates are from $1.25 up to $3.00 depending on equipment such as bedding and cooking utensils.

Pilot Butte Inn has 140 rooms. Rates are : Singles$1.50 without bath, $2.00 with shower and $2.50 with shower and bath - Double $2.50 without bath, $3.00 with shower, and $3.50 with shower and bath.

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ARMY MAPPING ENGINEERS COMING

Portland Chamber of Commerce
Bulletin - May 8, 1937

June 1 to See New $250,000 Annual Payroll in Portland

When June first rolls around the mapping unit of the 29th army corps engineers will be stationed in Portland and for at least two years the city will have another $250,000 annual payroll, according to an announcement by the industrial division of the Chamber of Commerce.

All details have been completed for bringing 123 men under the command of Lieutenant-Colonel C. L. Young, now stationed at Port Angeles to this city. Arrangements have been made to house the offices and use for barracks the Holman and Glenhaven schools, two structures now not in active school use.

This mapping unit of the army engineers is one of the busiest of the field engineers as they are engaged in mapping almost every foot of the territory of the Northwest, work which can be utilized by the forestry and other departments of the federal government as need is presented, through the use of a French field mapping invention.

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In the December 1936 issue of "Readers Digest" is an article entitled "Gold in them Hills" by Rex Beach. This is condensed from an article in "Cosmopolitan". This brings out what the U. S. Government should do for and in Alaska and what Canada has done in scientific prospecting with the aid of airplanes and geologists.

Lillian Neff

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GLACIERS

Report of Committee on Glaciers, by F. E. Matthes, Chairman, American Geophysical Union, for the year 1834 - 35

(Abstract covers only portion of report dealing with continental United States. Some data also taken from report for 1933 - 34.)

The report gives data on advance or recession of glacier termini from autumn of 1934 to autumn 1935. Condensed data are tabulated below. Changes are in feet, slope distance; + indicates advance.

Mountain or Range	Glacier	Change during year	Change in recent years
Mt. Baker, Wash.	Easton	-190	4,750 feet, 1908-1935
Rainier	Nisqually	- 54	- 353 feet, 1930-35 -3,428 feet, 1857-1935
	Emmons	- 48	- 390 feet, 1930-35
	Carbon	- 24	- 65 feet, 1932-35
	South Tahoma	- 61	- 147 feet, 1932-35
Hood, Oregon	Eliot	- 22	- 360 feet, 1901-35
	Coe	+ 15 Approx.	Little change in recent years.
	Ladd	-----	Little change in recent years.
	White R.	-----	-1,000 estimated, 1901-35 (Later measured as 1,800 feet, approx.)
	Newton Clark	-----	-300 (very indefinite) 1901-35.
Shasta, Calif.	Wintun	No change	-4,200 feet, 1920 (or 1927?) - 1935.
	Konwakiton	No change	- - - - - - - - - - - -
	Mud Creek	- 20	- 60 feet, 1933-35 (undercutting)
Sierra Nevada Range	East Lyell	- 1	
	West Lyell	+ 7	- 7 feet, 1933-35
	Maclure	0	
	Dana	+ 19	- 27 feet, 1933-35
	Conness	+ 12	- 13 feet, 1933-35

Mountain or Range	Glacier	Change during year	Change in recent years
Glacier National Park	Blackfoot	+ 8	- 2 feet, 1933-35
	Sperry	----	+ 8 feet, 1933-35
	Grinnell	- 43	- 97 feet, 1933-35
	Agassiz	- 79	-154 feet, 1932-35

Comment -

From the above, it may be noted that of the glaciers in the Pacific Slope on which we have data, Easton, Nisqually, White River, and Wintun have suffered much greater depletion in recent years than the others. Of these, Nisqually flows south; the others flow southeast. Their exposure to rays of the sun is thus much greater than that of ice streams which face the north. The coincidence of greatest annual insolation and greatest annual ablation appears to be significant. Of course other factors enter into the picture, such as direction of prevailing winds, elevation of the gathering ground, and seasonal and geographic distribution of precipitation. The fact that prevailing summer winds on the Pacific Slope are from the northwest, on which side the glaciers are apparently receding less rapidly, suggests that relative insolation may be the more important factor in glacial ablation.

K.N.P.

NORTHWEST GEOLOGY

GLACIATION - EASTERN WASHINGTON

Flint, Richard Foster, "Pleistocene Drift Border in Eastern Washington," (Geological Society of America, Bulletin, v. 48, pp. 203-232, 5 pls., incl. maps, 1 fig., February 1, 1937) In Portland Library.

In the December 1936 issue of the Geological Society of America Bulletin Dr. Flint had an article on the Pleistocene Glaciation in Eastern Washington, and this article is a continuation of his observations. He describes the drift borders and attempts to show that the glacial evidence, as indicated by glacial deposits, is the result of only one glacial advance, the Wisconsin phase.

Northeastern Washington has two distinct physiographic regions; the plateau, of Columbia lava, and a highland area. The basalt is covered with "Palouse soil" to a depth of 100' plus, which is partly eolian and partly lacustrine in origin. In the Grand Coulee-Chelan district, the moraine is 200' high and stretches from the Columbia River on the west to Grand Coulee on the east. In the Highlands area the drift border is less clear, and moraines are found in a few places only. There is abundant evidence of

glaciation in the major valleys; at higher levels the record is mainly depositional. Nunataks were formed by the Okanogan Mountains, 2 peaks of the Moses Mountain group, several peaks of the Kettle Range, Huckleberry Mountains, Pend Oreille and Priest River Mountains. In the southern part of the San Poil valley the ice margin ended in a lake, depositing Nespelem silt.

In the Creston-Spokane district the drift border encroaches on the plateau. The drift border must be placed beyond Bretz' limit. The drift is patchy and is unmarked by any end moraine. A layer of till between the "Palouse soil" and the overlying loess is described in detail, as this till layer has been used to prove a prior glaciation. Dr. Flint indicates that the granitic erratics which Bretz mentions, are merely weathered from the till and are not a record of a former ice sheet. South of the Glaciated area is typical Palouse topography, but in the area under consideration, the Palouse topography has been modified to flat slopes which are clearly abnormal. It is indicated that this is evidence of ice overriding these hills.

Exposures of multiple glaciation are not found in eastern Washington. There are no marked differences in weathering in situ, and all indications point to a late Pleistocene origin. The decay of many of the pebbles found in the till resulted before the pebbles were moved to their present site. Cementation, degree of dissection, and the thickness of the overlying loess are not criteria which can be used to identify a former ice sheet.

In the Creston-Spokane area, the "Palouse soil" is pre-late glaciation and is essentially loess. The "old drift" or till which occurs between the "Palouse soil" and the overlying loess has a matrix closely similar to the "Palouse soil" and the contact between the two is sometimes gradational. The Palouse soil is greatly weathered. Stones averaging 3 inches in diameter are predominately granite and metamorphics. Bretz believes the scablands were cut prior to the old drift. If Dr. Flint is correct, this theory is untenable. "Spokane drift" is really this late drift.

A valley train starts at an elevation of about 2000' at Spokane and grades to the rock threshold at Grand Coulee. This train is described as being a part of the latest glacial epoch, of Wisconsin age. In the Grand Coulee-Chelan district, the drift is all referred to a single glacial stage. The drift is fairly continuous over the Highlands area, and is fresh from the base to the top, and decidedly not a result of 2 distinct glacial stages.

Although there is evidence of pre-Wisconsin glaciation, it is indirect and does not preclude the possibility of a pre-Wisconsin glaciation. The ice had a maximum thickness of 5000' at Colville. The drift border is doubly lobate, indicating that the ice sheet was a piedmont glacier, fed by ice from British Columbia, the Cascade and Rocky (?) Mts. Had it been fed by local precipitation, the greatest development would have been at the center and the ice sheet would have been singly lobate. The Pleistocene snowline was 3000' lower than at present. Dr. Flint found that there was a lack of suitable data to postulate any Pleistocene crustal warping.

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Matthes,Francois Emile

Glacier-Measurements in the United States (American Geophysical Union Transactions, 12th Annual Meeting, Section on Hydrology, pp. 211-215, May 1, 1931) CU

Breifly gives status of study of glacial measurements in the U. S. Mentions work of Mazamas on Mt. Hood. Gives 2 pages of data collected by National Park Service on Nisqually glacier of Mt. Rainier. Gives recession, yearly 1857-1918 estimated; 1918-1919 measured. Total recession for 72 year period is 2,958'. At this rate Nisqually would cease to exist in 410 years.

(RCT)

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Matthes, Francois Emile

On Glaciers (American Geophysical Union, Transactions, 14th Annual Meeting, 1933, Section on Hydrology, pp. 345-350, tables, June, 1933.) CU

Annual report of committee studying glacial movements. Most of them are retreating, especially those of western mountain ranges. Nisqually has had a continuous and fairly steady retreat. Gives data for retreat of Mt. Rainier's. Nisqually, Emmons, Carbon, South Tahoma, Paradise for 1930-1932 with Nisqually back to 1857. Mt. Hood's data by Mazama Research Committee, Eliot, Coe, Ladd glaciers 1925-1932.

(RCT)

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Matthes, Francois Emile

On Glaciers (American Geophysical Union, Transactions, 16th Annual meeting, 1933, Section on Hydrology, pp. 388-392; June, 1935: 13th Annual Meeting, Section on Hydrology, pp. 282-287, April 28, 1932.) CU

1935. Gives credit to Kenneth Phillips of Mazama and Park Naturalist, C. Frank Brockman of Mt. Rainier, and others. For Mt. Rainier, takes each glacier in some details, Nisqually, Paradise, Stevens, Emmons, and Carbon. For Mt. Hood, Eliot, Coe, Ladd. Gives data on other western glaciers outside of Washington and Oregon. 1932. Committee of Mazamas study of Eliot, Coe, and Ladd Glaciers of Mt. Hood show they have lost less than Mt. Rainier glaciers. Tangled mass of logs protruding from under moraine of zigzag glacier. Evidently forest was overridden by glacier. Sylvester found similar situation on White River Canyon in 1906. Attempts an interpretation.

(RCT)

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Wentworth, Chester K. and Ray L.L.

Studies of Certain Alaska Glaciers in 1931 (Geological Society of America Bulletin, v. 47, pp. 879-934, 11pls., 18 figs., June 30, 1936)

, OrCa OrP OrU

Glaciers studied, purpose, method. Juneau region; general statement, Mendenhall, Herbert, Taku, Norris, Twin, Glaciers; summary. Seward region, general statement, Spencer, Deadman, Bartlett, Trail, Bear Lake, Glaciers. Prince William Sound and Copper River regions; general statement, Valdez, Camicia, Sherman and Sheridan, Grinnell, Allen, Childs, Miles glaciers. General fluctuations.

1. Great extension of glaciers in late Pleistocene time. Mergin of many, now separate, glaciers to form great valley-filling ice tongues, which moved out to sea and whose surfaces, in the coastal region were 1,000 - 2,000 feet above any existing glacier.

2. A period of several thousand years of net recession, doubtless with many unknown variations and periods of advance, eventually reaching receded positions somewhat inland from those in 1931.

3. Maintenance of receded position for several hundred years, permitting growth of spruce forests somewhat inland and toward glaciers.

4. Advance, trimming spruce forests to lines now clearly shown. Maximum position maintained one-two decades, within last 200 years.

5. General recession during past 100-200 years, doubtless with many unknown fluctuations.

6. Slight advances, some of striking rapidity, or lessened retreat or halting, shown at ends of glaciers between 1906-1916.

7. Continued retreat through 1931. Average of 50 feet per year. Miles Glacier at rate of 150 feet per year and Bartlett at 20 feet per year since 1916.

(RCT)

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NEW NATURAL WONDER

Great Underground Cavern Near Omak is Explored
(Wenatchee Daily World - Sept. 1,'36)

Just in case you think you have seen all the marvels of this North Central Washington Land of natural wonders, here is something new and more than a little unusual.

It's a huge cave with yawning side caverns, steps, slides, and queer formations, about ten miles northwest of Omak. It is known as Albright's cave, and while a few people have casually visited it from time to time, it

was never thoroughly explored until very recently.

Harold J. Cundy, Wenatchee student of prehistoric writing; Barton Robinson, Omak geologist; George B. Ladd, Omak Photographer; and Guy Tugaw, Riverside guide, made a survey of the cave recently and assembled some data on the structure.

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ROCK GARDENS

Close observers have noticed a new notch in the sky line of Mount Adams since last Labor Day, the date of the trip of the Geological Society to that region. The cause of the change in appearance in the beloved peak has, through strange coincidence been explained at the last Thursday luncheon. It seems that a large protrusion from the side of the mountain was dislodged by one of our members and carefully transferred to the backyard of this energetic rockologist, Franklin L. Davis. The Paul Bunyan proportions of the specimens of this particular collector have on many trips been the envy and wonder of members and we may say the dismay of Tracey Wade in whose sturdy Plymouth this little giant transferred his trophies in toto to Portland. The great day finally arrived when he hired a rock garden artist and gave him a free hand to build his specimens into the massive rock garden. In the evening he hurried home with a song in his heart and a vision in his mind of his yard transformed into a bit of glorious mountain scenery. Alas, "the best laid plans of mice and men gang aft agley." The workman proved to be a "breccia" specialist and had broken all the large rock specimens into nice little even sized slivers and had them very neatly arranged in devious classical geometric figures. The shock has unbalanced the mind of the little giant. He now wanders aimlessly about the city mumbling an inarticulate lingo of geological terms. The eminent medical authorities in the Society believe that the only way he can return to normal will be by taking him back to Mount Adams and allow him the free use of pick and crowbar until by accident, he may hit one of his feet with the pick or bar, the shock of which it is claimed may reinstate his rationality.

(E.N.B.)

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MORE ON THE BEND MEMORIAL DAY TRIP

(Excerpts of a letter from Phil F. Brogan)

This is a final letter to confirm plans for the Memorial weekend field trip of the Geological Society of the Oregon Country into the Bend region, and also to make a few final suggestions. One of these is a reminder that lake and stream fishing in the deschutes country is good at present and a suggestion that ardent anglers bring along their tackle. Part of our outing will be on the slopes of Newberry crater, where East and Paulina lakes are located.

About lunches: Bend will be your headquarters while in the Deschutes country, but lunches will be required on the Sunday field trip to the Lava Cast forest, about 25 miles south of this city. The gang should also wear heavy shoes, but hobs will not be necessary.

Our first general get together will be on the summit of Pilot Butte, at the eastern city limits of Bend, on Saturday evening. This will be at 7:15 p.m.

The start to the Lava Cast forest and the volcanic attractions south of Bend will be made Sunday morning at 8 a.m. Our present schedule calls for a swing up the new spiral road to the top of Lava butte, for a view of the recent lava that welled from that butte and dammed the ancestral Deschutes river. The next stop will be at Lava River tunnel state park, for a mile trip underground and a review of Williams' theory of lava river tunnels. Then to the Lava Cast forest.

Walter J. Perry, retired Forest Service official, naturalist and discoverer of the Lava Cast forest, will be your official guide on the field trip through the area of lava casts. Preceding the inspection of the casts, E. C. Alford, pastor-geologist and founder of the Deschutes Geology club, will lecture on the Lava Cast forest, in the vicinity of the forest service museum.

We hope to have John E. Doerr, Jr., Crater Lake national park geologist, along on the trip.

On Sunday evening, the group will return to Bend, inspect local collections, if they so wish. If there is time available Sunday, we may route the group 20 miles east to the Dry river gorge, where a pleistocene river formed Millican lake, now dry, and cut it away through Horse ridge, flowing north to a junction with Crooked River.

At your request, on Monday morning we shall head the party in the general direction of Portland. We have made arrangements with the management for a visit to the diatomite mines at Lower Bridge. McKinley Stockton, superintendent, plans to be on hand to serve as host and guide.

From the mine, we shall swing over to Crooked river, for a view of the pliocene sediments exposed under the Madras lavas and partly covered by the intra-canyon flow. From this point, members of your club will be able to grasp the manner the intra-canyon basalts flowed into and nearly filled the ancestral Crooked River.

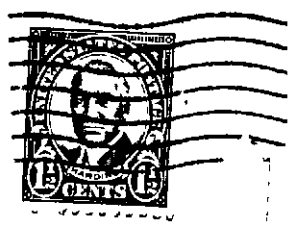
Immediately north of Crooked River, in the vicinity of Trail crossing and the old Clarno exposures, your group will have an opportunity of collecting some gem material. If time is available, members of your party who have not viewed the Cove can do so, making the short drive west from Culver.

Deschutes national forest field men and members of our club looked over the Lava Cast forest last Sunday and report that the area is free of snow and that the road is open and in good shape.

RESERVATIONS FOR BEND TRIP

Mr. Schminky states reservations at hotels and auto camps has been requested for those who signed the register prior to May 18, 1937.

Those who have not made reservation for over-night accomodations should communicate with Mr. Schminky immediately. TA 2485



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PORTLAND, OREGON

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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LECTURES

June 11, 1937 (Friday) - Owing to the civic activities of the Rose Festival it has been decided not to hold the regular lecture meeting scheduled for the evening of June 11, 1937. The meeting on June 25th will be held as usual and the members of the Bend Caravan are requested to bring their choice specimens collected on that trip for display and discussion. The lecture announcement will be made later.

July 23, 1937 (Friday) - Hugh Matier, petroleum geologist for the Union Oil Company has been secured for one of his interesting illustrated lectures.

TRIPS

June 19 - 20, 1937 - Saddle Mountain
Leader: Robert Layfield.

NOTICE

The second week of August has been decided upon as Geological Society Beach Week with headquarters at Ocean Park, (Spencer Creek) 7 miles north of Newport. Members who can arrange for their vacations at that time are urged to do so. Make your own reservations as early as possible either at Ocean Park, Newport or Otter Rock and plan to join with the group for a week of fossil collecting and study of the geology of that interesting coast section.

Evening campfire meetings and short trips to points of interest will be part of the program to be announced later.

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REPORT ON DR. AND MRS. ADAMS

Saturday June 5th the condition of Dr. and Mrs. Adams was reported as satisfactory. Mrs. Adams underwent a slight operation on her knee and as a result was not resting as comfortably but her general condition is improving. Dr. Adams is still a very sick man but the danger of pneumonia from the cold contracted last week is believed past. It will be some time before they can leave the hospital.

Anyone wishing to visit either of them should telephone the hospital first for permission.

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GEOLOGISTS FIND FOREST FLOODED IN ANCIENT DAYS BY LAVA FLOW

Morning Oregonian - June 2, 1937

BEND, June 1 (Special) - High in the Paulina mountains, 25 miles south of Bend, members of the geological society of the Oregon country and their Memorial day weekend trip to the Deschutes basin found definite proof that ancient lavas flooded a forest of several thousand acres and left "ghost trees" to mark that forest of old.

Proof was discovered in hundreds of lava casts, some horizontal and some vertical, of trees that had been engulfed by the lava flood. To study these casts, the visiting geologist, including Dr. Edwin T. Hodge, crawled into the strange tunnels.

Many of the casts were found to hold root and limb molds. Traces of wood structure and charcoal convinced the visitors of the origin of the casts.

Dr. Hodge told the amateur geologists that in his opinion the lava cast area is even more spectacular than the Craters of the Moon national monument of Idaho.

While in the Deschutes basin the Portland geologists were also taken through the mile-long Lava river tunnel, a state park.

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GEOLOGY OF THE BONNEVILLE PROJECT

By Claire P. Holdredge

The foundations of the Bonneville Dam were laid about 30 or 40 million years ago when the Eagle Creek Formation of Oligocene age was deposited. These volcanic sediments, consisting of agglomerates, conglomerates, sandstones, ashes and finer materials, are the oldest rocks exposed in the Columbia River Gorge. They represent thick accumulations of material ejected from a vent or vents of undetermined location. Some of these sediments show the effects of having been reworked by water and most of them have undergone some alteration of the nature of hydration. The ferro-magnesian minerals have been largely altered to clay-like minerals while the feldspars and similar minerals have remained surprisingly fresh. Some of the beds have been so extensively altered in this manner that they have the appearance of bentonite. This formation contains an abundance of plant remains in the form of petrified wood, fossil charcoal, and leaf fossils.

Soon after the end of this period of deposition, or perhaps while the deposition was still going on, these sediments were intruded by basic lavas and dikes of these rocks are present in the area. The most notable example is Bonney Rock which is a diabase intrusive body of sufficient size to accomodate the power house which was founded on it.

The followed folding of the volcanic sediments and some subsequent erosion although the latter is not apparent in the Bonneville area. The erosion of these rocks was brought to a close by the great outpouring of basaltic lavas of the Columbia River Formation. These flows accumulated to a depth of several hundred feet in the Bonneville area. Subsequently they were folded and eroded. Then another outpouring of lavas of a more intermediate type covered the eroded surface of the basalts and caused the formation of entirely new drainage lines.

During the establishment of the new drainage the Columbia River spilled over the summit of the Cascade Mountains between Mt. Hood on the south and Mt. Adams on the north and started the cutting of the Columbia Gorge. This occurred in early Pleistocene time and must have progressed very rapidly. The submergence of the lower gorge probably occurred after the ice age. This submergence drowned the Columbia valley to The Dalles. During the ice age erosion of the gorge continued at about the same rate as before but near its close there occurred a series of floods of fantastic size, the nature and origin of which are still controversial. As these floods receded they left new deposits in the Gorge. Then the over-steepened valley walls began to crumble and a series of great landslides occurred. In the Bonneville area these included a slide between Tanner Creek and Eagle Creek, Ruckel Landslide and the great Cascade Landslide. The first of these was undoubetdly that between Tanner Creek and Eagle Creek. Ruckel Landslide was probably the next to occur and may have crowded the river over to the north side of the valley. The last and greatest of these landslides was Cascade landslide on the north side of the river between Hamilton Creek and Rock Creek. It is almost six

miles long from east to west and is almost four miles wide. It pushed the river over to the south side of the valley and dammed it to an elevation of about 250 feet. Some of the evidence points to a very recent occurrance for this slide. When the river over-topped this landslide dam it apparently did so at the contact with Ruckel landslide in the vicinity of Cascade Rapids but lower downstream it swerved to the north and left part of Cascade Landslide on the south side of its new channel. The portion thus severed from the main slide now forms a part of Bradford Island.

As the river cut its channel down through the landslide dam the material that it removed was in part carried far down the river or even out to sea in suspension. But the coarser materials were dropped much closer where the current slackened. Some of these covered the lower portions of the landslide. Further cutting lowered the river level below these deposits and left them as terrace deposits.

In the river bed itself were found deposits in the process of being transported by the river. These were called recent river deposits. Boulders too large to be moved by the river have accumulated in the stream bed at many places to form a "boulder pavement".

The entire Bonneville area is underlain by sediments of the Eagle Creek Formation and the lavas intrusive into them. The Columbia River basalts and the later flows outcrop only in the canyon walls but much talus from them trails down over the outcrops of the Eagle Creek sediments.

Buried gravels and sands, with definite beds of silt in places, underlie much of the Bonneville area. On the north abutment of the main dam to well above Boat Rock and possibly much farther east. They extend some distance to the north as shown by the drilling and may underlie a large portion of Cascade Landslide. These deposits are present beneath most of the lower portion of Bradford Island and were found in the area around the east end of the lock and between there and the power house. For the most part they are covered by landslide materials but in places they have been buried beneath later gravels. They are characterized by a comparatively large percentage of mica and of pebbles of metamorphic rock.

Landslide deposits are common over a large part of the Bonneville area. They consist of two types of material. The lower and front portions of each landslide is characterized by an abundance of material derived from the Eagle Creek Formation. Due to the hydration of this material in place the forces to which it was subjected during the landsliding has made of it a clay-like mass in many instances. The upper and back portions of each landslide are characterized by broken up lavas from the basalts and overlying flows. This material is very pervious. Thus in Ruckel Landslide this loose material formed a pervious water reservoir in the back portion of the slide in which water accumulated during the wet season and from which this water continued to flow down over the landslide during the dry season thus keeping the slide wet during the entire year. This condition coupled with annual erosion on the toe of the slide by the freshets in the Columbia River made much trouble for the Union Pacific railroad which runs across the landslide.

Overlying the landslide deposits are the terrace deposits of loose gravel and sand. Most of this material was derived from the landslides themselves during the cutting of the new channel for the Columbia River. Many of the pebbles were from the hydrated Eagle Creek Formation and therefore too weak to be used as aggregate for concrete. These deposits form the extensive flat areas on which the town of North Bonneville is located, the flat upon which the government camp is located, the lower end of Bradford Island and many smaller areas on both sides of the river as far upstream as Cascade Rapids.

The Main Dam rests entirely upon beds of the Eagle Creek Formation. These beds include agglomerates, conglomerates, sandstones and finer materials which have been called bentonites in the field. These beds strike about north 45 degrees east and dip about 15 degrees to the southeast. Since the axis of the dam is almost due north and south the bedding planes in the rock cross the structure diagonally and have an upstream component to the dip. Two especially weak beds of the so-called bentonitic type were encountered and made a considerably greater amount of excavation necessary than was at first anticipated. Two or three prominent faults striking parallel to the strike of the stratification but dipping from 30 to 45 degrees to the northwest were encountered. There appeared to be but a comparatively small amount of movement along these faults and they were marked by a relatively small amount of gouge and adjacent shearing. Many tests were made upon this rock to determine its fitness for foundation material and the dam was designed according to the results of these tests.

The abutments of the main dam were tied in to superficial materials. The north abutment was found to be bordered by about forty feet of buried river deposits overlain by about the same thickness of impervious landslide debris. This in turn was overlain by a considerable thickness of terrace gravels and sands. The abutment structure was so designed that the water percolating around it through the buried river deposits would have to travel through these materials at least 1000 feet. The water was shut out of the terrace deposits entirely. The south abutment was bordered by similar materials but the buried river deposits were much thinner and pinched out entirely a short distance upstream. It was therefore possible to keep all water out of both these deposits and the terrace deposits as well.

The power house rests entirley upon diabase of the Bonney Rock intrusive and the south end of this structure abuts into the same material. The north end of the power house abuts into the superficial deposits of Bradford island. These include a few feet of slightly pervious buried river deposits, impervious material from the older landslide from the south side of the gorge between Tanner Creek and Eagle Creek, impervious material from Cascade Landslide and overlying terrace gravels. In this case it was likewise possible to force all water passing around the north abutment to travel through the ground at least 1000 feet.

The lock structure rests largely upon diabase of the Bonney Rock intrusive but overhangs this material on the east end and there rests upon the adjacent baked sediments of the Eagle Creek Formation.

The north shore and Bradford Island fishways are not heavy structures and are carried upon the superficial landslide and terrace deposits largely. The fish elevator structure at the south end of the power house is founded upon Bonney Rock diabase.

It was necessary to relocate the railroads on both sides of the river. That upon the north bank presented very few geological problems for it passed over only terrace and landslide deposits which in all places appeared to be stable. However a slide was started in these deposits when Sheridan point was removed in order to widen the channel at this point. On the south side much heavy construction was necessary in relocating the Union Pacific railroad and relatively more serious and complex problems were encountered. This line runs over many types of deposits. The greatest problem was the stabilization of Ruckel Landslide. This is thought to have been accomplished by draining the impounded water from the slide though a series of tunnels and by protecting the toe from erosion and adding weight to it at the same time by placing upon it a heavy layer of rock rip rap. Another serious problem in the relocation of this railroad line was the tunneling of Tooth Rock. This rock is an enormous boulder of basaltic lava from the Columbia River Formation that has slid to its present resting place from a point perhaps 2000 feet above on the canyon wall. This rock was so filled with cooling fractures that had been slightly opened by its descent down the canyon wall that there appeared to be danger of the tunnel collapsing. However the tunnel has been driven through this rock almost parallel to and a little above and back of the railroad tunnel.

Numerous minor geological problems were encountered in securing foundations for bridges and other structures accessory to the project and during the course of the work of erecting the major structures. One example of the latter was the selection of materials for earth fill at various points. In some places impervious materials were necessary while in others pervious materials were not only permissable but in some cases highly desireable.

During the course of the work a great number of borings were made and numerous shafts sunk. As these were completed the acquired data was filed and digested and as the various problems arose the data thus acquired added to that secured from surface exposures and from excavations for structures was correlated and made use of. All the data acquired during the course of the work has some bearing on the regional geological problems and it is hoped that at some time it may be published in such form as to make it available to regional workers.

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THE OLD FOSSIL MAKES A FIELD TRIP

Well, said the Old Fossil as he moved over a little into the shade, since I do my best geologizing and take most of my field trips in this easy chair, I like to have my figures so I can think them over without too much mental effort. Now when Doc Hodge and the other boys talk about millions of years and millions or billions of this and that, it sounds like a Democatic platform and I get all messed up. I want my figures more like the Townsend Plan, anybody can visualize $200 a month even if you don't know where it is coming from.

Remember when Jack Stevens told us about silt and how the Columbia carried around 15 million tons of suspended load a year. Well all I could think of then was, that's a lot of muck, and forgot about it. But I was looking at this Data of Geochemistry and it says that it also carried 21,638,000 tons of dissolved material. There you are again with a lot of millions. Now, a shovel full or a wheelbarrow load is about my size, I used to work in a brick yard, but we'ed get righ back into millions of those. Suppose we take something we have seen and know about.

The combined suspended and dissolved loads amount to about 36.6 million tons. Lets say that was a nromal year and just as well make it a leap year so it will be even 100,000 tons per day average or over 4000 tons per hour.

Now a good carload is 50 tons and the 80 cars needed would make a good train even on a water grade from Cascade Locks where this information was taken. So the load carried by the Columbia averages just about a good train load per hour throughout the year which, by the way, is about 3 carloads per year for each square mile of the drainage area. Sure, sure, I know it would take a train load every few minutes during the spring freshet and probably only one a day during low water, but I can't worry about that.

From the dope in this book too, you could just about figure out how many carloads of carbonates, sulphates and other salts to make up our train, but I'm tired and I've busted my pencil, so we'll let Davis figure that out on that little slip stick he carries.

Come around again sometime and we'll make another field trip.

Tracy Wade.

NORTHWEST GEOLOGY — Washington — Recent Bulletins

Culver, Harold E., "The Geology of Washington, Part I, General Features of Washington Geology" (State of Washington, Dept. of Conservation and Development, Division of Geology, Bulletin #32, 70 pp., Olympia, 1936)

As stated in the Introduction, "Part I of a comprehensive report on the Geology of Washington, has been written with the double purpose of presenting the generalized geologic features of Washington and of explaining the mode of their presentation on the accompanying geologic map. The great mass of stratigraphic and structural data on which the generalizations were based find no

place in this summary. They are presented and discussed in some detail in Part II of this report 'Index to the Stratigraphy of Washington'".

The plan of the geologic map is carefully presented. The various divisions are explained and reasons given for making them, the colors and symbols on the map are also considered. A time scale for Washington is presented. There is a 5 page digest of the physiography of Washington which is valuable for a generalized understanding of the State.

The geologic formations as presented on the map are discussed, the formations included in each division, region covered, and the authority for each formation. The reader will find the names of those formations with which he is familiar and how they are represented on the map.

The contents include the Introduction; Physiographic provinces. Geologic formations: Quaternary; alluvium, volcanic rocks, glacial drift, continental sediments; Tertiary, distribution, lithology, structure, mapped units, Miocene and Oligocene marine strata, Miocene volcanics; Miocene continental deposits, Tertiary intrusives, Eocene marine strata and intercalated basalt, Eocene continental strata; Mesozoic formations, Mesozoic marine strata, Mesozoic (?) acidic intrusives, Mesozoic continental strata; Paleozoic formations; Proterozoic formations. Summary of geologic history. Bibliography.

While a copy of the geologic map was not at hand, the reviewer has had an opportunity to see one, and the result was quite pleasing. With PartI, Part II, and the geologic map, the investigator should have a very good text of Washington geology in generalized form. A study of Part I leaves the reader with an increased appreciation of the effort which is necessary to make such a geologic map.

This bulletin may be obtained from Olympia, by writing the Dept. of Conservation & Development, as suggested in the reference at the head of this article.

(RCT)

Glover, Sheldon L., "NonMetallic Mineral Resources of Washington, with statistics for 1933" (State of Washington, Dept. of Conservation & Development, Division of Geology, Bulletin #33, 135 pp., Olympia, 1936)

This bulletin is an excellent summary of the non-metallic resources of Washington. As is stated in the Introduction, these non-metallics have contributed from 85 - 95% of the total value of the mineral production of the State. All known occurrences are mentioned in this report. The data is drawn from files of the Division of Geology, from previous reports and a certain amount of field work. Substances are arranged in alphabetical order, of which there are 55.

Each division gives the Washington occurrences and the references to source of material. The occurrences are arranged according to counties. The bulletin has a great number of charts and tables to better illustrate the production, occurrence, and other pertinent data.

Minerals considered are: Abrasives; Asbestos; Barite; Carbon Dioxide; Clay Products; Clays & Shales; Coal, coke, fuel briquets; Diatomite; Epsomite; Feldspar; Fluorite; Fuller's Earth; Gem & Ornamental stones; Glass Sand; Graphite; Gypsum; Lime; Limestone; Magnesite; Marl; Mica; Mineral Pigments; Mineral Waters; Molding Sand; Peat; Petroleum & Natural Gas; Portland Cement; Pumice; Pumicite; Sand & Gravel; Silica; Sodium Compounds; Stone, limestone, basalt, granite, marble, sandstone, serpentine, slate; Strontium; Sulphur; Talc & Soapstone; Miscellaneous, alum, andalusite, bauxite, bentonite, beryl, borax, brucite, dolomite, garnet, lithium minerals nitrates & Phosphates, olivine, potash.

The bulletin will prove invaluable to anyone interested in the occurrence of any of these minerals in Washington. It is well organized, definite localities are given whenever possible, and it is the latest and most authentic source of information.

The bulletin may be obtained by writing the Dept. of Conservation and Development, Division of Geology, Olympia, Washington. No data was available regarding the cost.

(RCT)

NORTHWEST GEOLOGY — Latah Formation, Fish Remains

The Latah formation of eastern Washington is one of the most interesting sediments, from the standpoint of the amateur and the professional. As the "great lava flood" of Columbia Basalt inundated the late Miocene topography and spread steadily northward and eastward, the drainage of the then existing streams was frequently cut off. Lakes formed behind these lava dams and in these lakes the sediments of the time were deposited, silts, sands, volcanic ash and reworked residual clays. These lakes must have existed for considerable time, as trees grew on the shores and their leaves were entombed with the deposits of erosional material.

These leaves are remarkably well preserved and the casts consist of perfect specimens. This indicates that the flora could not have traveled far, else the leaves would have been badly broken. Collectors have found these Latah beds veritable treasure houses, and a great number of excellent suites of specimens have been gathered.

Most of the organic remains in the Latah have consited of leaf casts. Recently, vertebrate specimens have been located, as reported by Scheid[1] of

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[1] Scheid, Vernon E., "Fish In the Latah Formation of Idaho" (Science, n. s., v. 85, no. 2196, p. 120, January 29, 1937)

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the University of Idaho. He states that in May, 1936, Dr. Ralph Lupher, the writer and others, investigated a Latah exposure in a road cut, 11½ miles east of Lewiston, Idaho, in T. 36 N., R. 4 W.B.M. The sediments consisted of white shale with an 8 inch bed of volcanic ash, striking N. 85° W., and dipping 20° W.

Fragmentary fish remains were found at that time and further search disclosed 3 complete skeletons. Scheid re-visited the locality a number of times and secured many skeletons of fish from 4-6 inches long, which have been determined as belonging to the genus Lousiscus. The locality has been called Station 4 by Kirkham and Johnson[2], and the flora of that station has been described by Berry[3]. This is probably the first discovery of complete

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[2]Kirkham, V. R. D., and Johnson, M. M., Jour. Geol. v. 37, pp. 483-504, 1929.

[3]Berry, E. W., U. S. Geol. Survey Prof. Paper 185, pp. 97-125, pls. 19-24, 1934.

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and articulated fish skeletons. It is suggested that perhaps other localities may yield vertebrate skeletons if a diligent search is made for them.

This discovery should be of interest to members of the G. S. O. C. Many sedimentary formations in the Oregon Country contain abundant flora - and most searches are directed to collections of this kind. If collectors would consciously be searching for vertebrate remains as they collect flora, it may be that important discoveries may be made in formations in other parts of the Pacific Northwest.

(RCT)

FOSSILS DISCOVERED BELIEVED 175,000,000 YEARS OLD
Oregon Daily Journal - April 15, 1937

Cambridge, Mass., April 15, -(AP)- Discovery in South America of fossils and skeletons of hitherto unknown animals which perished in quicksands and swamps 175,000,000 years ago was announced today by the Harvard Museum of Comparative Zoology.

Llewellyn I. Price and Theodore E. White, Harvardpaleontologists, found the rich fossil beds. They said the discoveries shed new light on the origin of primitive reptile ancestors of the great dinosaurs and of the warm-blooded mammals that now rule the world, including mankind.

Remains of many ancient animals at least 15 of which are entirely new to science, have been taken from the deposits in the red clay foothills of the Brazilian plateau, near St. Cruz, by an expedition led by Price and White. The Harvard announcement said the bed appeared to be the most significant record of animal life in the triassic age ever found in America.

Thereptiles of the permian and triassic periods were the first forms of life able to live and rear their young out of water, the Harvard scientists explained. For a hundred million years their descendants, including the great dinosaurs, ruled the earth. Then the reptile domain abruptly ended and when, after a long lapse, the fossil story resumed, the mammals were dominant and only a half dozen reptile groups remained.

"The cold-blooded ancestors of man and the other animals, who were somehow equipped to survive the conditions that eliminated most of their fellow reptiles, have left relatively little evidence of their progress during these hundred million years," the Harvard paleontologists said.

Among the traces of such early mammal-like animals unearthed by the Harvard expedition were fossils of "cynodonts," small, dog-sized, meat-eating animals, and "dicynodonts," peaceful lizards about six feet long which lived on plants and were killed by cynodonts and other carnivorous creatures.

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ECONOMIC MINERALS

Ore Deposits

The deposits of minerals which are rich enough in some metal to be mined at a profit are called ore deposits.

Most ore deposits are formed by the gaseous and liquid solutions given off by intrusive magmas as they crystallize. These solutions may deposit their dissolved material as a result of cooling or of reactions with some soluble wall rock with which they may come in contact. The solutions may deposit their material in cracks in the rocks surrounding the magma and form veins such as the gold quartz veins of California and Ontario.

Some ore deposits are of sedimentary origin, such as the hematite ores at Birmingham, Alabama. Still other deposits may be due to concentration of the metal by ground water, running water (placer deposits), and other secondary processes.

Description of the Ore Minerals

AZURITE. Chemical composition: $2CuCO_3 \cdot Cu(OH)_2$, hydrous copper carbonate.

Origin: Formed by the alteration of primary copper deposits.

Occurrence: Common in the upper portions of the copper deposits in Arizona and New Mexico.

Characteristics: Blue color; effervesces slowly in hydrochloric acid.

BAUXITE. Chemical composition: $Al_2O_3 \cdot 2H_2O$, hydrous aluminum oxide.

Origin: Formed by the decomposition of igneous rocks, especially those rich in plagioclas feldspars.

Occurrence: Deposits are known in Arkansas, Alabama and Georgia.

Characteristics: Commonly occurs in spheroidal masses about the size of garden peas. Has a rusty brown color.

BORNITE. Peacock copper ore.

Chemical composition: Cu_5FeS_4, copper iron sulfide.

Origin: Usually occurs as a primary mineral deposited by solutions from an intrusive magma.

Occurrence: Abundant in many large copper deposits of the western states.

CHALCOPYRITE. Copper pyrites.
Chemical composition: $CuFeS_2$, copper iron sulfide.
Origin: Similar to that of bornite.
Occurrence: In most copper deposits.
Characteristics: Distinguished from pyrite by its inferior hardness and deeper yellow color.

GALENA. "Lead".
Chemical composition: PbS, lead sulfide.
Origin: Commonly occurs as a primary mineral deposited by magmatic solutions but may also be precipitated by cool or cold waters.
Occurrence: Some of the largest lead deposits in the world are in southwest Missouri where the lead occurs in the form of galena. Other important deposits are found in Colorado, Montana and Utah.
Characteristics: Bright lead-gray color, perfect cubic cleavage and high specific gravity.

HEMATITE. Red iron ore.
Chemical composition: Fe_2O_3, iron oxide.
Origin: A common product of weathering. Ore deposits of hematite may be formed ina variety of ways. Some varieties of hematite are primary magmatic minerals; others are found in sedimentary rocks.
Occurrence; Chief ore mineral of iron. Mined at Birmingham, Alabama, in the Lake Superior region, and at several places in the west.
Characteristics; Red color, red streak and dull luster.

SPECULARITE is a variety of hematite which has a steel gray color, a high metallic luster and is commonly platy; it is sometimes called "micaceous hematite."

LIMONITE. Brown iron ore.
Chemical composition: $2Fe_2O_3 \cdot 3H_2O$, hydrous iron oxide.
Origin: Always due to the alteration of other iron minerals. Like hematite, limonite is a common product of weathering.
Occurrence: Limonite is mined as an ore of iron in many places in the United States.
Characteristics: Yellow or brown streak, brown color and inferior hardness are properties which serve to distinguish limonite from hematite.

MAGNETITE. Magnetic iron ore.
Chemical composition: Fe_3O_4 or $FeO \cdot Fe_2O_3$, iron oxide.
Origin: Magnetite occurs as an early mineral in some dark colored igneous rocks; it is also formed by magmatic solutions and by alteration of other iron oxides.
Occurrence: in certain iron ores in the Adirondack region, also in Wyoming and elsewhere in the west.
Characteristics: Usually granular; color black; strongly magnetic.

MALACHITE. Chemical composition: $CuCO_3 \cdot Cu(OH)_2$, hydrous copper carbonate.
Origin: Like azurite, malachite is formed by the surface alteration of copper deposits.
Occurrence: Common in the upper portions of the copper deposits in Utah, Arizona and New Mexico where it is associated with azurite.

Characteristics: Bright green color effervesces with acid.

PYRITE. Iron pyrites or "Fool's Gold".
Chemical composition: FeS2, iron sulfide.
Origin: Common constituent in ore deposits formed by magmatic solutions also occurs in sedimentary rocks where it has been formed by the chemical action of aqueous solutions.
Occurrence: Abundant in most sulfide ore deposits in the United States. Excellent crystals of pyrite have been found near Roxbury, Connecticut, at Leadville, Colorado, and at Bingham Canyon, Utah.
Characteristics: Distinguished from chalcopyrite by its superior hardness and pale yellow color.

PYRRHOTITE: Magnetic pyrites.
Chemical composition: FeS . S, often contains nickel.
Origin: A common constituent of high temperature magmatic ore deposits.
Occurrence: Pyrrhotite is abundant at Ducktown, Tennessee, and in the nickel ores at Sudbury, Ontario.
Characteristics: Dark reddish bronze color and weak magnetism.

SPHALERITE. Zinc-blende or "Rosin Jack".
Chemical composition: ZnS, zinc sulfide.
Origin: Commonly associated with galena, see above.
Occurrence: In the United Statessphalerite occurs in large amounts in Missouri, Oklahoma, Kansas (Tri-State district), Wisconsin, Iowa, Illinois (Upper Mississippi Valley) and Montana.
Characteristics: Shows good cleavage and characteristic resinous luster.

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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.

Upon the basis of the geologic structure of the region, it is relatively certain that present discovery has revealed only a few of the great deposits which still lie beneath the surface. Butte and the Coeur d'Alene districts came to light quite by accident, but their richness might be taken as a measure of deposits yet unfound.

Production - The four states produce about one-fourth 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 a part of the general power program.

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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SADDLE MT. FIELD TRIP - JUNE 19-20, 1937

Leader: Robert Layfield.

Approximate itinerary:-

Saturday, June 19

1. Meet at the town of Cannon Beach 1:00 P.M.
2. Will see Haystack rock (remnant of old volcano) 1 mile south of Cannon Beach.
3. Visit tunnel 10 miles south of town and on the way see various basalt dikes cutting sandstone.
4. Return to Ecola State Park, 1 mile north of Cannon Beach, Includes: Kitchen midden (Indian shell piles), trails and scenic beauty, basalt headlands and sea stacks.

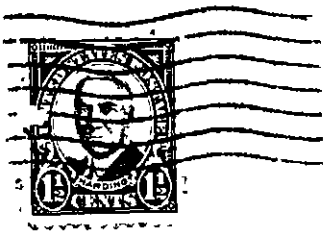
Sunday, June 20

1. The members of our Society will be guests of Capt. Battles for breakfast at Saddle Mt. C.C.C. camp, 8:30 A.M. Bring your own lunch. (The camp is 12 miles south of Seaside on Highway #101).
2. Visit around camp till 9:30 A.M.
3. 9:30 A.M. Leave and drive 4 miles up Wolf Creek Highway. Basalt dikes and foraminiferal clay shales.
4. 10:00 A.M. Drive to northwest end of Humbug Mt. Lecture here pointing out notes of geologic interest about Humbug Mt. and Saddle Mt., which may be seen across the Lewis and Clark River valley. Best spot for pictures of Saddle Mt.
5. Drive to foot of Saddle Mt. (a) View NE cliffs of Humbug Mt. (b) Interesting spring at picnic grounds (c) Short side trip by trail for a better view of Saddle Mt.; to see dikes from a closer position (d) Site of "Old Tote Road" - old military pack trail to Nehalem in the '60's.
6. Depending on time available lunch may either be had here at the picnic grounds or near the top of the mountain.
7. Climb the mountain. Many interesting dikes and basalt breccia areas. The trail completed last fall is a very easy grade (seldom over 5%). The climb is about 1½ mile gaining 1600 ft. elevation.
8. Lectures during ascent and at the summit. (a) Explanation of amazing spring within 100 feet of the top (b) From top of Saddle Mt., if day is clear, can be seen Mt. Rainier, Adams, St. Helens, Hood and Jefferson (c) A suggested route of return will be pointed out that takes one around the NW end of the mountain, to only a few miles south of Astoria.

It is urged that all who have time before or after the trip visit the Astor Column in Astoria. Looking due south one sees Saddle Mt. Another point of historical interest is the site of Old Fort Clatsop where Lewis and Clark camped at the western terminus of their exploration trip. The road turns south for 2 miles right across the highway from the Astoria Airport.

NOTICE - All those who can be present to participate in the breakfast at the C.C.C. camp at 8:30 Sunday morning please leave their names with Mr. H. B. Schminky by Tues., June 15th. It is necessary this far in advance so that arrangements may be made. Those who cannot leave Portland, Sat. June 19th are urged to join the party at the Saddle Mt. C. C. C. camp Sunday morning not later than 9:30 A.M.

Those who are spending Saturday night at Cannon Beach are requested to write to Mr. H. F. Travis (G.S.O.C. member) Box 57, Cannon Beach, stating number in your party needing lodging. Mr. Travis will make reservations so as to keep the group as close together as possible. Remember that reservations are required for lodging and breakfast.



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PORTLAND, OREGON

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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

LECTURES

June 25, 1937 (Friday) - Dr. E. T. Hodge will speak on "Bonneville Industry". The members of the Bend Caravan are requested to bring their choice specimens collected on that trip for display and discussion.

July 23, 1937 (Friday) - Hugh Matior, petroleum geologist for the Union Oil Company has been secured for one of his interesting illustrated lectures.

TRIPS

MYSTERY TRIP -- JULY 4th and 5th

Everyone is going places, auto camps and hotels are already swamped with reservations, the pocketbooks of society members are flat from the past series of two day trips and backs are just beginning to unkink from the bumps and hollows of foreign beds; we we will just stick close to the old home town and take it easy. Dig out the picnic baskets, fill them with anything that will fill you, load the family into the gas buggy and join the gang. The caravans will leave S.W. 6th Avenue and Yamhill St. each morning at 8:00 A.M. The destination is secret, but a prominent member of the Society will lead the way.

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ACTIVITIES OF MEMBERS

June 2nd, 1937 Dr. Hodge spoke on the Northwestern Neighbor's program sponsored by Northwestern Electric Company. His subject - "Some of the Wonders of this Oregon Country in Which We Live".

June 18, 1937 Mr. Vance spoke before the Isaak Walton League during noon luncheon at Hilaires Restaurant. His subject - " Streams of Oregon and Coast Range".

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Joe Wimmer writes from Pendleton, Oregon, June 3, 1937 as follows:

"I visited the Umapine section a few Sundays ago and got some photos of the earthquake damage - roughly this is what occurred there - (1) the end of a hill slid 9 feet and dropped about 6 feet (2) many crevasses are still to be seen some 1 foot across at the surface (3) the earth here is all loose soil and very soft (4) several small areas about 30 to 50 square feet in this area have sunk from 2 to 6 feet forming circular pot holes (5) the disturbed area covers about 100 feet by 800 feet approximately (6) Dry Creek which heads east of Weston and flows toward Milton which always was dry in the summer (as long as local residents can remember) now has a fairly constant stream flowing.

The deformation I described above - slides etc. is a result of, and not the cause of the disturbance. The hill whose lower end moved is the section bordering on the present valley floor.

On the map you may locate it, as immediately adjoining and southeast of Gloncove station on the Walla Walla Valley Railroad - The station is about 7 miles from Milton and the property is known as the Russell ranch."

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THE CORVALLIS TRIP

May 15 found many Society members Corvallis bound. It was open house in the geology department at the college for all of the "Geologists". Some of us remembering the trip of the year before were unable to sit quietly in our cars and let the miles go by. First we leaned forward to get a better view of thus and so. Then we were remembering that array of rocks and minerals. Someone insisted he was going to stay with that whale and the other fossils in Dr. Packard's laboratory. Mrs. Smith could only dream of all the questions she wanted to ask Dr. Sanborn about her fossil leaves. And the first thing we knew we were on the campus! It didn't seem possible, but there we were scampering up the steps of the science building. Several chuckles burst forth as someone remembered how a certain young woman had, the year before, burst in upon a very busy man pouring over a typewriter in some dark recess of the physics building and had asked, "Where do we find coffee?" He most surprisedly and dryly had remarked, "I don't know. I wish I did." At that moment the other members of the group had discoverd we were in the wrong building. We hadn't even read the "Keep off the grass" signs. We'd followed that delicious coffee odor.

We found Dr. Packard's room first, and looked about to our heart's content. There in the center of the room was a recent find ..... a new species of canine, Canis horribus. To some he was doggish, to others he was suspiciously alligatorish. What do you think? We looked at all the things on display and delved into boxes and drawers that weren't exactly on display. No one seemed to mind. At last the whale began to receive his due share of attention. He was carefully measured and studied. Dr. Packard discussed the whale at some length much to Mt. Vance's delight. He has a special feeling for that fossil. He cleaned it out of the rock in which it was embedded and sent it down to the college.

Dr. Sanborn's room held the fancy of many, nearly all the afternoon. To most of us Portlanders Paleobotany is as yet a relatively unexplored field. We've found a few leaves and know a few choice spots, but what is the story of the leaves can tell? How much can they be used in correlations of strata, etc.? Some of us prodded Dr. Sanborn mercilessly. It seems that she will just have to give us a class in the extension work soon.

Finally some of us broke away and hurried upstairs. There we were met by a rather gruff voice, "Where are you all? Where have you been? Oh, down with the fossils? Deserting us, eh? Now, I like that!" Of course you know that was, Don Wilkinson. Can't blame him much. Up in their department they had laid out on tables their most colorful and spectacular mineral specimens. And besides that, microscopes were set up showing thin sections of rocks and the effects of polarized light. Looking down the tubes of those 'scopes and seeing the rainbow colors and shadows; seeing that it was thus and so; seeing it and knowing that it is so, but WHY? We'll never rest until we have delved further into this mystery of mysteries.

Sunday morning at 5:30 o'clock the sun was shining! Was that what beckoned Mr. Vance that he bestirred himself to get up and cut the kindling, much to the consternation of the other campers. If so, it was a false star he followed for it was practically the only time the sun shone that day. But with brave hearts and the true spirit our caravan headed westward soon after the appointed hour of 7:30 A.M. The weather teased us with little splatters of rain, little forebodings of what was yet to come. Everytime we emerged from our cars that day the rain beat down in torrents and the wind blew a gale. Oh, it was a great day, but we learned our geology! There is nothing like having the rain and wind beat on your face. "And there is nothing like carrying rocks in your best hat", said the "press" that day.

The first stop was at a road cut showing a very good exposure of the Tyhee sandstone, Eocene in age. Here Dr. Packard explained briefly the general features of the Coast Range structures.

It is believed that an Eocene sea along the Oregon Coast extended inland some distance. The Tyhee sandstone is of wide extent and is several thousand feet thick. It is a micaceous sandstone composed mainly of coarse mica flakes. From which direction did the streams flow that brought in sediments of a feldspathic character which are usually considered as the results of weathering in a desert climate? The Tyhee was deposited in muddy waters.

Interbedded with it are shales containing mica and some organic matter, plant remains which have become carbonized. No good fossil leaves have been found in the Tyhee. The sands are too coarse for leaf preservation.

The Oligocene sea covered the Eocene deposits, extending eastward as far as Eugene where the Oligocene beds are termed the Eugene formation. The lower Oligocene sea was deep enough for shales to accumulate in some places 1000 feet. These shales are well exposed at Toledo. At Yaquina the Oligocene is typically Eugene formation. It is a near shore deposit of sandstone in places 800 feet thick. This lies on top of the Toledo shales and seems to give evidence of a retreating sea. The upper Oligocene sea was an advancing sea as evidenced by the Nye shales which overlie the Yaquina sandstones. These are deeper water deposits, being fine grained shales. They are gritty and dark colored. The dark color is due to the presence of organic substances. Few fossils have been found in the Nye shales. Fish scales, a few small clams such as Acila and Nucula, and some foraminifera have been found. There is still some conjecture as to whether these shales are upper Oligocene or earliest Miocene.

On the beach near Ocean Park we stood on the Astoria formation. To the north the dip of the beds could be plainly seen as they dipped out to sea. The Astoria beds lie directly and unconformably on the Nye shales. The Astoria beds are quite fossiliferous, containing clams, snails, tooth shells, pectens, sea urchins, foraminifera, whales, seals, and sea cows. The whales lie at the beach horizon northward toward Otter Rock. The near surface fossils are weathered badly. One has to dig into the dark colored shales to get a fresh fossil for his collection. Wind, rain, and ocean wave do their share in presenting an ever changing coastline.

At Newport Pleistocene sands overlie the Astoria formation. The Pliocene is missing. This area was probably above sea level in Pliocene time and was consequently subjected to erosion. Pleistocene sands were laid down on this old erosion surface. The history of the basalt masses exposed along the Oregon Coast is unknown. It is thought to be Pleistocene in age. The basalt is hard and young. How did it get there?

The major folding in the Coast Range has a northeast southwest axis. The Eocene beds were folded at the close of Eocene time. The major folding occurred at the end of Miocene time. Faulting has beenquite extensive. Several unconformities have been noted. Since Miocene time the entire area has been subjected to vigorous erosion which gives the area an old worn down appearance.

Lunches were eaten huddled in our cars at the Devil's Punch Bowl. A few found coffee and comfort at the little store there, but most of us sat and steamed in our cars. Man has assumed control over most of his environment, but as yet he still must bow to "weather". The caravan disbanded after lunch. Dr. Packard and his students found the trail back to Corvallis while most of us started the homeward trek. For those who had never taken the trip along the coast it was a perfect finish for a very satisfying weekend, marred only by the unhappy misfortune of Dr. and Mrs. Adams.

Eva Catlin.

(We are glad to say our latest report from the hospital stated both patients were making progress toward recovery.)

MYSTERIOUS FALCON ISLAND

In Friendly Islands Group

Among the many interesting things occurring in the South Pacific, is the Falcon Island that bobs up and disappears at intervals.

The New York Times, March 7, contained an article on the celebrated Falcon Island, a member of the Tongan group which periodically emerges out of the blue-green waters of the South Pacific.

The romantic islands of the South Seas apparently lie on one of the world's main "fault" lines. Their surfaces are studded with craters, some extinct, others active, with quantities of pumice, smoking and steaming often float around their shores, indicating that violent eruptions have taken place under the ocean bed. Falcon Island shows unique evidence of having had many subteranean disturbances.

The island was named after H.M.S Falcon, which first sighted a breaking reef on its location in 1865. In 1877 H.M.S. Sappho observed columns of volcanic smoke rising from it. Three years later the island had disappeared beneath the sea. In 1885 its reappearance was reported by H.M.S. Egeria, described it as a mile and a quarter long and 153 feet high. By April 1894 the island had vanished again, rising to the surface a few months later increased to 3 miles in length. However in two years it was gone.

In the summer of 1927 the inhabitants of the island of tongatabu, about 56 miles distance distance from Falcon's location, heard rumblings and saw smoke columns rising from the sea. Shortly afterwards Falcon Island reappeared, this time it was a mile long and 350 feet high. By February 1928 it was a mile and a half long and 530 feet high.

Falcon Island had been studied by scientists who came from all over the world. But they had only been able to observe it from a steamer's deck, because the dangerous reefs prohibited a landing. In the fall of 1928 a party of American geologists, with Prince Consort of Tonga, succeeded in reaching its shores by swimming through the breakers.

The geologists reported the island to be circular in shape, with a hot lake of some 50 acres in its center shooting up showers of small stones. The island was composed of a number of huge mounds of unsubstantial volcanic ash deposited on a coral reef, which formed an under sea crater's mouth.

This mysterious mountain island is composed of pumice and ash with a reef as permanent foundation, built up by subterranean eruptions and periodically eroded away by wind, rain and sea.

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Note:

There is an interesting article entitled "New Island Suddenly Arises in Black Sea", appearing in the March 13, 1937 issue of "Science News Letter" page 168.

Dr. W. Claude Adams

LOCAL MAN REMEMBERS "DEEP BREATHING" WELL OF 1892

By Harry S. McNutt

Publication of an account in the Journal recently of a well on the property of the Rose City Sand & Gravel company on N. E. 82d avenue near Siskiyou street that alternately blows and sucks air with no little force has brought forth a report of another well dug on the East Side many years ago which did the same thing.

In fact, the early-day well was so active that it annoyed neighbors, who later filled it in.

Account of the early-day well was brought to the Journal by T. C. Niner, 1414 N. Benton avenue, who, incidentally, is one of The Journal's first subscribers. He has taken the paper since its first day of publication.

"My father, George N. Niner, and I were digging a well in 1892 near what is now N. E. 48th avenue and Everett street," Niner said, "I was a small lad then, and one day, while working in the bottom of the hole, I heard a noise that sounded like a thousand bees. I got out faster than I had ever thought I could. Later my father went down, and he, too, heard the noise, but, needless to say, there were no bees down there.

"The well at that time was about 52 feet deep. We went on down to 63 feet, where we had enough water. The hole was three feet in diameter and we used the old pulley-and-bucket system to get the water, with a lid on top of the well case. At times the well would suck so hard we could hardly lift the lid. At other times it blew out air and kept the lid banging up and down until it ruined some of our neighbors' nerves. After we traded the place, those neighbors filled it in.

"We were told at the time that tidal action, alternately forcing moisture and air through the subsoil over wide areas, caused the sucking and blowing."

A prominent government geologist recently said, in referring to the Rose City Sand & Gravel company well, that difference in air pressure above the ground, causing similar differences in the porous gravel substrata, causes the push and pull of air.

Thus far these two are the only wells in this vicinity known to suck and blow. Others have been reported in scattered sections of Eastern Oregon, Eastern Washington and Idaho

Taken from the Morning Oregon - May 9, 1887 edition

NEW TRANSPORTATION ROUTE - -

The artesian well on W. S. Ladd's place, back of East Portland, having proven a failure as a well, will probably be extended through to China and used as a pneumatic tube for the transportation of freight and passengers. The Portland Flouring Mills, owned by Mr. Ladd, having large contracts for flour to go to China, and by extending through he can lay down his flour there at prices which will defy competition. A sack of flour placed in the tube will, it is expected, gain enough impetus as it drops toward the center of gravity to carry it through the remainder of the tube and deposit it gently on a platform at the other end.

The entire crop of tea from China and Japan will be sent through this pipe and a switch will be built to it by the Union Pacific, and this company will land tea in New York within a week from the time it is picked. The tube will solve the question of a short route to the Orient, and will be the favorite tourist route. Passengers will be furnished with abestos ulsters and will take a parting drink with friends here and will be in China before they have wiped their lips. The completion of this scheme will be of great benefit to East Portland, and Mt. Tabor property will advance a hundred per cent on account of the fine view it will afford to the mouth of the tube.

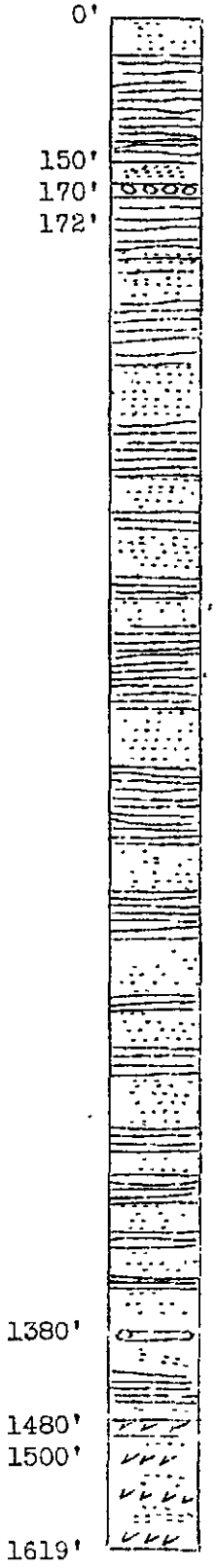
Note:

We have the log of this well and are publishing it thinking it might be of interest to some of our members.

Aprroximate location of Ladd Well as given with the log, should read:-

41st and Hoyt. S. W. $\frac{1}{4}$ of N. E. $\frac{1}{4}$ Section 36 T. 1 N. R. 1 E. Willamette Meridean. Elevation approximately 215 feet above sea level.

Ray-Maling Well Hillsboro
S.E.¼.S.E.¼. Sec.36 T.1 N.;R.3 W.



0'
Clay and soil
150'
170'
Sandy shale
172'
Water bearing sand
Gravel
Shale and hard clay
1380'
Redwood log
1480'
1500'
Igneus rock
Alternating gray
basalt and clay
1619'

Ladd Well near 45th. and Stark
S.E.¼. S.E.¼ Sec. 36 T.1N. R.1 E.

0'
Loam and sand
100'
120'
140'
Sand, clay and gravel
Sand with boulders of granite
and basalt
220'
Boulders, sand and gravel
Course grit and gravel with
sandy layers. Water
405'
Olive marl compact, sand, grit,
lignite and fossil plants
720'
750'
Fine grit, sand and gravel of
basalt and granite rocks
Gravel and fine sandstone
850'
Shale and marl, sandy layers
containing many fossil plants
and wood
1000'
Fine white sand and course gray
sand in alternating beds
1080'
Fine congl. containing layers
of shale and marl with fossil
plants and sand
1200'
1250'
Course basalt grit
1300'
Fine grain sandy marl and shale
with fossil plants
Granite??
1700'

"Timberlines as Indicators of Climatic Trends", by Griggs, Robert F., in Science, v. 85, no. 2202, pp. 251-255, March 12, 1937. In Portland Library.

The attempt to connect the geologic past with the present is a comparatively recent development. Lyell did it theoretically and modern geologists study the work of ice, wind, running water, etc., in order to better interpret that which has happened. The excavations of archeologists and their correlation with geological terrains, the records of the annual varves in water-laid deposits, the interpretation of the variant thickness of tree rings in ancient logs, and the identification of sub-fossil pollens, each in its own way has helped to carry the chronicle back. Mankind has generally assumed that climatic changes during periods of glaciation came too slowly to have any human importance.

The place to study plants or animals in migration is at the limits of their ranges. The town of Kodiak stands almost exactly at the edge of the great forests of Sitka spruce which stretches up the Pacific Coast from Oregon and Washington. On the mainland the interior forest of Canadian white spruce reaches its terminus within a few miles of the Valley of Ten Thousand Smokes. These timberlines naturally invited research into the factors which fixed their position. Points considered were (1) was the climate too severe for the trees to grow a crop of cones, (2) did the cones bear viable seed, (3) was there heavy mortality among seedlings, (4) were the trees so stunted that their rate of growth compare with that of the same species several hundred miles back from the edge of the forest.

Nothing that could be observed about the trees at Kodiak gave any indication that they had reached their limit and were held in check by climatic factors. Everything suggested that the forest is advancing. A century ago the people of Kodiak had to go many miles to find wood such as now grows nearby. A study of fossil pollens indicates that the present forest is the first that has occupied this country since the beginning of the bogs.

A general belief among botanists is that tree growth is limited by the isotherm of 10° C (50° F.) for the warmest month. In southwestern Alaska this isotherm stands 250 miles beyond the edge of the forest. The facts indicate that in Alaska there is a plant migration of exactly the same character as the paleontologist finds in past geological ages. Apparently the climate of Alaska has been mild so recently that the trees cannot keep pace with the change. Instead of advancing many miles per annum, the forest creeps into the grassland very slowly. At Kodiak, the advance is in the order of 1 mile per century.

The retreat of the forest in northeastern America has been intimated but the forest border has never been carefully studied there and conditions certainly should be looked into.

There are places where the forest appears to be advancing. At Mt. Rainier, in Paradise Park and Indian Henrys' Hunting Ground, new trees are coming in. There is clear evidence to an earlier forest in the shape of old charred stumps. It seems likely that this suggested advance is merely the recovery from fire. A common source of timberline modification

is grazing.

In a few places as around Lake Louise and on Mt. Hood, there was, locally, clear evidence that timberline was in retreat.

It has been supposed that great climatic changes in geologic time were world-wide in scope. Conditions here in North America make it clear that shifts in climate of sufficient magnitude to become of geological significance are not necessarily even continental in extent, but may occur in much smaller areas. It will be recognized that this greatly simplifies the problem of accounting for the ice ages, since it may involve merely a redistribution of heat and rain received by the earth rather than variations in the total amount.

(RCT)

o o o o

"Structure of the Earth's Core", Science v. 85, no. 2201, Science Supplement; p. 14, March 5, 1937.

The core of the earth is considered as a great metallic sponge filled with hydrogen gas by Rev. Joseph Lynch, seismologist of Fordham University. The subject of the composition of the earth's core is a fascinating one and one over which endless arguments are waged. The specific gravity of the entire earth is 5 times that of water; the specific gravity of the earth's crust is slightly over 2 times. Which means that the specific gravity of the core must be as high as 12 times that of water.

This has led to the conclusion that the core must be composed of the heavy metals. Its composition and character has been interpretated from earthquake wave transmission in various ways. Father Lynch finds that properties other than mere heaviness are required of this core; it must absorb shear waves, and the tidal phenomena required a rigidity less than the crust. He has used palladium with occluded hydrogen and the material approached the requirements of such a core as Father Lynch feels the earth must have. Experiments are not being made to study the effect of the absorbed hydrogen on the elastic properties of the material.

(RCT)

o o o o

"A New Treatment of Spodumene", Science, v. 85, no. 2200, Science Supplement p. 8, February 26, 1937.

Spodumene is a lithium bearing mineral which looks and behaves like feldspar, and it is the most plentiful of the lithium bearing minerals. Lithium and lithium salts are ordinarily extracted from ores which are rarer and more expensive. Spodumene has been too difficult to process for industry to use it. Recent developments heat the spodumene in a kiln similar to a lime kiln. The spodumene is reduced to a crumbly mass while the remainder remains strong. This allows a recovery of the spodumene. Lithium minerals are used in ceramics, in glass, and in air conditioning apparatus, among other things.

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PETROGLYPHS FROM THE KALAMA RIVER, SOUTHWESTERN WASHINGTON

A very interesting "petroglyph" has recently been discovered a short distance up the Kalama River, where a new highway has been under construction. It consists of a face, quite broad across the cheek bones, and with a pointed chin and aquiline nose. The eyes are stained with blue pigment. The head is covered with a folded cloth and has a distinctly Egyptian appearance.

This "petroglyph" is located on the Kalama River Road, which leaves the Pacific Highway north of the Kalama River crossing, at a point where the Northwestern Electric's substation is situated. Go east on the gravel road, a distance of about 1 mile. The "petroglyph" is found on the rock on the left hand side of the road just before the canyon of the river is entered.

Examination of the carving leads to the suspicion that it is not as old as it might be. The head cloth seems to have a wash of cement mud over it. The eyes are too blue. In addition, this locality used to be solid rock and was broken by blasting. Evidently the carver must have crawled through a very tiny seam to do his work. Local residents were insistent that the carving was authentic.

However, after careful questioning, it was admitted that the carving was made during the road construction by the compressor man as time hung heavy on his hands.

The moral of this story is, when can one be certain that carvings are authentic, and when are they the result of more recent work? It has been suggested before, that many carvings and paintings are the work of fishermen who have to do something when the fish are not striking. Whenever petroglyphs are studied, the investigator should be very cautious and critical of all the evidence. Authentic carvings and paintings are valuable additions to the record; others are what have been termed, darned impudence.

(RCT)

"Migration' and 'Homing' of Salmon", A. G. Huntsman, Science, v. 85, no. 2204, pp. 313-314, March 26, 1937.

The question of migration of salmon is one of particular interest to those of us adjacent to the Bonneville project where many theories are constantly being argued as to the migrating tendencies of the salmon. A recent addition to this group is Mr. Huntsman who feels that the chance of these fish returning to the stream of their nativity is largely determined by factors other than a "homing" instinct. He states that in quite a number of cases salmon marked or tagged in one river have been recaptured in another, and that in some instances when the fish is presented at a fork in a common estuary with a choice between another river and its own, it frequently will take the other.

When the fish happens to get very far from the "zone of river influence" there is little likelihood that it will in its random wanderings reach the place where it originated. As they tend to keep near the surface it is not surprising to find that to a considerable extent they go where drift bottles go. He cites instances along the Atlantic Coast where this actually happens.

(RCT)

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PORTLAND, OREGON

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

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LECTURES

July 9, 1937 (Friday) - Will be a Society picture evening, with Clarence Phillips, Bruce Schminky and others showing their choice films and stills....Clarence Phillips has a reel of Society personalities which will prove interesting as well as instructive....Come out and see yourselves as others see you.
Choice fossils from now Oligocene beds near Portland will be on display. Lets make this an old fashioned party.

July 23, 1937 (Friday) - Hugh Matier, petroleum geologist for the Union Oil Company has been secured for one of his interesting illustrated lectures.

TRIPS

July 18, 1937 (Sunday) - Boat Trip to Bonneville - "Geology of the Columbia River Gorge".
Reservations close July 14th -- Boat fare $1.50.

Don't forget the Society week at the beach. Time - August 8th to 15th. Headquarters at Ocean Park (Spencer Creek) between Otter Rock and Newport. We expect Dr. Packard to pay us a visit there. Paleontology is only half of the interest to be found along this section of the coast.

Mr. Earl K. Nixon has recently been appointed as director of the Bureau of Mining and Geology of the State of Oregon. Members of the Mining and Geology commission report that Mr. Nixon is exceptionally well qualified to assume this important position, and the members of this Society wish him success, and hope to be of any assistance possible.

Mr. Nixon was born August 4, 1895 at Emporia, Kansas, and finished grade school and high school at Eureka, Greenwood County, Kansas. For three years he attended the University of Kansas, majoring in Geology. He then went to the University of Wisconsin where he remained for a year and a half. He is a member of the Geology Club at the University of Wisconsin, and is also a member of Sigma Gamma Epsilon, national geologic fraternity. For short intervals during his college career he was occupied in assisting in the mapping of oil structures, and acted as geologist on a state survey party in the state of Wisconsin.

After leaving college in February of 1918, he was employed by the M. A. Hanna Company of Cleveland, Ohio, such employment continuing in general down to May of 1932, with two brief intervals as the exceptions. From June, 1918 to December, 1918, he served in the United States Army, being honorably discharged as a second lieutenant. For a few months during 1920, he was in the employ of Benjamin C. Neely of Crystal Falls, Michigan as Geologist and in charge of field operations for an oil syndicate, the work being performed in Texas, Louisiana, Mississippi and Kentucky. Aside from these two exceptions, he was employed by the M. A. Hanna Company, including such work as the following: Drafting, geological mapping, ore estimating, collating geological data, in charge of diamond drilling in pyrite mine in Georgia; geological mapping and field work in northern Michigan; in charge of soft coal exploration in West Virginia; geological mapping and in charge of exploration in anthracite coal mines in Eastern Pennsylvania; mining engineer for three underground mines and two open pits on Mesaba Iron Range in Northern Minnesota; in charge of diamond drill exploration for iron ore in Ontario Canada; in charge of diamond drilling and underground development in deep Gogebic Range mine in Wisconsin and Michigan; geological work and direction of exploration in northern Michigan. For one year and 9 months from June of 1930 to March, 1932 he served as District Geologist and was superintendent of extensive mine exploration in Venezuela, South America.

In June of 1932 he came to the Pacific Northwest where he was engaged until November of 1933 in examining, exploring and operating gold mining properties in Montana, Idaho, Washington, Oregon and California. During the winter of 1933-34 he was employed by the Dairy Farm Gold Corporation of Lincoln, California at mill construction and cyanide plant. From February of 1933 to may of 1934 he was engaged in personal work covering gold mine examinations in California, New Mexico, Arizona and Oregon. From June of 1934 to February of 1935 he was Mining Engineer and Geologist in charge of field operations and explorations of Gold Operators, Inc., of New York, doing work in Oregon, Montana, California and Idaho. Since that time he has been Manager of Esterly mine, a placer operation and exploration in Southwestern Oregon.

He assumed his new duties with the State Bureau on July 1, 1937.

THE ORIGIN OF METEORITES - THEIR COMPOSITION AND THEIR CONTRIBUTION TO OUR EARTH'S STRUCTURE

By J. Wimmer

I. Introduction.

Astronomers for many years have been studying the craters of the moon, measuring their diameters and depths and attempting to count their number by photographic aid.

Geologists in recent years have been studying the craters on the earth, but unlike the astronomer they are afforded closer and clearer observation at close range and as a result of their untiring efforts have discovered many scientific facts regarding their origin, age, composition of material and relationship to our earth structure.

Recent studies of certain depressions or basins on the earth have revealed their likeness to craters. Yet no direct evidence of volcanic activity has been noted about them, although they closely resemble volcanic craters.

Twelve of these large craters situated in various parts of the world have attracted considerable attention and much has been written regarding their origin, age and formation.

The following data lists the location, width and depth of some of those which have been investigated and shows the relationship of the width to depth. It should be noted that the depth as measured in recent times was not the exact depth at the time of occurence, since all of these craters have been partially filled by erosional activity. Nevertheless a definite relationship exists between width and depth.

Location	Width Feet	Depth Feet	Ratio Width to Depth
Texas, Ector County	530	18	29.4
Ashanti, Gold Coast	34,300	1300	26.4
Siberia	164	13	12.5
Campo Del Cielo Argentina	183	16	11.4
Estonia	33	3	11.0
"	128	13	9.9
"	300	50	6.0
Henburg, Australia	30	3	10.0
" "	240	25	9.6
" "	360	60	6.0
Wabar, Egypt	328	40	8.0
Arizona, Meteor Crater	3,900	570	6.8

The name "Cryptovolcanic" has been given these craters largely because they are intensely deformed and complex structures. Also because of their resemblence to volcanic craters, although no definite evidence exists of igneous activity within their confines or adjacent thereto.

Generally these craters are round or elliptical in shape, with the central portion raised up in dome shaped fashion sloping radially toward the rim. The rim, as a rule, rises abruptly on the inside and slopes away gradually on the outside of the crater. It is also higher than the surrounding land surface.

Bucher, describes cryptovolcanic structures as one in which the center has been pushed up several hundred feet while the marginal zone has been depressed, the folding indicating an actual shortening of the crustal surface. In those structures studied by Bucher, no trace of volcanic materials or of any thermal action has been found. He is of the opinion that they were formed by a central plug forced upwards.

Early studies of these deformed structures presented a complex and intri cate problem to geologists in endeavoring to explain a satisfactory reason for

their origin that would meet all tests.

Some felt they were caused by an explosive force within; others gave as the cause, the rising of a magmatic plug. These theories, however, did not meet all of the requirements and gradually they have been superceded for one which, though hard to believe at first, has answered all requirements.

It is now quite generally agreed among geologists that the disturbing force came from without the earth and by impact caused the disruption of the surface material.

Further studies have indicated that the craters were caused by the impact of meteors striking the earth's crust, creating impressions proportional to their size and shape.

Examination of the crater rims has shown that the rock strata dip radially away from the crater instead of inward. This outward dip is due to the force of the explosion on the surface carrying the material at the surface in an upward direction. The rocks being elastic, were stretched beyond their elastic limit and permanently deformed. At the moment of impact a large volume of heat was released, further aiding the deformation.

The result of the explosion formed a ring of synclines and anticlines in the crater due to the angular or oblique direction taken by the meteor as it struck the earth's surface.

II. Meteors - General.

Three unknown factors exist in the study of meteorites viz: mass, velocity and temperature. These factors will now be discussed in the light of the present accepted theories.

A meteorite upon striking the earth does so at a very high velocity - a velocity much higher than we are accustomed to think of in scientific measurement; velocities of 40 to 70 miles per second being common.

When two bodies, traveling at this rate, come together the energy that is liberated at the time of impact is transferred into heat, but not instantaneously - time is required for this heat to be dissipated. At the surface of contact an excessive pressure is developed - pressure greater than can readily be conceived. At the moment of impact a wave is set up, in both the earth and the meteorite, traveling in the negative direction assuming the direction that the meteorite is traveling as positive. The material of the meteorite continues onward in the positive direction at its original velocity and due to the wave motion is finally broken up into molecular particles and converted into gas.

In passing through space to the earth's surface meteorites pass through the following stages:

A Atmosphere - Here frictional resistance with the air is dissipated as heat affecting only the shell of the body due to its internal temperature which is somewhat lower than that of the encountered atmosphere.

B A change from Kinetic to Potential Energy takes place when the body is brought to rest upon striking the earth's surface. This results in an expenditure of a vast amount of energy in the form of heat.

The height of disappearance of a meteor averages about 60 miles and those accompanied by fire-balls have a disappearance height of somewhat lower than 40 miles. Meteorites which have been recovered and whose flight was noted by observation had an average height of disappearance of about 15 miles.

It is assumed that the velocity of a meteorite follows the law of falling bodies, falling from a great height and is proportional to the weight and size of the mass.

The following examples show the depth of penetration of the earth's surface of several meteorites. A 9 pound stone penetrated 5 inches in dry earth while a 46 pound stone penetrated 15 inches. An 110 pound stone penetrated 3 feet 10 inches in clay and an 800 pound stone penetrated in excess of 8 feet.

It is estimated on this basis that a 36 ton meteorite would have a depth of penetration of about 400 feet.

If we examine the data of large meteorites that have been recovered we find however that most of the large meteorites weighing several tons have been recovered near the surface - an outstanding example of this is our own Willamette Meteorite found near Oregon City which weighed about 15 tons. When found it was exposed above the surface about 18 inches. It is logical, I believe, to assume that those large stones found near the surface, originally were deeply buried and due to normal erosion have become semi- or fully exposed.

Astronomers tell us that the smaller the mass is, the more perpendicular will be the fall and that large masses strike at a low angle. This fact may account for the location of certain meteorites which are found located at an angle to the point of impact rather than perpendicular to it as the stone in Meteor Crater, Arizona.

The weight of a spherical iron meteorite is approximately equal in tons to the cube of its radius expressed in feet. The weight of the displaced atmosphere during a vertical fall is in tons equal to approximately three times the radius squared in feet. If we take the ratio of the weight of a meteorite to the weight of the displaced air, we find that the result is equal to one-third the radius of the mass. Therefore, an iron meteorite one inch in diameter, gives a ratio of 1/72. That is, the weight of the air displaced is 72 times the weight of the meteorite. If we consider a body having a velocity of 40 miles per second at the time it enters the atmosphere it is easily seen that its velocity in traveling through the atmosphere, which

becomes denser as the mass approaches the earth's surface, would be greatly reduced because as it falls it has to expend more and more energy in displacing the denser air in front of it.

Stony meteorites as compared to iron meteorites weigh about one-half as much; therefore the above ratio would be doubled. An iron meteorite 6 inches in diameter would displace an amount of air equal to 12 times the weight of the meteorite. Such a meteorite would weigh approximately 31 pounds therefore the amount of air displaced would be approximately 375 pounds.

An iron meteorite 6 feet in diameter weighing approximately 27 tons would displace just its own weight in air in a vertical fall, while one 30 feet in diameter would weigh 5 times as much as the displaced atmosphere.

Studies of the Kinetic energy expended by a meteorite as compared to the explosive force obtained by nitro-glycerine show that a meteorite traveling at a velocity of about 2.3 miles per second would, upon striking the earth, equal the explosive force of the same weight of nitro-glycerine.

Since the Kinetic energy increases as the square of the velocity, a mass traveling at 10 miles per second would develop an explosive force equal to 19 times its weight in nitro-glycerine, while one traveling at a velocity of 40 miles per second would develop 306 times its weight in nitro-glycerine.

Astronomers have shown by repeated observations and calculations, that the minimum velocity of meteorites at the time they enter the earth's atmosphere is about 10 miles per second and that the maximum velocity may be as high as 40 miles per second or higher.

The large ones, of course, are slowed down so that they strike the surface at about the minimum velocity due to the displacement of a larger quantity of air. At this speed it is clearly seen that they will be shattered upon impact. The force of the impact would be of an explosive nature, melting and vaporizing the material. This explains why so little material is found when the evidence of a large meteorite having come to our planet from without is discovered.

III. Origin of Meteorites.

Considerable speculation has developed among scientists in recent times concerning the origin of meteorites. The prevailing conceptions are summarized in the following sections:

A They may have come from our own earth, having been thrown so far out into space that gravity lost control over their movement. A body on the earth's surface weighing 100 pounds is at a distance of approximately 3963 miles from the earth's center. If sufficient force could be applied to this body to throw it 36,000 miles into space it would weigh approximately one pound so far as the earth's attraction of gravity is concerned. Other planets would of course act upon it and keep it from returning to the earth. If in leaving the earth it took a circular path it is fair to suppose that at some future time it would return close enough to the earth again to be

acted upon by the gravitational field of the earth, assuming some other planet in the mean time had not already acted upon it.

B. They may be formed by the condensation of small dust particles and gases in the upper atmosphere. Since pressure is lacking in space, it is hard to conceive how these particles could be so well united together and why they should unite at all since they are all moving at an assumed constant velocity in a vacuum.

C. Another theory is that they issue from our nearest celestial neighbor, the moon. It is believed by many that the craters of the moon are the source from whence our meteors have issued. Its surface appears to be extremely broken. The mountain ranges are few and the surface is pitted all over with craters, some as large as 100 miles in diameter. The Moon's average distance from the earth is 238,840 miles. The distance from the earth's center to the common center of gravity of earth and moon is 2880 miles, which is only .0121 of the distance from the earth to the moon. This means that the mass of the moon is just .0121 that of the earth and the density of the moon compared to the earth is .601 or about 3.4 the density of water, the earth's average density being 5.53. The attraction on the surface of the moon is about one-sixth that of the earth, that is a body on earth weighing 6 pounds would weigh only one pound on the moon. Since the attraction of the earth is six times greater than that of the moon it is possible that the earth may attract bodies thrown from the moon into space and pull them toward its surface.

D. Comets have been watched for long periods of time by astronomers and it has been noted that they gradually break up and disappear. It has also been observed that after breaking up, on their next time of return, a meteoric shower is visited upon the earth instead. Of the 400 comets whose orbits have been computed, over 75 percent have parabolic orbits while the remaining 25 percent have elliptic orbits. It is the latter, that is, the comets with elliptical orbits, which return, the others visit our solar system only once. The periods of comets with elliptical orbits vary from 3.5 to 1000 years. About 60 have periods less than 100 years. About 20 have been observed at two or more returns and several are expected to return in the next few years. One, Biela's comet has been recently lost, either by disintegration or by having its orbit transformed by perturbations. About 30 comets, having periods ranging from 3.5 to 8 years all pass very near the orbit of Jupiter. This fact is very significant as it indicates that these comets come very close to Jupiter pointing to a close connection between it and those comets.

Laplace, has suggested that comets have been captured by the planet to which they stand related. It is easily seen that a comet coming close to a planet will be disturbed by that planet. Its velocity may be either increased or decreased. The planet and the comet may come very close to one another resulting in an acceleration which will enlarge the comet's orbit or even change its orbit from an elliptical to a parabola or hyperbola. Or again it may retard its motion, further diminishing its orbit or period

Callandrean has shown that the breaking up of a comet ought not to be very unusual. He suggests that the number of comets in Jupiter's family have possibly been increased due to division of the larger ones.

It is estimated that the larger masses travel at about 26 miles per second, while the smaller ones travel from 40 to 70 miles per second. Since the parabolic velocity is 26.16 miles per second, it is the maximum velocity a body falling towards our sun can attain by the time it reaches the distance from the sun to half the diameter of the earth's orbit regardless from whence it started.

It has recently been shown by Prof. Stroemgren, that those comets which have elliptical orbits, always formed a part of our solar system; while those moving in a parabolic path are the outcasts from the solar system.

Two theories, the Laplacian and the Planetesimal hypothesis have been advanced as the birth of the solar system. The first is based on a single star and the second, which has become the accepted theory, is based on the interaction between two stellar bodies.

In the Laplacian theory it is assumed that a single star made up from successive rings of gaseous material was condensed into a solid mass while in the Planetesimal theory it is postulated that a disturbing force acted upon our sun causing it to eject a small part of its mass which later became condensed into a solid body. Its size gradually increased by accretion of other small masses with which it came into contact in its orbital motion.

The Planetesimal hypothesis satisfies both the Geological as well as the Astronomical tests.

IV. Classification of Meteorites.

Meteorites have been classified into two main groups:

1. Siderites or all metal meteorites.

2. Aerolites or all stone meteorites.

An intermediate group which contains metal as well as stone is classified as siderolite.

Siderites, or the all metal meteorites, consist almost wholly of iron with a small percentage of nickel and cobalt forming the alloys, Kamacite and Taenite.

Siderolites, or stony iron meteorites, are classified as:

1. Lodranites - only one having been found in India weighing 970 grams.

2. Mesosiderites - well represented in collections.

3. Siderophyres - only one having been found in Saxony.

4. Palesasites - about 20 have been found.

Aerolites, or stony meteorites, are similar to our terrestial rocks and have been divided into two classes:

1. Calcium - aluminum stones which are free from nickel - iron.

2. Magnesium stones which are free from nickel - iron.

Almost 90 percent of the stony meteorites are characterized by the presence of small spherical bodies imbedded in a fragment of the same mineral. These have been called Chondrules.

Chondrules are composed chiefly of the minerals Olivine or Pyroxene. The presence of chondrules in meteorites suggests a tuffaceous origin. It is thought by some investigators, though not fully agreed upon by all, that these chondrules were caused by collision between the meteor and the atmosphere; or by an abrupt change in temperature when the meteor approached close to the sun and then wandered into space and again cooled.

V. Composition of Meteorites.

Chemical analysis of meteorites has shown that they contain about 28 of the elements found on the earth, no new element has been found in any meteorite so far examined. Many of the minerals in the meteorites resemble those on earth and appear to be of volcanic origin, some are peculiar and not found on the earth. The following table lists the most and least abundant elements so far noted:

Most Abundant	Least Abundant	
Aluminum	Argon	Nitrogen
Calcium	Chlorine	Palladium
Carbon	Chromium	Platinum
Iron	Cobalt	Potassium
Magnesium	Copper	Ruthenium
Nickel	Helium	Sodium
Oxygen	Hydrogen	Titanium
Phosphorous	Iridium	Vanadium
Silicon	Lithium	
Sulphur	Managanese	

The composition of stony meteorites as found in 63 analysis is as follows:

Silica	38 percent
Magnesia	23 "
Ferrous Oxide	13 "
Metallic Iron	12 "
18 other constituents	14 "
Total	100 percent

These analyses indicate that silica is predominant in stony meteorites. Due to the abundance of silcia in terrestial rocks it becomes difficult to identify a stony meteorite from a native rock after weathering has taken place a short time.

An analysis of stony meteorites shows that they contain the following minerals:

Group	Mineral	Group	Mineral
Silicate	Olivine	Feldspar	Anorthite, Labradorite, Oligoclase
Pyroxene	Enstatite, Bronzite, Hypersthene, Diopide, Augite	Phosphate	Apatite
Sulphide	Pyrrhotite, Troilite	Oxides	Magnetite, Chromite, Quartz
Carbon	Graphite, Diamond	Carbonate	Breunnerite

The following alloys which are found in meteorites are rarely found in terrestial rocks:

Nickel-iron alloys: Kamacite, Taenite, Plessite

Nine other rare compounds have been found, none of which are known to occur in terrestrial rocks.

A comparison of the minerals found in stony meteorites and terrestrial rocks shows that the following are common to both:

Apatite	Magnetite	Pyroxene
Carbon	Olivine	Pyrrhotite
Chromite	Plagioclase Feldspars	Quartz

It is interesting to note that of the terrestrial rocks, peridotite compares very closely in composition with the stony meteorites. Peridotite is of igneous origin and occurs as an intrusive.

The following table due to Merrill, shows the close relationship in composition between the stony meteorites, peridotites and rocks of our earth. The figures are in percent and are averages.

Mineral	Stony Meteorites	Terrestrial Peridotites	Common Rocks
Silica	38.68	37.78	59.93
Magnesia	22.67	28.38	3.85
Ferrous Oxide	14.58	18.36	3.42
Metallic Iron	11.98	-	-
Alumina	2.88	3.11	14.97
Lime	2.42	3.06	4.78
Sulphur	1.80	-	.11
Metallic Nickel	1.15	-	-
Water	.75	3.79	1.94
20 others	3.13	5.52	11.00

The above table shows that the stony meteorites and terrestrial peridotites are, when compared with the common rocks of the earth's surface, about 20% lower in silica, 11% lower in alumina, 12% higher in iron and 20% higher in magnesia. This would tend to indicate that the earth's crust, while closely resembling meteoric material, did not originate by deposition of meteoric material or that the meteoric material now falling onto the earth's surface is of slightly different composition than that of former geological ages.

Time and weathering may also have changed the material of the earth's crust so that it no longer resembles new meteoric material.

All meteorites that have been examined and analyzed show that they are composed of volcanic materials and free from animal or vegetable matter. In no case has any evidence been produced to indicate that meteorites contain sedimentary rock, shale, limestone, sandstone, schist, gneiss or granite.

A study of the material composition of meteorites leads one to believe that they were once molten matter and later cooled under pressure. Evidence of this is to be seen in their crystalline structure and occluded gases. If this is the case, then those found are certainly a part of a former planet that has undergone disruption and has been broken into smaller pieces.

VI. Temperature of Meteorites in Flight.

The temperature of meteorites in flight has been discussed by several scientists and differences of opinion exist among them as to the range of temperature a meteor is subjected to in flight, outside of our atmosphere.

If we consider a mass in space, as exposed to the sun for a long period of time, and further consider it as a "black body", it then becomes a perfect conductor of heat. It must then follow the law that it loses heat by radiation at about the same rate that it receives heat from the sun.

Applying the Stefan-Boltzman, constant of radiation and the Solar constant in the equation of absolute temperature we find that the temperature of the black body in space is proportional to 282 times the square root of the ratio of the distance between the earth and the sun to the distance of the meteorite to the sun.

(To be continued in an early issue)

Activities of the Members

Wednesday, June 23rd at the noonday meeting of the Churchmens Forum, Clarence Phillips spoke on "Highlights of Oregon Geology".

Friday, June 25th, A. D. Vance gave a geological talk before the Sellwood-Morelands Lion Club.

Wednesday evening, June 30th in the Mazama Club Rooms in the Pacific Building, Tom Carney showed five reels of moving pictures. The first four of which were taken while Mr. and Mrs. Carney were on their vactions and showed some fine views in National Parks of this western country. The last reel showed the coronation ceremonies which was very much enjoyed by the group. Mr. Carney remarked since he could not attend the coronation he decided to purchase this film.

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FIRE AND CONTROL OF TIMBER GROWTH

As the annual forest fire season is about to begin, it is interesting to note that according to E. F. Rapraeger of the U. S. Forest Service that while fire is actually used in southern states to control yellow pine timber growth, its use in western forests is never beneficial. The fire damage is evidenced in 3 ways, (1) understocking and reduced yields, (2) decay started in burn-wounds on trees, (3) excessive branching which results in rough timber of reduced market value. Complete protection from fire is essential if western white pine is to be grown of high quality.

(RCT)

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"Cobalt - An Essential Element", RossAiken Gortner, and H. G. Denham, Science, v. 85, no. 2207, pp. 382-383, April 16, 1937.

A new use for cobalt has been discovered by workers in New Zealand. Animals, particularly sheep, become ill with what is known as "bushsickness", while grazing on certain pumice soils of the North Island. Certain metallic salts helped relieve this situation and in each case it was discovered that the critical element was cobalt. The cobalt is administered in drenches in a dose of 8 mg. per week and has been completely effective in preventing and curing sheep ailment. It is possible that soluble cobalt salts may be added to the soil in the form of top-dressing as plants quickly absorb this element.

(RCT)

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THE GEOLOGICAL NEWS LETTER

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LECTURES

July 23, 1937 (Friday) - Hugh Matier, petroleum geologist for the Union Oil Company has been secured for one of his interesting illustrated lectures.

TRIPS

Don't forget the Society week at the beach. Time - August 7th to 15th. Headquarters at Ocean Park (Spencer Creek) between Otter Rock and Newport. We expect Dr. Packard to pay us a visit there. Paleontology is only half of the interest to be found along this section of the coast. Plan on spending one or both weekends at the beach even if you cannot stay the full week.

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August 22,1937(Sunday) - Little Crater Lake - Olallie Lake.
Leader: Russel Collins.

Sept. 4th, 5th & 6th - A full 3 day trip.
Leader and destination as yet unconfirmed.

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A POWERFUL SOLVENT - SELENIUM OXYCHLORIDE

The good old story about the man who had discovered a universal solvent was gaining considerable headway until some bright boy rose up to inquire what it was kept in. Selenium oxychloride seems to be almost in this catagory. Prof. Gilbert Smith of Brooklyn Polytechnic Institute describes a case where this chemical froze one night in the laboratory (it freezes at 65° F), broke its container, dropped to the wooden floor, ate through it into the physics laboratory beneath, destroyed numerous instruments there, even bakelite fixtures. Glass, feldspar, tungsten, platinum are among the materials which resist corrosion by this chemical.

(RCT)

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"IGNEOUS ROCK TEXTURE DEMONSTRATION FOR STUDENTS OF ELEMENTARY GEOLOGY" ,

W. Farrin Hoover., Science, v. 85, no. 2208, pp. 411-412, April 23, 1937.

Mr. Hoover describes a few simple experiments by which one may actually produce the crystal textures studied in igneous rocks; a granatoid, a felsitic, and a porphyritic texture. A supersaturated solution of sodium thiosulfate, ordinary photographers hypo, is prepared by heating 100 cc. of tap water to boiling and then adding 200 grams of the salt. The test tube is cooled to or below room temperature by putting the tube in cold running water. The resultant solution is now supersaturated.

To produce a granatoid texture, put 20 cc. of this solution in a test-tube and "salt" the solution with a small particle of foreign matter. Crystallization begins immediately, forming aggregates which have the same arrangement as crystals often observed in igneous rocks.

To produce a felsitic texture, again place 20 cc. of the supersaturated solution in a test tube and shake it violently. Minute crystals accumulate on the bottom of the tube, and can be examined with a hand lens.

Porphyritic texture is formed by proceeding as for granatoid texture. When the crystal aggregate iswell developed, violently shake the tube and minute crystals form to fill in the voids.

A glassy texture can be produced, similar to that in obsidian by half filling a 250 cc. beaker with sugar and heating slowly so as to melt but not burn the sugar. If the melted sugar is poured into a beaker of cold water or onto a cold surface, the resulting rapid cooling will form glassy textured masses.

(RCT)

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THE ORIGIN OF METEORITES - THEIR COMPOSITION AND THEIR CONTRIBUTION TO OUR EARTH'S STRUCTURE

By J. Wimmer
(Continued from 7/10/37, Bull.)

This results in a temperature variation proportional to distance. For a black body at various distances from the sun we obtain the following temperatures:

Distance from Sun Millions of Miles	Temperature °C.
36.0	180
67.2	58
92.9	9
141.5	- 45
483.0	-149
886.0	-182
1782.0	-209
2800.0	-221

The earth is 92.9 million of miles from the sun and a black body, before entering our atmosphere, would have a temperature, as shown by the above table, of about 9°C. Therefore it is seen that as a mass approaches the earth's atmosphere its temperature is not absolute zero, but at a temperature equal to that above the melting point of ice. This conclusion is based on the assumption that it is a black body and a perfect conductor of heat.

On the other had, a non-conductor of heat, such as a reflecting surface, will have a different temperature. If we assume a non-conductor of heat, such as a reflecting surface, then the side facing the sun at a finite distance from the earth will have a temperature of about 62°C, while the opposite side will be at absolute zero temperature, i.e. -273°C., resulting in an average temperature of -105°C.

From the above assumptions we may conclude that a meteor, if a black body, when near the earth may have a temperature between -105°C. and + 9°C.

The inner and the outer, or surface temperatures, will be different. If we consider the material composing the mass as having a diffusivity of .01 cm^2 per second, that is similar to limestone, and further assume that it is to be at absolute temperature and suddenly raised to +9°C. and if the body is 10cm. in diameter, at the end of 15 minutes, the difference between the temperature at the center and that at the surface will be less than 15°C. At the end of 30 minutes the difference will be less than 0.2°C. If we further assume the velocity to be 100 km. per second it would take 5 days to travel the distance equal to that from the orbit of Venus to the orbit of the Earth.

Unless it travels faster than 100 km. per second or is greater than 10 cm. in diameter it is very likely that there will be very little difference in the temperature between its interior and the surface, before it enters the Earth's atmosphere.

In view of the above, it is generally believed that a meteorite has a temperature closer to 0°C. than to the assumed absolute temperature of space.

Ward has shown that a large meteorite, traveling at a velocity of 60 miles per second in the atmosphere, will cause the air in front of it to attain a temperature in the neighborhood of 5000° C. due to compression.

VII. Frequency of Meteoric Falls.

A study of the frequency of meteoric falls by months from 1850 to 1930 has brought out some interesting, though only partially understood facts. A decided minimum occurs in the months of March, October and December with a pronounced maximum in January, June and September,

The following table compiled by Dr. P. Tscherivinsky is of interest. It shows the number of observed falls by months:

January	30
February	26
March	22
April	43
May	50
June	51
July	40
August	40
September	34
October	29
November	30
December	27
Total	422

A study of the hourly frequency of the falls which have reached the earth's surface shows a marked maximum between noon and 4 p.m. and a minimum between 2 and 3 a.m.

The reason for the hourly frequency variation is explained by the fact that a mass following the earth in its path arround the sun, its apparent speed will be the difference between that of the mass and that of the earth. If it is following the earth i.e. coming from the antiapex,(sunset side) it will enter our atmosphere at a considerably reduced rate of speed and its chances of reaching the earth's surface are much greater than if it were coming from the apex or sunrise side of the earth.

In the case where a mass comes from the sunrise or apex side its speed would be the sum of that of the earth and that of the mass and considerable difficulty would be encountered in entering the atmosphere.

The least possible collision velocity of a meteor in flight is about 6.9 miles per second, while the head on parabolic collision velocity maybe as high as 70 miles per second. From these figures it is clearly seen that the penetration of the atmosphere is difficult by a mass when coming from the front and easy when coming from the rear of the earth.

During the period from 1800 to 1925 over 470 meteoric falls were located and 129,349 meteorites recovered. This is an average of 277 meteorites per fall. On this basis, considering the number of square miles of land surface

of the earth as 57,500,000; we find one meteor fell per 440 square miles during the 125 year period.

The observed falls are of course, only in the populated centers. Those sections of sparce population do not show many falls and therefore do not contribute much to the data.

VIII. Amount of Meteoric Material Falling on the Earth.

It is conservatively estimated that during a single 24 hour period, over 24 million meteors travel through the sky. Few of these ever reach the earth's surface.

Wylie has shown that approximately 2 million kilograms of meteoric material per year falls upon the earth. Using this figure as a base, the annual fall on each square mile of the earth's surface would be about 10 grams. At this annual rate, the earth's radius would be increased about one-half inch in 10 million years from meteoric accumulation.

Many more iron meteorites have been found in the Western Hemisphere than in the Eastern Hemisphere and nine-times as many in proportion to stony meteorites. The section where they have been found in abundance extends from northern Mexico to the adjacent parts in the southern United States.

All large as well as small iron meteorites have been found either on the earth's surface or only slightly buried - none have been discovered at any great depth. This would indicate that those found are, or may be of recent deposition and that meteoric falls in past Geological times either contributed practically nothing to the size of our planet or have been completely disintegrated due to weathering. If a large amount of meteoric material had fallen in past periods - that is, greater than in recent times, the evidence has been destroyed by time and erosion, especially if the earlier falls were of the stony kind.

IX. Weight of Meteoric Material Added to the Earth.

The total weight of 129,349 stones that have been known to fall in 12 countries whose area is 7,205,503 square miles in the last 125 years is 17,074 pounds. If we assume that ten times as many fell as were found, this weight would increase to 170,740 pounds.

Since the beginning of the Cretaceous Period or approximately 125 million years this would amount to 85,370,000 tons.

The populated area of our earth is only 3.6 per cent of the total area, so for the total area of 197 million square miles the added weight would be 3,644,500,000 tons.

In the Siberian fall of 1908, to be discussed later, it is estimated that 40,000 tons of material reached the earth's surface, while in the case of the Arizona meteorite it is conservatively estimated that several millions of tons of material fell.

In western Africa, the Chinguetti iron meteorite which was found in 1921 measured 325 feet by 146 feet has an estimated weight of one million tons.

The Brazil meteorite of 1915 has an estimated weight of 20 tons.

The following table lists some of the large meteorites that have been found and their estimated weights in tons:

Cape York.....	40
Bacubirito.....	25 to 40
British Africa.....	40 to 60
Xiquipilco.....	20 to 25
Chupaderos.....	24
Willamette.....	15
El Morito.....	12
Santa Catherina.....	25
Twenty others range from	1 to 15 each.

X. Relationship of Meteoric Finds to Falls.

It has been shown that meteorites are found in all sizes weighing from a few grams to 60 tons. It is believed that all meteorites at the time of entering the atmosphere are fragmental and that they are further reduced in size by the atmospheric pressure and velocity at which they are moving. Since iron meteorites are more resistant to destruction than stony meteorites, the iron meteorites should be the larger of the two. A comparison of the many stones so far found attests to this fact.

The following table compiled from Merrill's study of meteoric finds and falls indicates that few of the finds are actually seen to fall:

Number of Meteors	Type	Seen to Fall		Remarks
		Number	Per cent	
367	Iron	17	5	All metal
31	Stony Iron	5	16	50% metal
370	Stone	322	87	5 to 25% metal
21	Calcium Aluminum	20	95	less than 1% metal
12	Magnesia	12	100	no metal

It is assumed that the iron or metallic meteorites are the older since they are more resistant to destruction by erosion while those of which the greater percentage are seen to fall, are the stony meteorites.

This would seem to indicate that there may be a change in the composition of the material composing meteors from basic to acidic. It must of course be remembered, that stony meteorites have a short life after being subjected to erosional activity and, unless sought soon after falling, they may become disintegrated and their identity lost forever.

XI. Description of Meteoric Craters on the Earth's Present Surface.

Consideration must be given to the effects of time in studying the meteoric craters on the earth's surface. The present surface, as well as the surfaces of past Geological ages, must be taken into consideration.

The descriptions which follow, though they do not cover all known meteoric craters, are nevertheless indicative of the effect produced by large meteoric falls to our earth's surface in recent geological time.

A. The Arizona Crater has a maximum diameter of 3950 feet and a minimum diameter of 3850 feet. Its present depth is 570 feet. The outer slopes rise gently from 130 feet to 160 feet high at the rim while the inner slopes are very steep - almost perpendicular in many places. The bottom is level and has an area of over 300 acres.

Fragmentary nickel-iron material is found scattered about for a distance of 6 miles from the crater. The size of the material decreasing from the crater rim outward. The weight of the material ranges from an ounce to 1000 pounds.

About 20 tons of this material has been recovered outside of the crater while within the confines of the walls only four small pieces have been found. The reason for this distribution of material about the rim is, that as the meteorite struck the earth's surface it exploded and in doing so broke up into many smaller masses. The broken parts were thrown in all directions, the larger ones falling closer, while the smaller particles fell further away from the crater. Recent geophysical explorations indicate that at least one large mass rests under the southwest rim of the crater, about 700 feet below the present floor

An analysis of the meteoric material collected in the vicinity of the crater is as follows:

(a) Diamond (b) Nickel 7.33 percent (c) Platinum 3.65 grams per metric ton (d) Iridium 14.65 grams per metric ton.

About $500,000 has been spent investigating this crater and searching for the main meteoric body. A test shaft was sunk outside of the crater which showed that the subsurface rock structure was shattered at that point radially outside of the crater

The rim of the crater is covered with ejected debris composed of the rocks making up the general structure.

The original crater, since it was first formed, has been filled about 700 feet with this debris which fell back after it was efected. There is about 120 feet of sedimentary material deposited above the debris that fills the crater.

Evidence points to the existence at one time of a lake covering the entire bottom of the crater, however in historic times this body of water has completely disappeared.

It has been calculated by Tilghman, that the debris now remaining about the crater, would if replaced with the crater fall short by millions of cubic yards in filling the cavity. The shortage may be accounted for by erosion. On the basis of erosion, Tilghman, has calculated the age of the crater as between 10,000 and 50,000 years.

A study of the tree rings, on the large cedars on the parapet, indicates that the catastrophe occurred at least 700 years ago.

The deposits on the bottom of the crater are from 70 to 90 feet in thickness and consist mainly of sand and quartz flour with many lacustrine gastropod shells and diatom frustules. These deposits indicate a body of water that must have been of long standing and non-seasonal. In order that water remain in the crater the weather conditions must have been different from what they are at present. Either cooler or more humid conditions must have prevailed. The present water table is approximately 200 feet below the floor of the crater. At the time that the crater retained the lake the water table must have been above the floor of the crater.

A thin layer of volcanic ash is to be found in the lake bed deposits. It is believed that no volcanic eruption had occurred in this area since Pleistocene (late glacial) times. In considering the latter evidence, it is felt that this age of the crater is at least as early as the late glacial period or Pleistocene Period i.e. 40,000 to 75,000 years.

Over 400,000,000 tons of limestone and sandstone were shattered by the impact of perhaps several hundred thousand tons of meteoric material in the occurrence of the major catastrophe.

Evidence points to the fact that the meteor fell at an angle of about 45 degrees.

That a great deal of heat energy was expended at the time of the formation of this crater is evident, by the presence of Coconimo sandstones which have been altered by fusion to slica-glass. In order that this process occur a temperature of from 1400 to 1800° C. is required.

Many of the rock fragments carry brown and green stain, thought to be due to the vaporized nickel-iron.

B. In Central Siberia on June 30, 1908 a meteor struck the earth's surface in anisolated section at 61° N latitude and 101° longitude, felling trees radially outward for a distance of over 30 miles. All of the fallen trees point away from the center of the disturbance.

In the center of the area are to be seen ten fumal shaped craters whose diameters range from 30 to 150 feet and whose average depth is about 10 feet.

An exploration of the area in 1921 did not result in finding a single piece of meteoric material although it is estimated that over 40,000 tons of material fell here at the time.

The meteor was seen to travel from the northwest to the southeast and overtook the earth. Its speed therefore was slow relative to the earth's speed. At the time of this catastrophe, the night sky was very bright and remained so the following two nights.

C. The Carolina Bays Craters on the eastern coast of the United States between North and South Carolina and extending into Virginia, Tennessee, Georgia and into the Atlantic Coastal plain, contains hundreds of craters ranging in size from 500 to over 8000 feet in diameter. All are elliptic in shape with their long axis nearly parallell. Their direction being 45° south of east. The southeastern rims are higher and more pronounced than the other parts. It is believed that the origin of these crates dates back to either the Pleistocene or Pliocene Period that is between 25,000 and 20 millions of years.

Although no meteoric material has been found within the crater walls or in the immediate vicinity, a large number of octahedrites have been found in the region northwest of the craters.

A study of the topography of the area shows that there are 43 prominent craters and in the 500 square miles adjoining there are over 70 craters which have diameters exceeding 500 feet. Their average lenght is 2210 feet while their average width is 1430 feet. Their extreme length is 8090 feet and the extreme width 4410 feet.

This section contains by far the largest number of craters so far discovered. Their origin has been investigated by a number of scientists. Some differences of opinion exist among scientists as to their origin. Some believe they were caused by the action of the winds and the sea. Others, such as Melton and Schriever have advanced the theory that they were caused by meteoric bombardment. It is known that meteors commonly strike the earth at angles varying from 35 to 55 degrees.

A shower of meteors striking the earth at the same time would cause elliptical depressions. In the latitude of the Carolinas a point on the earth's surface rotates through an arc of about 850 miles in an hour. It is therefore evident that a meteoric shower must have taken place in a comparatively short period of time - perhaps less than one-half hour. Since the distance equal to the breadth of the coastal plain could have been traversed in about 10 minutes.

D. Until 1927 the only known example of a meteoric crater was that of Arizona. In 1931 however the Henbury Craters of Central Australia were discovered and added to this interesting subject.

So far 13 craters have been studied, the largest measuring 660 feet by 360 feet with an average depth of 55 feet.

Others in this locality have a diameter ranging from 30 to 250 feet.

Large quantities of meteoric iron have been found in the vicinity of these craters. Pieces ranging in weight from an ounce to over 270 pounds have been recovered.

E. In 1932 H. St. J. Philby, while crossing the Arabian desert in search of the ancient city of Wabar, found that the supposed ruins were a series of craters and the cinders in the ruins turned out to be pure silica-glass.

Silica-glass is a product of the fine sand of the desert and thermal action.

Some rusted meteoric material was also discovered nearby weighing as much as 25 pounds.

Since a temperature of 1700° C. is required to melt quartz sand, it is evident that a large amount of heat energy was expended at the time these craters were formed and with this expenditure of energy, silica-glass was produced.

Thin section studies of the meteoric material shows that it was altered by excessive heat.

F. At Paragould, Arkansas, on February 17, 1930 a meteorite was observed in falling and upon being recovered immediately afterwards, it was found to weigh 820 pounds. It had penetrated a clay soil to a depth of 8 feet, scattering the material for a distance of 50 feet arround the point of impact.

G. Near Odessa, Texas a large crater has been found whose diameter measures 530 feet. Near it a meteorite of iron composition was found.

H. In the Baltic there are a group of craters, the largest being 300 feet in diameter and 150 feet deep. Its rim extends 12 feet above the surrounding land surface. In this same area six additional smaller craters have recently been discovered.

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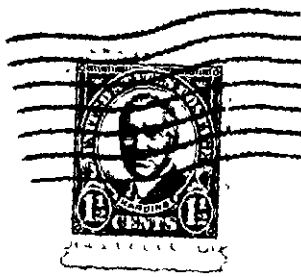

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THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

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LECTURES

Watch your daily newspapers for announcements of coming lectures.

TRIPS

August 7 - 15, 1937 - Don't forget the Society week at the beach. Headquarters at Ocean Park (Spencer Creek) between Otter Rock and Newport. We expect Dr. Packard to pay us a visit there. Paleontology is only half of the interest to be found along this section of the coast. Remember to spend a weekend with those members of the Society spending their vacations at the summer camp.

August 22, 1937 (Sunday) - North Santiam River. Leader - Dr. Thomas P. Thayer. Many of the members will remember Dr. Thayer's interesting lecture on this area.(See vol.2,no.11,pp 7-9 for abstract) Due to the fact that Dr. Thayer has been transfered to California, this may be our last chance to take a trip under his leadership. In view of this fact, Russell Collins has kindly consented to postpone the "Turquoise Pool" (Little Crater Lake) trip.

Sept. 4-6, 1937 - Labor Day week-end in the John Day country. This will be a trip similar to the one of 1935.

Sept. 19, 1937 (Sunday) - Turquoise Pool and Ollalie Lake. Leader - Russell Collins.

MORE ABOUT BREATHING WELLS

In connection with the subject of "Breathing Wells"(see G. S. O. C. Bull. of June 25, 1937) it may be interesting to mention something about another one recently visited by a party from the U. S. Engineer Department.

The Norco well is located at the NW edge of an orchard tract known as Wenatchee Heights, 4 miles SW of Wenatchee. The well derrick can be seen on the SE skyline of Squillchuck canyon from the road.

The well at the surface was started at 2200 feet elevation and was drilled and cased three years ago to a depth of 2953 feet, using a portable Star-28 drilling rig. At present the company is constructing a Standard rig to drill deeper.

The structure (dome) on which the well is located can easily be seen from Squillchuck valley road on the NW side and the Stoinilt canyon road on the SE side of Wenatchee Heights.

The well at present bottoms about 700 feet below sea level. The complete cycle of breathing extends over approximately 24 hours. For twelve hours there is a head pressure pushing out a gas that burns and the next twelve hours a back pressure causing a partial vacuum in the well. The owners think that this periodic change of pressure is due to tidal effect. Two factors are against such a theory. The well is a little over 100 miles direct line across the Cascade Mountains from the effects of the ocean tides and ocean tides change more often than every twelve hours, about every seven hours.

What is the answer to breathing wells? Your guess is as good as mine.

R. A. Layfield.

OREGON GRAPE REAL NATIVE
Morning Oregonian 8/9/36

Oregon's state flower, the "Oregon grape," is a real native bloom, its ancestors having lived in this region more than 30,000,000 years ago.

Fossil leaves have been identified by Dr. C. A. Arnold, University of Michigan paleobotanist, in miocene rocks from eastern Oregon. The Oregon grape is not really a grape but belongs to the barberry family.

Cigarbox wood also grew in this same region ages before smokers arrived. The rock records show that "Mexican cedar" thrived here, whereas it is now native only to the tropics and eastern Asia. Again, incidentally, this "cedar" is a species of mahogany.

Apparently the eastern Oregon of miocene times was inhabited by many plants no longer native here, Dr. Arnold states. From fossil leaves, seeds and fruits he has identified the ginko tree and alianthus, or Tree of Heaven, now native only to Asia, and the ironwood, found now only much farther east.

CANNON BEACH SECTION OF THE SADDLE MOUNTAIN TRIP OF THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY - JUNE 19, 1937

In spite of a southeast gale and rain storm on June 19th, the party assembled on schedule at Cannon Beach and waited some time for those who might have been delayed. The party proceeded south on Highway #101, several stops being made between Ecola Inn and Arch cape to study the formations on the promontones. The highway wound through alternations of clay, shale and sandstone formations, weirdly twisted into various shapes. Many places were penetrated by basaltic dikes. The sodden, but cheerful party finally took refuge in the famous Arch cafe tunnel. The foreman of the construction work allowed the party to proceed at their own risk, through the tunnel and helped with many explanations of the work and its problems. He finally left the group to the able leadership of Mr. Layfield who knew more about the rock than those who have spent over a year in its removal from the tube through which, within a few months, the international tourist will pass on trips from Mexico to Canada.

The workers in the tube have three names for the materials encountered namely gumbo, solid rock and loose stuff. In the center of the bore a stretch of about 500 feet of super fine grain lava was encountered, no timbering of any kind is necessary in this part of the tube. At the south end of the tunnel where work is now going on, gumbo and loose material have been encountered, and work is being carried forward by hand labor and steel linings were necessary to protect the workers. Treated timber will replace the metal shields and remain until the concrete linings are in place. The principal problem now is caused by loose slide materials which shows the grinding of past slips. The tunnel will be approximately 1200 feet long when completed, of which about 100 feet still to be excavated. A drift has been run through this loose material and two more are in process of being made. It was quiet in the tunnel save for the clink of metal on rock or the movement of a wheelbarrow pushed by a worker wearing a muddy fiber helmet, bringing out another load of that painfully won drift boring. The material removed was pried loose by men lying prone in that murky gloom. This is all hand work and the material is being removed with much hard labor.

The party finally walked back down the five per cent grade and came out of the north portal of the tunnel to find that the gale had increased during the time spent in the tunnel.

The stormy surf made it far too dangerous to visit the buried forest layers, some caves and other interesting formations.

The sorm clouds hanging low, made the trip through Ecola State Park inadvisable, as the headlands became traps when low scud envelope them. The perfect picture in Ecola Park of basalts in proper series with their crystal seams along with the deposits of shell and artifacts left by careless savages in the more recent past, still remain among the places to be visited by the members later on a drier day.

At the Warren Hotel there were cottages or hotel rooms waiting and the party seemed eager to reach the comfort of the shelters offered.

All the discomfort of the storm was forgotten when the evening brought the party together in the museum filled lobby of the hotel as an alternative to take the place of the bonfire on the beach that had been planned. The lobby is rigged to look like a ships forecastle. The comfort of plate glass window overlocking the ocean and the cheery fire in the immense fire place was doubly appreciated by the guest who had only to,remember and listen, to know what the storm was doing outside. The official maximum wind velocity at Astoria that day was 56 miles per hour.

The group was addressed by two local old timers, Mrs. Mary Gerritse and Mark Warren. The local speakers were much interested when Mr. Layfield explained what had been observed and studied in the afternoon. The keystone of the evening was the discussion of the contradictions of the coast country formations. Mrs. Gerritse told of the trials of the early mail carriers who brought the mail north from Nehalem Bay to reach this isolated beautiful spot.

After a night of good sleep induced by pleasant duty well done, and the feeling of security accented by the dying gale, the party assembled on the dot of schedule at the Coast highway and left for the promised breakfast with the Commander of the Saddle Mountain CCC. Thus closed the part played by Cannon Beach in one of the wettest trips ever experienced by our Society thus upholding its reputation for carrying on with its trips in spite of the elements. The people of Cannon Beach wish to extend a hearty invitation to the group to come again and see what they missed this time, on account of the storm, and increase the knowledge of us all as to the why and wherefor of the coast formations.

H. F. Travis.

The writer will be glad to help any of the members to find the things of geological interest on Cannon Beach. Anytime during the summer, before Labor day, he can be located at the "Beach of a thousand wonders".

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THE SADDLE MOUNTAIN TRIP-SUNDAY, JUNE 20

Rain, rain, rain, all day long, but it failed to dampen the spirits of the seventeen members and friends of the Geological Society who climbed to the summit of Saddle mountain. The trail was said to be a mile and a half long, but it was unanimously agreed that this was one of Mr. Joe Wimmer's miles, and not the ordinary one. The trail was good except for three small spots where it had been obliterated by slides. There were many switchbacks, indicating the steepness of the mountainside.

At the summit, which the party reached after a two-hour climb, the wonderful panorama which would be enjoyed on a clear day, could only be

imagined, as the mountain was enveloped in a cloud. Lunch was eaten in the Lookout cabin, which, though uninviting, afforded welcome shelter from the rain and wind.

Recompense for the discomforts of the trip was had in the opportunity of viewing at close hand the marvelous dike system exposed on the upper part of the mountain. Towards the top the narrow dike stood up like a great high wall. The trail crossed it several times. It is believed that on no previous trip of the Geological Society has such an outstanding dike system been available for observation.

Flowers in all the colors and of many varieties did their best to add cheerfulness, but the weather did not permit the climbers to loiter for close inspection of these. Mr. Leo Simon, however, did find a plant he was particularly interested in, the Lewisia columbiana. The flowers made a beautiful carpet over the upper part of the mountain.

The day began with breakfast at the Saddle Mountain C C C camp. Twenty one enjoyed the very generous hospitality of Captain James Battles, who did his best to make every one feel welcome. Plates piled high with hot toast, and ample quantities of all the other foods that make up the morning meal, were served by a detail of C C C boys. The party was pleasantly surprised and felt honored at being served on white tablecloths on the long table. Captain Battles took great pleasure in playing host, and invited all to pay him a visit when again in the vicinity.

Leaving the C C C camp, a short drive was made up the new Wolf Creek highway to view a series of basalt dikes in a deep road cut. The leader Mr. Robert Layfield, stated that he has counted twenty such dikes along this new highway as far eastward as Elsie. They are seldom less than fifteen feet wide, and are often as wide as 200 feet. All probably came from the same molten rocks underlying this entire district.

At this first stop may be found Foraminifera species Nonionella Miocenica also concretions. A description of this Foriminifera, by Cushman, may be had at Portland Central library, found in the publication, San Diego Society of Natural History, Transactions, Vol. 6, 1930-31. Three illustrations of the test are shown.

The drive into Saddle Mountain State park, from which the hiking trip started, was partly over a plank road. At one point this road was obstructed by a wrecked truck, so there was a delay while the men of the party qualified as road builders. They carried heavy planks and shoveled dirt to make it possible for the caravan to pass, and they did a fine job. On the return trip Mr. Baldwin drove his car off the plank road twice, and some wondered if the spring water found at the top of the mountain may have had some strange effect on him.

Mr. Layfield, who led the trip, came from northeastern Washington, especially for this occasion. The territory is well known to him, as he has

spent some time there. He surveyed the lines marking the boundary of the park, a gift to the state by the Crown-Willamette Paper Company. It covers approximately four square miles, and includes all of Saddle mountain.

The geology and other interesting features of Saddle mountain have been described by Mr. Layfield in a comprehensive article published in the bulletin of the Geological Society of the Oregon Country, Vol. 2, No. 24, Dec. 25, 1936. Another article on this subject, also written by Mr. Layfield, appeared in Vol. 2, No. 13, of the bulletin, dated July 10, 1936. This article includes a map, showing the location of the area.

The elevation of the mountain, as shown on the map of the U. S. Geological Survey, is 3266 feet. Both Saddle Mountain and Humbug Mountain, its close neighbor, are made up of basalt breccia. Interesting features of Saddle Mountain include the large, rounded, bare rock masses which form the saddle, and the spring near the summit, both discussed by Mr. Layfield in his articles.

Among those who climbed Saddle Mountain was a visitor from Oklahoma, the niece of Miss Rose Jennings.

E. M. B.

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TIMING THE WIND

The velocity of any kind of wind, from a mild zephyr to a hurricane, can be ascertained by the layman. A simple "rule of thumb" system published by the United States Weather Bureau sweeps away technicalities in favor of homely devices.

If wind blows less than one mile per hour, smoke rises vertically, the Bureau tells us. A wind of one to three miles per hour causes smoke to drift but does not move a weather vane. Breezes that make themselves felt on the face, move vanes and rustle leaves, average four to seven miles. They must attain a speed of eight to twelve miles to keep leaves and twigs in motion or extend small flags. When a wind can raise dust and paper off the ground and move small branches, it has reached a speed of 13 to 18 miles. And a wind velocity of 19 to 24 miles an hour will sway little trees and ruffle inland waters.

A "strong wind" (25 to 31 miles) whistles thru telegraph wires and turns umbrellas about, while a wind of 32 to 38 miles moves large trees and retards walking. Chimney pots and slate shingles may fly thru the air impelled by a wind traveling at 46 miles an hour. Officially speaking, any wind of a velocity between 39 and 54 miles an hour is a gale. A "whole gale" (from 55 to 75 miles) uproots trees and knocks things about generally. Any wind blowing faster than 75 miles an hour is a hurricane. No instructions are given for recognizing it. you won't need any!

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Road log for reconnaissance of the Washougal River canyon and vicinity, July 5, 1937

Miles	
0.0	Portland, Oreg., 6th Ave. and Yamhill St. Proceed north via Interstate Ave. and highway US-99W (marked route).
8.2	Vancouver, Wash., Washington and 5th Sts. Leave US-99W and turn east (right) on US-830 (Evergreen Highway).
a/17.6	Fisher Quarry. Purpose of trip will be outlined and specimens of andesite from the quarry circulated.
17.7 | 18.4	Cut bank north of highway shows rubble of andesite blocks (as much as 10 feet long) which rest on and are mingled with stream gravel.
18.5	Dike (?) of volcanic rock in contact with stream gravel.
a/19.5	Bluff north of highway exposes "redrock".
19.8 | 20.0	Volcanic breccia (agglomerate) intermittently along north side of road.
20.2	Stratified tuff (?)
22.3	Camas, Washington.
25.1	Washougal, Wash., left edge. Leave US-830 at cross-road and turn north (left) on Washougal River road.
a/26.1+	Stream deposit in cut bank west (left) of road. In this vicinity observe exposures of volcanics and young stream gravel.
27.4	Leave Washougal River road and turn northwest (left) at T-road up Little Washougal River.
27.6+	Little Washougal River flows on bedrock.
28.4	Turn east (right) and ascend hill. Cut banks along north (left) side of road show weathered stream deposit containing a few particles of crystalline rock.
a/28.9	Hilltop (terrace remnant). Vantage point for viewing land forms to the east.
29.7	Turn north (left) along Washougal River road. This point is 0.15 miles north of preceding turn northwest. (mile 27.4 above.)
29.9+	Volcanics outcrop along banks and bed of river. Observe general features.
a/32.4	Volcanics well exposed in cut east (left) of road near mouth of Cougar Creek.
a/33.8	Leave Washougal River road and turn northeast (left) to Bear Prairie. Altitude 224 feet (above sea level).
a/34.8	Weathered stream deposit exposed in cut north (left) of road; altitude 630 feet.

Miles	
a/35.3	In this vicinity weathered volcanic rock (andesite?) exposed in cuts east (right) of road.
a/37.1	Bear Prairie, T-road north at unoccupied CCC camp; altitude 1,153 feet. Summary of features thus far seen. Caravan will continue east.
39.5+	Volcanic rock in cuts west (right) of road.
a/40.1 – 40.4	Weathered stream deposit (gravel and laminated silt in cut west(right) of road). Altitude of base 800 feet
40.4 – 40.8	Weathered stream deposit (sandy silt) poorly exposed along road. Altitude of base 500 feet.
a/40.8	Coarse stream deposit.
b/41.4	Turn northeast (left).
42.6+	Salmon Falls of the Washougal River. Eagle Creek formation reported.
44.8	Cross-road; continue south via serpentine road. Weathered volcanics exposed
45.9	T-road junction; turn west (right).
46.0	Cross-road junction with US-830 (Evergreen Highway). Optional side trip of 2.9 miles to Cape Horn with stop at quarry, then turn west on US-830
a/47.5	West portal of avalanche shed. Parting fragmental volcanics and coarse stream deposit within the volcanics. Also small exposure of weathered stream deposit resting on the volcanics, and spheroidal weathering in the volcanics.
49.1	Scoriaceous volcanics in highway cut.
a/ 49.6 – 53.5	Weathered stream deposit containing particles of crystalline rocks. Road descends from altitude 600 feet to 75 feet.
a/56.2	Washougal River cross-road (mile 25.1 above). Optional summary of day's observations. Caravan will disband for return to Portland.
81.3	Portland, Oregon, 6th Avenue and Yamhill Street.

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a/ Caravan stops for discussion.

b/ Alternate route to mile 44.8

WASHOUGAL MYSTERY TRIP - JULY 5th, 1937

A. M. Piper, Leader

"Oh, we don't know where we're going but we're on our way!!" This was the motto of the field trip on July 5th, led by A. M. Piper, into what we later learned, was the Washougal country. At our first stop, Mr. Piper explained the purpose of the trip and the general route of travel, indicated on a complete and accurate log.

Mr. Piper is chairman of the G.S.O.C. Research Committee and he took this opportunity to give the members an idea of what geologic field work means and how the first steps should be taken. Field work is not all "beer and skittles", but a lot of hard work, with a real thrill of accomplishment when a job is completed or some new discovery is made. Genius has been defined as an infinite capacity for taking pains; the solution of an intricate geologic problem calls for something of that same qualification.

When starting work in a new area, it is necessary to select rock formations and to assign them temporary names or symbols by which each can be designated throughout the field project. A formation, as defined, is any rock bed or group of beds which can be traced systematically as a unit. neither thickness or uniformity in composition is a critical feature. As the work progresses, the formations first selected may be subdivided, or combined into fewer units. Formal names usually are assigned to the several formations in the final stage of the project. Once assigned and defined, that name is followed until data are discovered which may restrict its application or force its abandonment.

This "formation" should be accurately and completely described at each locality studied, which is of course, each outcrop. It is best to put each description on a separate page for ease in future correlation. Overlook no detail, as it may be that particular detail which will prove diagnostic in the final analysis. The locality and the features exposed, should be completely described, just how to get to it, by road or trail, or both, starting from some definite point, preferably a post office. The land description by township, range, section, and 40-acre subdivision should also be given. In your notes, answer in order the questions: Where? What? In each answer, it is helpful to start with the most general features and progress to the details.

First stop was at the Fisher quarry on the Evergreen Highway. This material was identified as andesite, which occurs as a single sheet about 90 feet thick. Fully 90% of the andesite is light grey in color, dense, and fine-grained (felsitic or aphanitic texture); small portions of the rock are scoracious, vesicular, and nearly black in color. The Columbia River, working in underlying fragmental rocks, has undercut this flow so that large and huge blocks have broken down in surrounding talus. As this flow appears to be quite fresh and makes up part of a hill whose form suggest a former volcano, it was suggested that the rock be tentatively designated as Type No. 1 of younger volcanics.

From this point on to Camas, other types of the young volcanics were

found. A pseudo-dike of andesite, with horizontal columns, was studied. These columns terminate against stream gravel and at first glance suggest that andesite has intruded gravel. Evidence was found to prove that this is not true and that the andesite is the older rock, although at one time it may have been a feeder for the overlying andesite. The "red rock" quarry exposed a red, highly inflated lava which contained both angular and water worn fragments of foreign rocks: another rock type in the "young volcanics" This same material appears to form a considerable part of Prune Hill, we were told, and it may be that Prune Hill is an old volcano; part of the Mt. Tabor, Mt. Scott series. Near Camas, a stratified tuff was observed in passing. All these are comprised by the young volcanics.

At Washougal, we left the Evergreen Highway and took the old Evergreen highway up the Washougal River. About a mile beyond Washougal an excellent exposure of stream gravel was observed, at an elevation of 75 ft. A. T. (above tide). The deposit consists of sub-angular and ill-rounded pebbles of basic igneous rocks. They are not intensely weathered except for a zone about 5 feet thick at the top of the exposure. There are a few "foreign" pebbles, one faceted quartzite which was promptly collected, labelled, and saved by Mr. Vance. Several other pebbles of quartzite, granite and metamorphic rocks were found. The sand filling was also composed of sub-angular grains, somewhat iron stained, cementing the gravel into a fairly well indurated bed. There are interbeds of sand and some clay.

This gravel occurs in a terrace (?) just above the Washougal River. We were asked to make careful notes so that we could later compare this bed with others we were to see. Was this terrace (?) formed by the gravel as deposited, or is the gravel a member in the bedrock and the terrace form a result of erosion rather than deposition?

Our trip continued, leaving the Washougal River and ascending a terrace to a height of 300 feet A.T. More gravel was exposed in roadside cuts, and were similar to those found before. The basic igneous pebbles were well weathered as was the sand filling. The leader summarized the observations of the trip, and reviewed the work for the afternoon. Then back to the Washougal River and wonder of wonders, at 12 noon, we had what Mrs. Lee Simon called a nunatack - lunch. Say it again - you'll get it. After a vigorous round with the vittles, we were sufficiently strengthened to look at the rock on which we sat. It proved to be an andesite.

At least it was a basic igneous rock, rather similar in composition to that of the young volcanics, yet it appeared "older" because somewhat decomposed and beautifully spattered with zeolites of which many handsome museum-type specimens were painfully chiseled out. Near the top of the road cut, we saw a stratum of reddish ash and soil, overlain by a decidedly young looking basic igneous rock. So we called the underlying rock, the first type in older volcanics. "Older volcanics", because they (1) appear to occur below rocks so far seen, (2) are somewhat decomposed as a result of later igneous activity, and (3) appear to form the fringe of a high land mass of mature topography to the north.

At mile 33.8 we again left the Washougal River road and turned northeast to Bear Prairie. On the way up the side of the terrace, at 630 feet A.T., we found more gravel, deeply weathered; the sand filling containing a great deal of mica, but otherwise very similar to the gravels seen before. This material is overlain (?) by andesite, on top of the Prairie. (altitude 1,150 to 1200 feet)

We stopped at mile 37.1 for a general view of the area. Silver Star Mt. was almost due north. In fact this trip fits in very nicely with three previous trips, (a) the first Washougal trip, (b) Silver Star and the East Fork of the Lewis River, and (c) the Vancouver trip. We discussed the features observed so far on the trip; in fac th leader was especially careful that we frequently inspected our observations and took stock of the status of our knowledge. This proved to be a valuable feature before the day was over.

At mile 40.1 on the east-facing slope below Bear Prairie, elevation 800 feet A.T., we found more gravel, similar to those before, only exposed in greater thickness and extent. The sand and clay lenses were more numerous but otherwise conditions appeared the same. The party voted to take the trip around by Salmon Falls on the Washougal, so we set out through the dust.

At Salmon Falls we found a basic lava rock,-another (?) type in the older volcanics,-somewhat columnar jointed, and forming the Falls. Upstream, the lava rock was underlain by stratified sedimentary rock which appeared to be a conglomerate or volcanic breccia; it was across the river and the river was deep and wet. We were only too willing to infer that this was the Eagle Creek (Warrendale) formation, but caution prompted us to call it the "older sedimentary rock." We dodged fervent picnicoers, exploding firecrackers and sought the peace and quiet of the river above the Falls, but the sun was streaking toward the western horizon and we had to tear ourselves away.

On the road cut to the Evergreen Highway we saw some very interesting stratified rocks which made us wish for another hour, but that will be another trip, we hope. Back on the Evergreen Highway and westward to the Mt. Pleasant avalanche shed where we stopped to see some sedimentary and fragmental rocks within the lava.

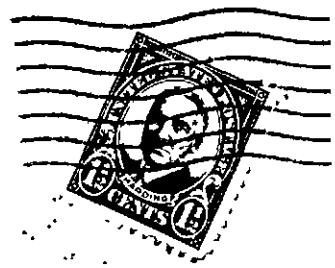
We saw the steamer Lake Bonneville returning from her weekly jaunt to Bonneville, the same boat we will be taking on the trip of the 19th, when we do our geology in style, from the deck of a river steamer.

The party disbanded here. It has been a most interesting day, for not only had we seen new country, but we had been initiated into the inner circle of research workers, the place we have been striving to fill ever since the inception of our Society.

While we were trying to convince ourselves that we had to go back to Portland, the leader explained just what a research problem in the area covered would mean, in the way of work. The advance sheet of the north half of the Troutdale quadrangle together with the northwestern portion of the Mt. Hood & Vicinity sheet cover most of the area. Starting along the Columbia River, each canyon and ridge should be traversed, preferably on foot; recording in detail all observation at outcrops. These data could then be correlated to give a picture of that portion of the quadrangle. The work could then be extended northward, while other parties worked eastward from the Vancouver side.

It is to be hoped that a group, or perhaps the whole Society in separate work parties, will take up some problem of this nature and somewhat justify the precepts of the organization by making a definite contribution to science.

(RCT)



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THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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SPECIAL NOTICE

GET TOGETHER MEETING AND PICNIC OF THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY WILL BE HELD AT MT. TABOR PARK AT 6:30 P.M., THURSDAY EVENING, AUGUST 26TH.

BRING YOUR OWN LUNCH COFFEE WILL BE SERVED BY THE SOCIETY. BONFIRE IN THE CRATER LATER IN THE EVENING.

COMMITTEE MEMBERS WILL CALL YOU ON THE PHONE TO FIND OUT THE NUMBER IN YOUR PARTY. COME OUT AND LETS HAVE A REAL GET TOGETHER MEETING.

TRIPS

August 22, 1937 (Sunday) - North Santiam River. Leader-Dr. Thomas P. Thayer. Many of the members will remember Dr. Thayer's interesting lecture on this area.(See vol.2,no.11,pp 7-9 for abstract) Due to the fact that Dr. Thayer has been transfered to California, this may be our last chance to take a trip under his leadership. In view of this fact, Russell Collins has kindly consented to postpone the"Turquoise Pool" (Little Crater Lake) trip.

Sept. 4 - 6, 1937 - Labor Day week-end in the John Day country. This will be a trip similar to the one of 1935.

Sept. 19, 1937 (Sunday) - Turquoise Pool and Ollalie Lake. Leader-Russell Collins.

We regret to report the death of Miss Julia Cowperthwaite, daughter of an early Oregon pioneer family, August 10th at Good Samaritan hospital after a long illness.

Miss Cowperthwaite was 72 years old. She taught school at various points in Oregon and was a postal clerk at the postal substation at the Woodward & Clarke company.

Later Miss Cowperthwaite was transferred to the main postoffice, where she served for 25 years.

Miss Cowperthwaite was a charter member of the Geological Society of the Oregon Country.

FOSSILIZATION AND PETRIFICATION

By J. Wimmer

INTRODUCTION

The term Petrification is used to describe organic remains found in the earth in a mineralized state. Through custom and usage it has been replaced by the term Fossil. A Fossil, is defined as the remains of a plant or animal, or the record of its existence, preserved in the rocks of the earth. It must record the size, shape and structure of the original and it must have lived at one time. A fossil must also have age. A skeleton of a mammal, as an example, which lived in a previous geological age, may also be regarded as a fossil although it is not extinct at the present time.

Fossils have the significance of indicating Geological Time, the type of climate, and environment existing during its life time, within certain limitations.

PRESERVATION

The preservation of an organism may be brought about in various ways as for instance by :

1. Freezing - this is confined to the polar regions.
2. Hard parts of the organism - a very common occurrence.
3. Carbonization - applicable to plants, as seen in coals.
4. Casts of the original - as seen in worm tracks.
5. Petrification of original - occurs to hard parts only
6. Footprints of animals - as seen of the Dinosaurs in the Wyoming coals.

A prime requisite for preservation is the exclusion of air and water from contact with a lifeless organism.

In order that preservation take place, the organism must be entombed immediately after its death in some kind of protective material, and its condition of preservation depends largely upon the kind of material in which it is deposited.

Fossils have been found in the following materials:1.Sedimentary deposits, 2. Volcanic Ash, 3. Ice, 4. Loess deposits, 5. Peat bogs, 6. Resin, 7. Infiltration of mineral deposits.

FOSSILIZATION

Fossilization occurs only to the hard parts of an organism, such as shell,

bone, wood and chitinous material. Shells, for example, may be preserved in soft muds which later change into clay, slate, shale or limestone. The soft muds sealing up and excluding both air and water. It should be noted, that the conditions which make possible fossilization, occur both in areas of volcanic activity as well as in areas of sedimentary deposition.

The remains of an organism in a fossilized state may be either:

(a) Altered by the infiltration of mineral substance carried in solution by ground water i.e. they become petrified or turned to rock.

(b) Unaltered such as those found buried in peat bogs, ice or resin remaining in a preserved state.

Altered remains have been divided for classification into four groups due to: (A) Silicification. (B) Calcification. (C) Pyritization. (D) Carbonization.

SILICIFICATION

In the process of silicification, silica in whole or in part replaces the original material as is evidenced in fossilized shells. This process results from percolating waters charged with silica or lime which enters and fills all cavities, with the result that the original material remains unaltered except for the openings and cavities. Frequently, petrification is brought about by the solution of the material and the deposition of mineral matter of which the fossil is composed; also by water over-saturated with mineral substance. Molecular replacement results in the latter case. The most common minerals associated with silicification are silica, lime and iron.

Silica acid in solution - unstable ortho- or mono-silicic acid is very penetrating and will invade cell structure starting the replacement process. If carbonic acid is present, as is frequently the case in underground waters, the penetrating power of mono-silicic acid is greatly enhanced.

CALCIFICATION

In the process of calcification, calcium carbonate in whole, or in part, replaces the original material as is evidenced in fossil corals, brachiopods, echinoderms and mollusks.

Calcification and silicification are reversible processes i.e., an organism may first be silicified, then later calcified, or the reverse action may take place. Silicification occurs more frequently than calcification, although calcification seems to be more general, especially where brackish waters have existed as is common in delta regions.

In either case a positive increase results in the specific gravity of the material.

CARBONIZATION

Carbonization results where leaves or plant remains fall into lake waters and sink to the bottom, there to be covered by the soft muds. Very little, if any, oxygen reaches them; consequently decay is a slow process resulting in a remainder of carbon which is found buried in the silts. The chemical action taking place, during the carbonization process, produces marsh gas, water and carbon dioxide. Fish, graptolites and plants are found in the carbonized state.

TIME FACTOR

The action of fossilization and petrification must necessarily take a very long period of time, as is evidenced by the fact that fossilized or petrified structures, so far found have not been identified as having lived within recent geological time.

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SO. IDAHO FARM LAND SINKING

New Canyon Being Formed - Area Closed Because of Peril to Visitors

By Associated Press

BUHL, Idaho, August 11. - Deep rumblings like muffled blasts of dynamite and rising clouds of dust were awesome evidence today that valuable farm land is sinking in southern Idaho's most productive agricultural area.

Geologists, called in by alarmed farmers, were unable to explain the phenomenon - the rapid sinking of soil that once was flat farm acres. They said they would begin a thorough investigation of the "sinking canyon" on August 22.

Because of acute danger to curious visitors, Emil Bordewick, manager of the Griffin ranches, on which part of the strange disturbance is occurring ordered the land closed to the public and placed special deputies around the region.

Close to Salmon River

A new canyon was being formed eight miles northwest of Buhl beside a deep gorge that carries waters of one of Idaho's Salmon rivers to the Snake River. A 30-foot wide wall of granite separate the new canyon from the chasm through which the Salmon flows.

Deepening of the depression unusually rapid for a geologic change, said Horton B. Abel, Nampa, Idaho, geologist, who is leading the investigation. Four acres of valuable land on the farm of H.A. Robertson sank in two weeks' time between 125 and 150 feet below its former level. Twelve other Robertson acres are cracking up. He fears they, too, will sink.

Geologists have found approximately 100 acres sinking in this region. Vast slabs of lava rock, considered heretofore immovable, are included in the settling process.

Giant Cavern, Theory

Abell expressed belief a great cavern existed deep in the earth and that alleviation of pressure was allowing the surface to sink.

Farmers dropped a 200-foot rope, with weights attached, down one of the giant cracks. It failed to reach bottom.

Worried farmers now wonder how far back the forming canyon will extend. Robertson fears his entire 180-acre farm will be turned into useless canyon-bottom land.

Visiting the area is hazardous, Abell said. Great clouds of dust rise from the new canyon as the earth continues to settle. Each movement of the soil is accompanied by deep-throated rumblings which Buhl farmers say sounds like "muffled blasts of dynamite".

The above taken from

THE SPOKESMAN-REVIEW, Spokane, Washington, August 12, 1937

Generous contributions to our publication have not lately been delivered to the Editor by the workers; especially lacking has been reports of lectures and field trips. However, our readers are just as avid as ever, consequently the Editor deems it necessary to publish the following. He found it interesting but does not vouch for its scientific merit. You, readers, are students of fact and masters of logical deduction and are, therfore, quite capable of forming your own judgement. - Editor.

THE TALE OF TWO NATIONS

OR

SETTLE OF NORTH-WESTERN UNITED STATES

(By E. C. McClellan, C. E., 725 S. W. 9th Avenue, Portland, Oregon.)

Over four thousand years ago there was a great flood in eastern Asia. The exact date is not certain, but estimated at 2196 to 2350 years before Christ, or 4135 to 4287 years ago, at this date.

At that time there were two races, or families, as they styled themselves living upon and cultivating the lands near the Ocean along the Yang tse Kiang, and Ho amg Ho rivers. Those on the Ho amg Ho called themselves the black haired people, or Sons of Ham, and the first who were able to carry on any consecutive chrononical data. The others were known as

the Sons of Tang, - or Yang.

The Ho ang Ho is the most dangerous river in the world, many times breaking out of its channel during periods of annual flood, and covering the country for many days and drowning its inhabitants. It has had three different outlets into the ocean, and at that time was emptying into the ocean very close to the mouth of the Yang ste Kiang. As these floods occurred every season, and of varying volumes, many of the people had rafts of logs, whereon they lived until the floods receded and they could return to their lands and cultivating. Floods also occurred on Yang ste Kiang, but there of minor danger, and rafts werealso used.

At the date of the great flood, many of those rafts were carried into the Pacific Ocean, and carried so far out that they were taken to the Japan Current and carried by it around to the North American Continent and those still living were able to land near the mouth of the Columbia River. As the waters of the Japan Current is warm, teeming fish, and showers frequent, the loss of life may not have been very great, and of course men, women and children were all together.

Landing there, they settled upon the land, and carried on their old occupations of farming and home building; but their habitations were different from each other, - the Sons of Yang having learned the way to construct residences of earth.

These people had been at war with each other before leaving Asia, and carried on their old feuds; and as it is very evident the Sons of Ham were more numerous, - having more rafts to be carried away, and also more war like, they were in the majority from the start, and kept the ascendency throughout the life of what became the two nations.

For the first few hundred years there was plenty agricultural land for both people, but when the whole became cultivated, the Sons of Ham forced the others from the country, killing many, and the others were driven up the Columbia Gorge to the lands in eastern Oregon and Washington. But in the course of time the Sons of Ham had to also spread east, and again forced the Sons of Yang further east, into the Snake River valley until they were stopped by the Rocky Mountains, and made a final stand some distance east of where the town of Twin Falls is now located, the western side of Goose Creek valley bottom, seeming to be the dividing line between the two nations, for by that time they were both numbering many millions.

The Sons of Yang, being unable to move farther east or north, as they increased in numbers worked south, along the west side of the mountains, past the Great Salt Lake, and I understand at least one hundred and fifty miles south of there.

##########

I am a Civil Engineer by profession, and after six years taking contracts surveying the public lands, principally in north-eastern Nevada, - 1879 to 1884, - located at Elko, Elko County, Nevada in 1884, and was

county surveyor for that county twenty years. During and after that period I worked in Idaho, Utah, New Mexico and California also.

In 1885 I discovered an old shaft about five feet in diameter and faced with small pieces of slate or shale, set in what I believe to be cement. Most pieces were very small, not much larger or thicker than my hand. The upper two feet of the shale had been broken down by action of water and frost, and caved in for bout three feet back, so I could not get very close to the edge, but I dropped a few stones down, and judged the shaft to be about thirty feet deep. As the size of the dump seemed to be far larger than would be caused by the amount of earth taken from the shaft, I believed there was chambers excavated below. The color of the dump showed it to be of great age, as the surface had the same sun and air burn as the soil around it, but as I had then never seen anything looking like human habitations in the country, I could not account for it.

Nearly twenty years afterwards I was on a surveying trip nearer the north part of Elko county, and where the Snake River desert or valley extends into Nevada, when I came across a village at the edge of the desert, where the canon of the West Fork of the Owyhee River leaves the mountains and enters the valley, and a road leading to Paradise Valley crosses the river gorge and extends west. I had been over that road in 1881, but had company and was not driving, and paid no attention to the scenery; but this time I was alone and able to look around.

The remains of the village habitations consists of concrete mounds, all of the same shape, and nearly same size, but without any order of placement. They were about a foot high, by eight wide and twelve feet long, the sides and ends were parallel and as regular as possible, and the corners were as square and true as any carpenter can turn to-day. From the top they slope out at about thirty degrees angle, and down the middle lengthwise there is a depression, about five inches deep, perfectly rounded, so the hips can rest easily and body lay as nearly straight as possible.

I spent some time there, and determined positively they were actually the work of man. Then, continuing my way, I saw many of the same mounds on all sides of me, and for several days, while I was surveying in the valley I saw so many it seemed to me there must be at least one for every fifteen or twenty acres of land. There were also round mounds, but I did not examine them; but they were also of concrete.

Since then I have seen many in different parts of the Snake River valley; and the concrete is so strong that while many thousands of years have passed away, I have never seen one having a crack or chip gone, and in one instance near Wells, Nevada, a road that has been travelled over for seventy years, crossed one of those mounds, from end to end, and I could not see that it had been injured any way by wagon wheels or iron shod hoofs.

After finding those mounds I wondered if there might not be some other indications of habitations, and soon found that there were also plain indications of mounds, the remains of dirt houses in different places first in the Snake River valley, and other places later. Of those mounds there are three peculiar characteristics. In preparing the earth, all coloring matter

has been excluded, so the mounds are nearly white, and can be seen for long distances. All elements that are needed for plant growth have been eliminated so no plant of any kind can grow in the soil; and when wet, or dampened it is water proof, the rains or melting snows running off, "Like water off a duck's back". Due to this fact the earth has never been whashed, or carried away, but the earth has simply settled to the ground by gravity alone.

I am no archeologist, and take no interest in such matters, and have only seen what has been actually forced upon my attention, and believe many things may be found by careful search.

The actual history of one of these nations, (I think by the Sons of Yang) is pictured upon the cliffs of Snake River, near the west end of the valley. The first picture shows them as they reach the shores of this country, upon the rafts that carried them over. The next shows when they were driven from the coast and east of the mountains. It represents a group of old men, women and children walking east, and guarded by a group of armed warriors back of them. The next is a similar picture, very likely illustrating when they were forced up the Snake River Canyon, and into that valley or desert. There may be found other records telling of the vanishing of both tribes, by famine, disease or battle, or all of them.

I have just heard of one mound being excavated in Oregon, and skulls, bones and utensils used found in it. Very likely they represent the bodies of the women and children, when their men were killed in battle, and then their opponents went in and slaughtered them, and left the house, and them in it. Superstition would very likely keep everyone away from there.

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JONES WILL SPEAK

Dr. Arthur C. Jones of the Geological Society of the Oregon Country will speak on "Geology of the Portland Region" at a meeting of the Sellwood-Moreland Lions club this noon in the Eastmoreland golf clubhouse.

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JOHN DAY RIVER TRIP

September 4-5-6

Leader: H. B. Schminky

0 Miles - Portland - Leave at your convenience on Saturday morning.

126 " - Junction Dalles-California and Sherman Highway.

137 " - Shaniko
144 " - Antelope
159 " - Clarno
179 " - Fossil

} Stop as desired along here - No caravan.

189 " - Pioneer Park - Camp for night - Bring camping outfit or stay at auto camps in Fossil.
Caravan will leave from Pioneer Park at 8:30 A.M. Sunday.

200 " - Service Creek
213 " - Spray
222 " - Kimberly
248 " - Junction Ochoco Highway

} Various stops will be made in this area.

280 " - Mitchell - Camp Sunday night - Auto Camp - Hotel.
Leave Monday 8:30 A.M.

The return to Portland will be down Bridge Creek by way of Burnt Ranch to Antelope.

Stops will be made in the Painted Hills area and other points of interest.

326 " - Antelope

470 " - Portland

- - - - -

NOTE: The mileage given above is along the highway. About 50 miles may be added by side trips off the main road.

PREPARE FOR COLD NIGHTS.

HAVE CARS IN GOOD MECHANICAL CONDITION.

PROGRAM OF NORTH SANTIAM RIVER TRIP

Portland to Salem - 53 miles
Salem to Mill City - 42 miles
Total trip (about) - 200 miles

Itinerary

Time of Meeting - 8:30 A.M. - On Battle Creek 2 miles west of Turner:

Stop 1. Take road west from Turner; take right turn up Battle Creek, just before crossing bridge. Go up road beyond sharp turns in basalt cuts to white cuts. Late comers can wait in Turner - party will come back through at 9 or so. Battle Creek is only fossil locality on the trip! Marine fossils in tuffs, also diatomite (?)

2. About 1 mile west of Sublimity on Sublimity terrace - Discussion of Stayton basin and Salem Hills.

3. About 1 mile N. of Sublimity on Silver Falls road - weathered terrace gravels.

4. 4 corners half mile N. of Stayton - platy andesite. From here go east on Fern Ridge Market road.

5. 4 or 5 miles east of Stayton on Fern Ridge - Fern Ridge Tuffs on Stayton basalts.

6. 5 to 6 miles E. of Stayton - View of old valley of Little North Santiam River and landslides on Mehama volcanics under Stayton lavas.

7. About 1 mile east of Mehama on Little North Santian road - Dikes and complex structures in river.

8. About 2 miles beyond Taylors Bridge - Discussion of Glacial Moraines. Depending on time - one more stop between 8 & 9 to see depth of till in creek above road.

9. About ½ mile west of Mill City on N. side of river - Outwash forest beds derived from glacial till. Somewhat brushy climbing - Be prepared!

10. Mill City - Lunch here - Also service stations! Excellent till exposures on south bank of river - contact on, and contrast with volcanic breccia. Type locality of the Mill City till. Under bridge on N. side of river - varved lake silts mixed in till, showing glacial advance after retreat.

11. Bridge across river south of Gates - Super position of river across basalt.

12. Picnic grove 3/8 mile west of Gates Bridge.
Varved silts exposed in north bank of river over distance of 1/3 of a mile – Gates Lake. The curious better bring waders if they want closeups – Mebbe they can make it – Mebbe not.
Return to Mill City via south side road.

13. If time permits – terrace south of Lyons – Good general view of this part of N. Santiam Valley, also profile of weathering well shown in road cuts – Crest of Mehama anticline, and House Mountain Scarp –

Official end of trip, if not called soon on account of darkness. (Well, maybe not <u>that</u> long!)

Better bring your lunch – we once had a milk shake in Mill City, and never had the nerve to try another. There will be very little foot work, but some of it may be rather rough. If you want photos of glacial till, bring your cameras. Also, for specimens bring hammers, as we may find the Santiam geologic column in the till. Bring your axes – we want some lively discussion, and don't care where the chips fall!

NOTE: Since an 8:30 A.M. arrival at Turner means leaving Portland about 7:15, it is suggested that those who like some sleep on Sunday morning go to Salem or thereabouts the night before. Salem has several auto camps, some of which must be good. We'll be seein' ya!

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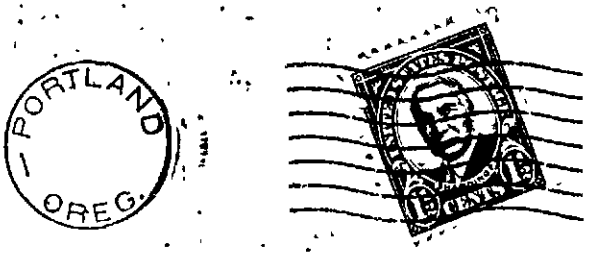

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THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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LECTURES

Sept. 10, 1937 (Friday) - Dr. E. L. Packard - "Pleistocene Mammalian Life of Oregon".

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TRIPS

Sept. 19, 1937 (Sunday) - Turquoise Pool and Ollalie Lakes.

Leader: Russell Collins.

The following field trips have not been written up for the Bulletin:

Area Northeast of Vancouver,
Jan. 17, Leader - Vance

Northern Washington County
Feb. 28, Leader - Reg. Reynolds

Tenino Mounds - April 18-19
Leader - Reg. Reynolds

Bend and Vicinity - May 29-30-31
Leader - Phil Brogan

Who will save the day and put these trips into print? Someone owes it to the Society. If you enjoyed and benefitted from any of these trips send in your impressions to Raymond L. Baldwin. Don't wait for George to do it.

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THE ECONOMIC GEOLOGICAL RESOURCES OF OREGON, FREE

The following publications of the Oregon Bureau of Mines and Geology are available at the office of the State Department of Geology and Mineral Resources, 704 Lewis Building, Portland, Oregon:

The Limonite Iron Ores of Columbia County - Free

The Ore Deposits of Northeastern Oregon - 50¢

The Oil and Gas Resources of Eastern Oregon - 25¢

The Oil and Gas Resources of Western Oregon - 25¢

Road Materials of the Willamette Valley - Free

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NEWS NOTE

Mr. D. K. MacKay late of the National Parks Service has been retained by the Oregon State Department of Geology and Mineral Rexources as geologist. His address is Baker, Oregon, and he will have charge of that residency.

Mr. MacKay is exceptionally well versed in Oregon geology and resources by virtue of his work with the National Park Service. His experience record includes work for oil companies in Canada and the United States, and for mining operators.

Mr. Mackay is also a member of the Geological Society of the Oregon Country.

NORTH SANTIAM TRIP

On Sunday, August 22 a group of 42 people including members and their friends had the pleasure of being led by, and hearing Dr. T. P. Thayer give the results of his geologic studies of the western part of the North Santiam River Region. It was a day of showery weather breaking somewhat in the afternoon. Low hanging clouds obscured the vision to an extent that some of the major structural features could not be observed. However, the rain did dampen the dust so was of some good use.

Beginning at 8:30 A.M. the group met on Battle Creek, northwest of Turner, and started on a trip in which the stratigraphy, structure and glacial phases of the area were observed.

A geologic column and its sequence were pointed out ranging from middle Oligocene to Recent in age. This started with the marine Illahe formation, a fine grained tuffaceous sandstone containing marine invertabrate fossils; this bed grades laterally into the continental Mohama pyroclastics to the east. These in turn were overlain by the Stayton lavas, bedded platy basaltic and andesitic flows of probable Miocene age. Capping this the Fern Ridge tuffs and conglomerates also of probable Miocene age were pointed out.

In the valley itself various glacial phases were pointed out from the Sublimity Terrace made up of entirely decomposed gravels and silts; part of a moraine on the north side of the valley near Lyons glacial till at Mill City; to varved silts and foreset delta beds of a marginal lake near Gates. Pleistocene was designated as the age of the glaciation. Recent river gravels were found lying on top of the glacial till and varved silts.

The Mohama anticline was pointed out with its axis running in a northeast and southwest direction; its crest is about halfway between Stayton and Mill City. The rising Stayton lavas as the party traveled eastward and the southeastward dipping lavas at Mill City were shown as evidence of this fold.

Other interesting features were: and example of an underfit stream, Mill Creek where it flows in an old abundened channel of the North Santiam River, and perched abundoned channel of the Little North Fork Santiam River, after the stream was captured by intercision.

"Climatic Cycles in Eastern Oregon As Indicated By Tree Rings" by Mr. F. P. Keen, Division of Forest Insect Investigations, Bureau of Entomology and Plant Quarantine, U. S. Dept. Of Agriculture, appears in the May 1937 issue of the Monthly Weather Review. Eight figures accompany the article.

FOSSIL CRABS

The writer has just finished looking over a copy of the U. S. National Museum Bulletin no. 138 on "The Fossil Stalk-eyed Crustacea of the Pacific Slope of North America" (Crabs) by Mary J. Rathbun.

Printed in 1926, it furnishes a comprehensive classification of Decapoda collected on the Pacific slope up to that time.

A systematic search for all available material was made and specimens were submitted for examination from every known collection by the Departments of Paleontology in the larger colleges and universities of the 3 coast states and the Provinical Museum of Victoria, B. C. Scientific organizations and individuals also submitted material.

The bulletin is generously supplied with illustrations. Thirty nine plates with several cuts to each plate help to visualize the species described.

The indexes arrange the contents according to Geologic Ages, Locality and Species.

Species whose nearest relatives now live in similar latitudes are collected in one index and other species whose nearest relatives now live in lower latitudes are grouped in another.

In the introduction by the author we are informed that the accumulated material yielded 91 species of which 54 are described as new. This large percentage of new species is an indication of the small amount of study given to the Decapoda of the Pacific slope.

Members of our Society have collected some excellent specimens of fossil crabs from the Buxton-Vernonia sections and with the exception of representations of one species collected by Diller in 1895 and one collected by Nannibal of Stanford University on Nehalem Bay the Oligocene of the Nehalem area is not represented.

Many of our specimens appear to belong to the genus Raninoides and after a careful inspection of the illustrations in the bulletin the writer believes that new species will be found among them.

Here is a real opportunity for our Society to make a contribution to scientific knowledge and the suggestion is here made that every member of the Society who can do so submit to Arthur Piper, Chairman of our Research Committee, Geological Survey, Couch Building, his or her specimens of Crustacia with a description of the place found so that they may be labeled and presented for identification.

The information to be gained will fit into the Research Committees plans. Mr. Piper believes that the number of Oligocene fossil localities we have extending west and northwest from the Columbia River will soon justify a structural survey project.

A. D. Vance

CRUSHING STRENGTH OF ROCKS

By Claire P. Holdredge

A few weeks ago the writer made some statements at one of the luncheon meetings concerning the crushing strengths of certain types of rocks. As a further contribution to this subject the following is offered:

E. C. Eckel, in his book, "Building Stones and Clays", gives a table which shows 75 tests of granites from 17 different states averaging 23,228 pounds per square inch. The granites from Washington averaged 14,407 pounds per square inch while those from California averaged 21,104 pounds per square inch. Traps from 8 eastern states averaged 20,897 pounds per square inch. These tests were all made on cubes which always give higher results than cylinders.

Ries and Watson, in their book, "Engineering Geology", state that Buckley found Wisconsin granites to vary from 15,000 to 43,973 pounds per square inch but that 15,00 to 30,000 was the usual range with rocks giving more than 30,000 pounds per square inch rare.

Cyril S. Fox, in a recently published book, " A comprehensive Treatise on Engineering Geology", gives the crushing strength of coarse porphyritic granite at about 10,000 pounds per square inch, medium grained granite at about 14,000 pounds per square inch, fine grained granites at about 11,000 pounds per square inch. The rocks tested were presumably English or Indian or both. He also states that medium grained rocks are strongest because the coarse grained rocks usually contain some weak mineral grains, the failure of which causes the whole rock to fail, while the minerals in the fine grained rocks lack cohesion. Fox limits basalts to 14,000 pounds per square inch and diorites at about 20,000 pounds per square inch.

The rocks from the Willamette Valley damsites discussed by Mr. McKittrick and the writer at the luncheon mentioned above presumably range in age from Upper Eocene or Oligocene to Miocene and all appear to have been formed as flows. They consist of five specimens of basalt and three specimens of andesite (The determinations are apparently McKittrick's). The basalts gave crushing strengths between 39,400 and 50,000 pounds per square inch and an average of 45,480 pounds per square inch. The andesites gave a minimum of 31,850 and a maximum of 40,900 with an average of 35,517 pounds per square inch. The tests were made by Prof. S. H. Graf of Oregon State College on cylindrical specimens.

Oliver Bowles, in his book, "Stone Industries", lists a quartzite from Montana with a crushing strength of 63,000 pounds per square inch. Recently it has come to the writers attention that the Phoenix Engineering Corporation is now building a dam at Polson, Montana, upon rocks that have a crushing strength of about 60,000 pounds per square inch. These rocks are also quartzites.

In view of the foregoing it can be seen that the crushing strength of rocks is quite variable. Specimens of the same type of rock from different localities or different horizons may vary widely. Crushing strengths of rocks is very important to engineers and to engineering geologists and they recognize, that, while certain generalizations can be made upon the basis of published reports of tests and upon judgement as to the condition of the rock, these are not always safe to rely upon. Many factors may enter into the variation of the crushing strength of rocks. The chief causes of variation are the variability in mineral composition, texture, density, secondary mineralization, metamorphism and weathering. Cohesion plays an exceedingly important role and depends to a considerable extent upon the mode of formation of the rock and its mineral content and texture.

It should be mentioned also that crushing tests made by students upon imperfect cubes prepared by themselves and with uncalibrated or antiquated equipment are frequently far from accurate.

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REVIEW by R. A. Kilduffe, Am. J. Clin. Path.

Atlas of Hematology. By Edwin E. Osgood, A.M., M.D., Assistant Professor of Medicine and Head of Experimental Medicine, University of Oregon Medical School and Clarice M. Ashworth, Medical Illustrator, University of Oregon Medical School. Cloth 255 pp., 325 colored plates. $10.00, J. W. Stacey, Inc., San Francisco.

Dr. Osgood's reputation as a hematologist, teacher, and investigator in the field of hematology suffices to ensure for this book a place among the outstanding tests upon hematology.

Even were this not so, the book itself would command attention for in may respects it is unique.

As stated in the preface, "Its major theses are, first, that accurate diagnosis is prerequisite to good therapy, second, that a systematic hematologic study will aid materially in the diagnosis of almost any disease....Its aim is to show the physician and student how to plan and interpret this examination and the technician how to perform the laboratory phase of it.

Any one called upon to make cytological blood studies will readily admit the difficulty not infrequently encountered in the identification of particular cells. One of the purposes of this atlas is to minimize this difficulty so that, once the salient characteristics of the cell have been noted, by means of the tables, descriptions, and illustrations, it may be identified "even though the observer has never before seen nor heard of it."

It will readily be seen that this is an ambitious project and in this respect the atlas is indeed unique. It is obvious, also, that with this purpose in view the major emphasis of the atlas must be, as it is, on morphology.

The book naturally begins with a discussion of the histogenesis and nomenclature of blood cells. The author's concept of the histogenesis of the blood is illustrated in the frontispiece and discussed in the opening chapter. Dr. Osgood's position is midway between the monophyletists and the polyphyletists. No one will dispute the confusion of hematologic nomenclature and it is to this section of the book that the comments of hematologists may be largely directed. Here the author has introduced - on logical and clearly stated grounds - a new terminology for the granulocyte (myeloid) and erythrocyte series. In every case, however, both the new and the most nearly equivalent older terminology are given in the text to avoid confusing the reader.

A table of nomenclature presents clearly the new terms suggested, the preferred older term, and also the many other names which have been applied to the same cell.

Identification of cells by means of this book depends primarily upon determination from a properly prepared and stained smear of the following characteristics: presence or absence of granules and their nature; presence or absence of nucleoli; and shape of the nucleus. By reference to appropriate tables certain other characteristics to be sought for are developed and the reader is finally referred to the colored plates issustrating the cells of the series in question from comparison with which the cells seen may be identified.

The chapters describing the blood cells (I-X) are followed by seven chapters in which the hematological aspects of disease in general and diseases of the blood in particular are excellently and clearly discussed. This section should prove of great interest to the physician and clinical pathologist. There is finally an appendix of methods, and extensive list of references, both general and by chapters, and a full and comprehensive index.

It is readily apparent that the value of such a book as this is largely determined, in the last analysis, by the character of its illustrations. The author, the illustrator and the publisher alike deserve the highest commendation for the excellence of the plates and the exceptional manner in which they have been reproduced.

This reviewer has seldom seen colored reproductions of stained blood cells which so closely approximate the actual picture seen under the microscope.

It may be predicted with confidence that this atlas for many years will serve a useful purpose, not only as a medium for the instruction of the student and the student technician but as a reference text for the physician, clinical pathologist, and hematologist.

No matter how extensive one's hematologic book shelf may be, this volume can be added to it with profit.

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EXTENSION COURSE IN GEOLOGY

Title	Credit Hours	Professor	Night
Earth Material	2	Hodge	Wednesday

There is a possibility that this night may be changed. This will be the only geology course given in Portland this year.

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PORTLAND
OREG.

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THE GEOLOGICAL NEWS LETTER

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LECTURES

Sept. 24, 1937 (Friday) - Ray Treasher, Geologist with the State Department of Geology and Mineral Industries will review the late history of the Columbia Gorge as reflected by the so called Satsop beds.

Quartzite gravels of the Yakima Valley will be described, and how they fit into the Columbia Gorge picture.

The relation of the true Satsop of western Washington to the Columbia Gorge gravels will also receive attention.

After the lecture a general discussion will be invited.

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TRIPS

Oct. 10, 1937 (Sunday) - Clackamas River.
Leader: Clarence Phillips.

Oct. 24, 1937 (Sunday) - Northern Clark County.
Leader: C. Holdredge.

Nov. 14, 1937 (Sunday) - Klickitat River Dry Ice Well.
Leader: J. C. Stevens.

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Thayer, Thomas P. "Structure of the North Santiam River Section of the Cascade Mts. in Oregon (Journal of Geology, v. 44, no. 6, pp 701-716, 3 figs. incl maps & sections, August - September 1936)

This article is similar to the lecture given by Dr. Thayer before the G. S. O. C. and is recommended to students of Oregon Geology. Marine fauna and leaf fossil localities are noted. Formations of W. Cascades are the Illahe and Mohama of Middle Oligocene, Stayton lavas correlating with Columbia basalts, Saradine Series which includes Mohama, Stayton and Fern Ridge tuffs into the Miocene, Breitenbush series of Middle and Upper Miocene, and a diorite intrusion, Halls diorite of Upper Miocene. The High Casades are composed of Outerson basalts, Minto basalts, Santiam basalts, Olallie Lavas and Battle Axe basalts. The W. Cascades structurally consist of 3 anticlines trending N.E.-S.W., which correlates with anticlines in the Columbia Gorge section. The Cascade fault of Pliocene age, raised the western side. The regional structural relations are discussed and are valuable in correlating Oregon history. A copy of this magazine is in the Portland Library.

(R.C.T.)

CHIPS FROM THE HAND SPECIMEN

Ray C. Treasher

AN UNRECORDED IRON INDUSTRY IN WASHINGTON

On a recent trip into the Grays Harbor area, the U.S.Engineer Mineral Survey party unearthed an interesting account of an attempt to commercially produce iron ore, which to our knowledge, has never been recorded. The information was given to the writer by Mr. Ed. B. Arthaud, of Hoquiam.

In the early part of the 19th century a chemist named E. H. Rothert came to Hoquiam and became interested in the magnetic beach sands near that city. It was found that the magnetic concentrate contained an appreciable titanium content and he devised a method of smelting this titaniferous iron ore, in one operation.

This process is a difficult one. The usual procedure is to smelt a high titanium ore to recover titanium metal, and then add it to melted pig iron to produce a titanium-iron alloy. Mr. Rothert concentrated the iron by means of electromagnets and treated it in a crucible furnace. Mr. Arthaud stated that the crucible held about "10 gallons" of charge and produced one-third of that amount of titaniferous iron. It was located on Lincoln Street in Hoquiam and production was effected in 1907.

The process was not commercially successful, partly because of the expense of concentration. Magnetite from Vancouver Island, titaniferous iron sand from Elma, Washington, and others were tried, but still the cost of production was too high and the industry did not prosper.

The alloy produced was exceptionally hard. Mr. Arthaud had a number of specimens but as the years passed so did these interesting pieces of an early iron industry.

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THE LOWER COLUMBIA RIVER TRIP

MAY 1st & 2nd, 1937

Claire P. Holdredge, Leader

The Columbia river has always been known for its beauty of scenery. But to the eighteen members of the society who made the trip to the lower valley there has been given a new meaning to this beauty that will continue to hold their attention. There is a wealth of picture book geology to be seen on either of the highways following this mighty river to the sea. Yet the area holds many secrets to try the skill of those who care to solve the riddles of mother nature.

On leaving Portland the lower Columbia river highway skirts the base of the hills bordering the Willamette river and the Oregon slough. Only narrow belts of flood plain separate these hills from the waters edge. The only rock that is exposed seems to be the basalts of the hills. This condition continues for the first fifteen miles, excepting for the flood plain belt which has been widened by the additional breadth of Sauvies Island.

In the following fifteen miles the main hills swing westward away from the river. A series of river terraces rise from the highway to their flanks. The maximum elevation attained by these terraces could not be determined from the highway. The terrace belt seems to reach its greatest width in the vicinity of Scappose. Basalts are exposed at Rocky Point and at St. Helens. The Rocky Point exposure may be an intrusion or an erosional remnant from the main mountain system. Those at St. Helens seem to be flows older than the terraces. In this area the nature of the rocks of the main mountain system cannot be determined from the main highway. But sedimentary rocks have entered the picture as it is known that marine fossils are to be found at the Wildwood golf links. Sedimentaries are first exposed along the highway about forty miles from Portland. This leaves three problems for this area: first, the age of the exposed basalts; second, the extent of the sedimentary beds and their relation to the beds farther west and third, the nature of the contact between the terraces and the main mountain system.

With the exception of the basalts previously mentioned, the road cuts show deep soil in these terraces until mile 33 is reached. Here gravels make their appearance. They had the characteristics of the Troutdale formation and are probably related. Gravels were found at many places, at elevations up to 350 feet and in conjunction with various formations from here to Astoria. In Rainier, an outcrop of basalt was first thought to be intruded into a gravel deposit. But a thorough examination proved that the basalt was the older formation and had served to protect the gravel from being carried away by erosion. In no place did it appear that the gravels had been buried by younger formations.

Breccias were first noted about mile 38, and they continued to appear for the next two and a half miles. They were found along with basalts, overlying the first exposure of sedimentary rocks at mile forty and a half.

The sedimentary rocks hold the key to the age of the coast range from this point to Astoria. The main mountain range has swung back to the river before Rainier is reached. River terraces no longer cover their flanks. In most places they face the river in bold and often naked bluffs, that allow their stratigraphy to be viewed from the highway. The sedimentary series seem to be the basement rocks at most exposures. They are overlain by the lavas. This unstable base, easily undermined by the streams, has been the cause of many landslides. The largest landslide surface now remaining is crossed about 79 miles from Portland, at the foot of Clatsop Crest. What dams may have closed the Columbia in the past can only be imagined as one views this slide from the crest. Puget island may have had its origin in such a slide dam. Here is more room for research.

In the majority of exposures, the sedimentaries are near river level. The highest exposure along the highway is nearly 600 feet at Clatsop Crest. But this is not the greatest elevation at which they are found in the main coast range.

Astoria is known as the type locality of the Miocene. It is assumed that some of the sedimentaries exposed farther east are Oligocene in age. In traveling the highway one sees nothing that would give a line of demarkation in the sediments. Only a study of the fossils will bring this out. The new beds at the Wildwood golf links and those found at an elevation of 900 to 1000 feet during road construction southwest of Rainier may help in this problem.

After passing the summit of the Rainier grade about 52 miles from Portland, the highway descends rather rapidly into the valley of Beaver creek. Here is a flat bottomed valley flanked with low, gently rolling hills, suggestive of old age topography, through which Beaver creek meanders sluggishly for many miles. Then most unexpectedly it starts to drop and the last few miles of its course is through a narrow canyon in which the meanders have become intrenched. What is the history of the Coast range? Was folding or faulting the cause of the elevation of the land? The Beaver creek valley is not the only evidence of this uplift. Little Jack Falls at mile 45.6 and another small fall at mile 69 drop from hanging valleys.

At mile 73.6 the party paused at OK creek while Joe Wimmer gave an eye-witness account of the disaster wrought by the flood of 1933. Storm waters imponded by a debris dam were released by the breaking of the barrier and swept the narrow canyon clean. A house at the mouth of the canyon was carried several hundred feet and demolished and several of its occupants were killed.

Lavas were found intruding the fossil bearing sediments at mile 75.9, and several sandstone dykes cut them at the stop at mile 103.6. Just more evidence that volcanism and diastroism were at work after the sediments were laid down.

Leaving Clatsop Crest, the highway descends to another series of river terraces ranging in elevation from 150 to 350 feet. Gravels were exposed in these terraces at miles 92.3 and 97.2. When these terraces are passed the road follows a river grade along sedimentary bluffs to Astoria. Here the party passed the night.

Sunday morning many of the group visited the Astoria miocene type locality at 5th and Commercial Streets. The nine o'clock ferry found everyone aboard for Megler, Washington. The crossing was a smooth one, so everyone could enjoy it. Geology began as soon as the boat docked. A bluff of massive sandstone, nicely exposed by new road cutting, awaited our examination at the ferry landing. A coarse grass found in some of this sandstone seems to indicate that it was deposited in a tidal flat. The undisturbed bluffs of this area showed massive rounded faces due to weathering.

At mile 0.4 (miles from now on are reckoned from the ferry landing) the road crosses a small anticline. At mile 14.3 Bear creek is reached. Tidal flats are the dominating feature of the river valley and the southern end of Willapa Bay. Road cuts show that sedimentary rocks predominate the hills along the river and the bay. One of the most interesting cuts was at mile 17.3. Here a bed of gravels that had attracted the scouting party because of the quartzites that it contained, was found to be lying unconformably on sedimentaries that had a dip of some 20 degrees in a northerly direction. Two gravel layers in the inclined beds were found to contain large basalt boulders that showed considerable spheroidal weathering on the surface and still were quite hard internally. Faceted quartzite pebbles were also found in these beds suggesting a correlation with the Troutdale and folding of that formation. All the gravel, including the quartzite, in the overlying bed were much smaller than any in the other two beds. What is the story hidden in these beds? Are the quartzites related to the Troutdale? The divide between Willapa bay and the Columbia is comparatively low. Did the floods of the Columbia of the ice age overflow into the bay? Or are these quartzites of an entirely different origin than those carried by the Columbia? In addition to the gravels, there was a thick bed of sandy clay through which ran fine veins of an asphalt or tar-like substance.

Leaving Willapa bay, the road ascends the valley of the Naselle river. The road cuts, which were mostly in river terrace, showed gravels in many places. This gravel was basalt or sandstone, and was not badly weathered. No quartzite was found in the cut which the party stopped to examine at mile 31.2. The valley has been drowned and then perhaps elevated slightly.

Low hills lie between the Naselle and Grays river. As the road twists its way through them, the cuts seem to reveal only sedimentary materials. They are usualy tilted and often crumpled by folding and slumping.

Many interesting sedimentary deposits consisting of sandstones, shales and gravels were noted along the Grays river. But the unfailing noontime urge to eat had hit the party, so no stops were made until a side road turned off from the main highway at mile 45.8. Here on the grassy banks of Grays river, the party downed the contents of picnic baskets. That is everyone but the leader. His lunch had disappeared miles before and now while the others ate, he was trying his skill at luring the wily trout. No trout were forthcoming however.

After lunch the party deployed on a gravel bar in the river to see how many varieties of rock could be found. The search yielded several

kinds of lavas, quartz, agate and sandstone. Thus, without going any farther upstream, they learned the nature of rocks to be found in the upper reaches of the stream.

The Grays river is a meandering stream flowing in a flat bottomed valley. Steptoe buttes rising from the valley floor seem to bear out the assumption that the valley had once been drowned.

After leaving the noon stop the road climbs a short divide separating the Grays river from Skamokawa creek. Practically all the road cuts showd sedimentary rock. The party stopped at mile 46.8 to examine one of the cuts. Shell casts, foraminifera and concretions were found in the sandstone. The concretions yielded crabs and shells and one loaf-of-bread-shaped one found by Clarence Phillips held the casts of a worm colony.

The valley of Skamokawa creek into which the highway descended would have made the "little crooked man" feel right at home for there were many crooked miles for him to walk along the road. The highway followed every twist of a very meandering stream. The valley floor was again flat and steptoe buttes were plentiful. The stream and highway were finally disgorged through a narrow cut in a dykelike lava intrusion at Skamokawa (mile 65.8). A dam at this point would create quite a reservoir in the valley above it was pointed out. The site might be considered in the future development of hydro-electric power in the Columbia basin. The reservoir would be pumped full with surplus power and emptied through generator plants during periods of low power production.

From Skamokawa eastward the highway hugs the Columbia, much of the way at the foot of towering bluffs. Geological features can be viewed with ease. The first stop (mile 68.5) was to view what the scouting party had considered an intrusion of basalt into a gravel terrace. Detailed examination proved, however, that the gravels were a remnant of beds that had been laid down against the basalt bluff. Erosion of the gravel had exposed a portion of the basalt. The true condition was revealed by following the gravel beyond the stopping place to where it had been completely eroded from the basalt. The moral of this is not to draw conclusions about a structure until every angle has been investigated.

At mile 70.3 bedded sediments were exposed below the basalts. The contact was vividly marked by red at many places as at mile 77.0. The lavas revealed at least four flows and lays conformably on the sediments. A soil zone is exposed between two of the flows. A fault at 77.1 exposed lavas underlying the sediments. No fossils were found in the sedimentaries, but the writer has since heard that petrified trees were found during the road construction. Every member of the society should see this seven miles of picture book geology. The question that arises when viewing them, is their relation to the Oregon shore. These beds seem to be nearly horizontal, yet almost directly opposite is the anticline at Clatsop Crest. It may be that these beds are exposed parallel to the strike of the folding and would therefore show little or no dip. Only a good map could give this relation, for the shores are too far apart to compare them by eye.

The hills withdraw from the river's edge in the vicinity of Stella, leaving a fringe of river terrace and floodplain between them and the water. At mile 88 a bold monadnock type of hill rises from this floodplain at the edge of the river. At Longview (mile 100) Coffin rock, like Beacon rock in the upper gorge, commands the plain. Lewis and Clark named both rocks.

Longview was the official end of this most interesting trip. But the party was admonished to notice the geology along the remainder of the homeward journey. Dip of the rock strata after leaving Longview, the red lavas at Kalama, the agglomerates east of Kalama and gravel beds were some of the things suggested for our notice.

H. B. S.

The Lower Columbia trip gives an excellent opportunity to compare this part of the gorge with that between Woodland and Troutdale and the part above Troutdale. The Lower Gorge is comparatively wide and, especially where bordered by competent rocks such as lavas, very steep-sided. It is bordered by both cut and fill terraces in many places. The fill terraces contain gravels largely. These gravels show a conspicuous lack of weathering and are therefore probably deposits of the so-called Spokane Flood rather than Troutdale. They contain a wide variety of materials including quartzites, basalts and the younger andesites. The cut terraces are largely in the harder rocks such as the lavas but are sometimes found cut into the Tertiary sediments also. In places where they have been protected by the harder rocks, gravels characteristically like the Troutdale are found in the cut terraces. Near the mouth of the Columbia on the north side sever streams head close to the Columbia and then flow northwesterly into Willapa Bay. Some of the side streams run in valleys that are characteristically drowned while others emerge from "hanging valleys". From Rainier Summit and Clatsop Crest a continuation of the old mature surfaces of the south side of the river cannot be definitely distinguished on the north side of the river but certain breaks in the topography on the north side of the river at about the same elevation as the old surfaces on the south side suggest a correlation.

Above Troutdale the Columbia cuts through the Cascade Range in a gorge very similar to the Lower Columbia Gorge. From Troutdale to Kelso the Columbia runs in a structurally low region which might be called roughly a part of the Puget Sound - Willamette Valley depression. From Kelso to the mouth the Columbia cuts through the Coast Range. The question which immediately presents itself is, "Why does the Columbia River not flow on north from Kelso through the Puget Sound depression into either Puget Sound or Grays Harbor?" Did the Columbia once flow north from Kelso prior to its drowning? Did some stream cutting headward from the west with a shorter route to the sea and a steeper gradient capture it? Did it aggrade its valley north of Kelso to such an elevation that it finally broke over a low divide during excessive floods and find a new and shorter route to the sea? If the answer to these questions is negative what is the history of the Lower Columbia Gorge? The problem is complex and has many far flung ramifications.

C. P. Holdredge

BONES OF "OLDEST MAN" ARE FOUND

Find in Palouse Region May Antedate Neanderthal Man of Europe

China has its "Peking Man" of prehistoric times, stone-age western Europe its Neanderthal man; and there's the "Java Man," and now, perhaps further to knit the brows of the anthropologists, may come the "Spokane man" of prehistoric age.

The Spokane area has some pretty aged lines written for it by the geologists, a region classified as among the oldest, ancient grazing ground for the mammoths whose bones are now found in the Palouse gravels and elsewhere in the Inland Empire.

Found Peculiar Skull

In the blue gravels of the Palouse, the graveyard of the bones of the mastodon of the prehistoric era, James Richardson on his ranch on the Palouse river, west of Lacrosse, found an odd skull of a man, lower jaw and several other bones. Water from an irrigation ditch cutting through the bank of the river at a depth of about six or eight feet, revealed the bones.

Orris Dorman, who has farming interest near Lacrosse, yesterday brought the story to Spokane.

"The bones were found in the second stratum of gravel of the Palouse region, thought to be a very old formation," he said.

Probably Skull of White Man

"The skull is probably that of a white man. It is rather long and of only medium width. It curves back immediately from unusually small brow ridges, showing less forehead than any modern type. It is quite symmetrical, although slightly curved to the left at the back.

"Its greatest peculiarity is its thickness, being almost twice the thickness of the modern white man's skull. The lower jaw is strong. The teeth are of medium strength and so worn down as to indicate a man of extreme old age, or one that subsisted on roots or coarse foods. The complete disappearance of sutures of the skull also indicates great age.

Shows Great Strenght

"The skull and other bones, especially the femur, indicate a man of great strenght and perhaps above average size. Those who have examined these bones, though not students of modern anthropology, are puzzled to determine the race they are from.

"These bones coming from the stratum in which are found the bones of the mastodon, raise the question as to whether or not the man belonged to a prehistoric race. The question seems to justify investigation," said Mr. Dorman.

"In another cut bank of the region there is a tusk of a mastodon protruding which soon will be excavated. At various times bones of prehistoric animals have been found in this blue gravel.

William Watzke, a businessman of Lacrosse, now has these ancient bones and will seek the opinion of scientists as to the period they belong."

(From the Spokesman Review - July 18th, 1937)

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W. B. Daly writes from Butte as follows:

"During the past forty years, only two earthquakes of any consequence were felt in the Butte district. These occurred on a fault near Three Forks, about 50 miles east of Butte. They were of sufficient intensity to shake the buildings and homes in the Butte district perceptibly, and in one or two instances walls were shaken down. The full shift of men working underground in the mines of Butte at that time." No damage whatever occurred underground, and none of the men so employed felt any vibration or shaking of any kind on account of the quakes. The reason for this is that the crust of the earth from the point of subsidence to the surface merely acts as a transmitter of the vibration and, for this reason, the workings underground were not shaken, but the surface and the buildings thereon were shaken. The principle is the same as if one places a dozen billiard balls in a row, each one touching the other and strikes the last ball with the hand with a sudden blow downward, whereupon only the last ball of the row will be affected. The other balls in this instance act only as a transmitter of the vibration.

"The surface buildings, plants, and equipment at the mines were well constructed and withstood the effect of the quakes in 1926 without any serious damage. The effect on these buildings and equipment would be the same, naturally, on the surface of a mine, as would be the case with buildings in a town or city. From these experiences, it is my judgment that underground workings in a mine will not be affected by an earthquake caused by subsidence on a fault plane. It may be possible that the first 100 feet from surface may be affected but, as we have no workings in this area, we do not know.

"The earthquakes that have been occurring in the Helena district during the past two years were not felt in the Butte district to any appreciable extent. The reason why we did not feel them in Butte is because the Butte district is situated on the so-called Boulder batholith, which is granite, and is, of course, an igneous rock. The subsidence on the fault plane in the Helena district occurred in an area on top of sedimentary rock. The transmission of the vibration from the sedimentary rock to the igneous rock was greatly reduced. The air-line distance from Helena to Butte is about 40 miles. At the town of Clancy, also situated on the Boulder batholith, and which is only about 10 miles by air from Helena, the vibration was not felt.

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DR. ARTHUR C. JONES
2640 S. W. PATTON RD.,
PORTLAND, OREGON

THE GEOLOGICAL NESW LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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LECTURES

Oct. 8, 1937 (Friday) - Dr. E. W. Lazell will speak on "Limestones of Oregon and Washington".

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TRIPS

Oct. 10, 1937 (Sunday) - Clackamas River.

Leader: Clarence Phillips.

Oct. 24, 1937 (Sunday) - Northern Clark County.

Leader: C. Holdredge

Nov. 14, 1937 (Sunday) - Klickitat River Dry Ice Well.

Leader: J. C. Stevens.

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THE SABRE-TOOTH HUNTERS

(From The Bend Bulletin)
September 29, 1937

Two enthusiastic members of the Geology Society of the Oregon country, Franklin L. Davis and Tracy Wade, both of Portland, passed through Bend this week on the trail, so they said, of a sabre-toothed cat. They were on their way to Fossil lake, and for the better part of a week will camp under the stars of Central Oregon's high plateau, a region far better known by scientists of distant lands than by residents of this state.

The two fossil hunters may not "jump" a sabre-tooth, for these huge cats of the pleistocene are strangely absent from Oregon's world-famed equus beds; but they may make discoveries of far more scientific importance than those so far reported by the eastern scientists who scaled towering, isolated Shiva temple of the Grand canyon of the Colorado. The Fossil lake beds have been extensively studied since those distant days when Governor John Whiteaker of Oregon interested Thomas Condon, pioneer geologist, in the black, sand-polished bones of elephants and llamas found in waterless depressions of Lake county, but many problems remain unsolved.

Mr. Davis and Mr. Wade are hopeful of finding the remains of a sabre-toothed cat in the old lake beds. If they are successful, their contribution to the science of paleontology will be great, for the absence of these pleistocene killers from the Fossil lake deposits has long mystified scientists. Plentiful in other parts of the present United States during inter-glacial periods, the big cats apparently never found their way into the old lake country of Oregon. In fact, all the larger cats are missing from the bone beds of Fossil lake. The absence of sabre-tooth bones from the Oregon beds is taken by some scientists to indicate that the Fossil lake fauna was primarily of an open plains type.

However, the sabre-toothed cats would have found some fine hunting in south-central Oregon in those distant days, probably during the first inter-glacial period. Llamas, represented by two types, were present, and giant beavers lived in the vicinity of the old lakes. The ground sloth was represented by at least one species. Two or more species of camel ambled over the Fossil lake plains of the pleistocene and browsed on lake margin forage. The American hog, the pecary, was also there, as were Elephas primigenius and Elephas columbi, two fine representatives of the elephant family. Camels browsed in the old lake country in great numbers. What better meat could a sabre-tooth expect!

But Smilodon, as the sabre-tooth is known to scientists, was apparently not included in the Fossil lake fauna. His absence may explain why more peaceful creatures were so abundant in south-central Oregon in pleistocene times.

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Mr. Davis and Mr. Wade will display fossils Friday night.

A NEW MEMBER'S IMPRESSION OF THE FIRST LAP OF THE LABOR DAY TRIP

Saturday's objective was to arrive at Fossil or there-abouts in order to be conveniently near Pioneer Park by 8:30 A.M. Sunday morning. We retreated from the terrific onslaught of rain drops at Portland 11:30 A.M. and met a cool but dry reception in the Maupin district.

While gayely traveling beyond Antelope we became aware of the fact that the highway was macadamized with agates and shiney quartz crystals. We stopped to collect some and make special note so that Mr. Reeves could be properly directed to the location in order to add more specimens to his fireplace.

The awe-inspiring view of the day, was the John Day Valley around Clarno. How could a resident of this state travel so far and yet not realize before the splendors contained in our Oregon? Upon arriving at Fossil, no cabins were available. It was thereupon agreed to sleep under the stars at Pioneer Park and keep a rendezvous with the Schminkys. Mr. & Mrs. Schminky were just having supper and praying it wouldn't rain until they were through. Which it didn't. At dusk, the rain arrived and with it came Mrs. H. H. Hann, her son and daughter, and a guest from California. A little later Mr. Vance arrived with his two body guards Mr. Tallman, and Mr. Rapraeger. Accomadations for guests were limited. The Schminkys slept in Hotel Plymouth, Mr. Tallman shared the band stand with the Webers. Mrs. Hann performed a miracle and tucked five souls away to sleep in a tent built for two. Dawn roll call revealed Mr. Baldwin, Mr. Borum and son, and Aletta Noss.

Take it away five Musketeers, the Motor Log of the day is yours. This is station DQX signing off.

Mrs. D. E. Weber

CARAVANING ALONG THE JOHN DAY RIVER

Saturday, September 4, 1937, was the start of the trek into the great land of the John Day River. It was one of Portland's wettest days, but that was no damper to our spirits for just beyond the Cascades there would be sunshine and good dry campsites in which to unroll our sleeping bags. We packed our sleeping bags and camp paraphernalia into the cars, donned our hiking togs and left the city and we hoped-the rain! But old man weather had another plan. He sent the little raindrops along. Several cars traveled a long way that night to find a dry place to make camp.

8:30 Sunday morning found the caravan forming at Pioneer Park. The mist was heavy and drippy, one might even say it was raining --- gales of laughter for everyone had a tall tale to tell of his experience's with the rain the night before. Such a start put us in fine metal for the day. Our leader, Bruce Schminky, in competition with the rain and the tall tales was finally able to distract our attention from ourselves to the rocks and the country which we had come to see.

We climbed up the hillside at the camp in Pioneer Park and began searching for geodes, but it was soon evident that a young lady's camera held the stage and we found ourselves "realistically" arranging ourselves on the hillside for a good picture. (It had to be good, she was taking it to California)

At the junction of the road into Pioneer Park and the highway the caravan (eight cars) stopped to look at a good exposure of Eocene lavas. They were badly weathered. It was not difficult to visualize their final breakdown into soil and realize that in a few centuries little man, if he is still here, will be eating the vegetables which will grow here.

Near Service Creek we stopped by the John Day River to view the basalt flows and to note the topography. The basalt flows rise from bedrock in the river to the highest peak. The John Day is a small sluggish river here. It has cut itself a very interesting course. Farmers have availed themselves of the terraces along its meanders, and being able to pump water easily from the river for irrigation purposes they have been able to develop a seeming oasis in this semi-desert land. The rich green of the orchards and the fields of alfalfa afford a pleasing contrast to the barrenness of the hills and the surrounding terrain.

About sixteen miles from Pioneer Park a short stop was made to note the dip of the beds, and to call our attention to the possibility of anticlinal structure. Mr. Vance's keen eye noted that the basalts here dipped in the opposite direction from what they had at Service Creek. This, he thought would indicate that instead of one major uplift to form that great anticlinal structure several smaller folds occurred and were a part of the major fold. In this area, nearing the axis of the anticline, the Coriba have been eroded away leaving the older beds exposed, providing a fossil hunter's paradise. Near Spray the beds of the John Day strata (Upper Eocene or Lower Oligocene) made their appearance forming massive cliffs of a tufaceous character. Wind, rain, and other factors of erosion have played their part in forming "Castles of Spain" on these cliffs. Some of us liked to think of them as the cliffs near Assuan. Only the mighty Nile with its great watercourse was missing, and when we realized this and saw only the little John Day flowing so feebly along its torturous course reality came with a start. After all, this was Oregon and Oregon's own beauty. The rain was gone and the sun had come at last to bring out the beautiful coloring in the beds. Chemical alteration has given the John Day beds a soft blue green appearance. The thinner, harder layers intermingled with the softer tufaceous materials of the thicker beds have been less altered and are thus lighter in color and stand out in contrast giving an exposure of the beds of any thickness the appearance (if your imagination is working) of a beautiful wide soft blue green ribbon striped with narrow bands of a soft cream color. It is easy to see how this country lends itself to the workings of an imagination, but though imagination had its place it was facts we were seeking. We wanted proof for the things wise men have written of the geology of this country.

At turtle cove we were given a chance to use our picks. Here the John Day beds form cliffs, the faces at one time were washed and scarred by the river which now flows a goodly distance away, the terrace, now lying between,

forming a very excellent pasture for the herds of the stockmen living there. Some of the stockmen came over to see why we were scrambling over those old cliffs. Mr. Schminky had the evidence and when he showed them the two pieces of jawbone with the beautifully preserved little teeth which he had just found they looked at their cliffs with a new light in their eyes. When we said they were probably thirty million or so years old, they looked at us with a new light??

Beyond Kimberly the red beds of the Eocene, the Clarno formation, began to appear more dominantly. These lie unconformably in most exposures under the John Day formation thus proving conclusively they are older than the John Day beds. In this area then, besides the basalt capping being eroded away most of the John Day is also gone leaving the older underlying much folded Eocene beds at the surface. It is believed that this area must be very near the axis of the anticline.

33.7 miles from Pioneer Park a stop was made to view Davis Dike. This is a dike of major extent and is thought to have been an important source of the Coriba capping this areaat one time. The interesting horizontal columns in the dike were noted. They were formed in the cooling lavas at right angles to the cooling surface.

Steamboat Rock .7 mile farther on was an impressive spectacle. The Clarno beds formed a brilliant red capping for the hills and other erosion remnants so abundant here.

Johnny Kirk Springs was our watering place. A vote was taken as to whether we should have lunch here with water or at the fossil beds about a mile farther on. It was unanimously decided to lunch with the fossils. Lunch was hastily eaten and we were soon up in those hills (John Day formation) wielding our picks with zeal and determination. And what luck! An Oreodon's skull was found by Mr. Reeves, and that dentist, Mr. Webber and his wife just seemed to have the magic touch. Wherever their pick fell it seems a tooth or a tusk was there. Mr. Vance and Leo went in for high climbing on the next cliff only to return empty handed. The group who went in for far vistas came back with tales of fossil utopia, "We just picked up bones all the way down the mountainside," they exclaimed, but what chagrin was there's when the wise ones looked at their "bones" and said "Mud!" But there is some justice! A tooth's a tooth and they each had at least one to flount in triumph.

Mr. Schminky and Mr. Vance had a great deal of trouble pulling us away from that place. As it was after four o'clock and there was yet much to be done, and people who were waiting anxiously at their homes to show us their fossil collections, we allowed ourselves to be mercilessly driven from our utopia.

About two miles from the Cant Ranch we stopped to look at a cliff-like exposure of conglomerates. The pebbles forming the conglomerates were mostly quartzites embedded in a matrix of sandstone. It is believed these conglomerates are Cretaceous in age but as yet no fossils have been found in them to definitely prove this. However, a short distance from the Cant Ranch we stopped and looked back across the river. The conglomerates lie

under the Red beds of the Eocene. It was at this stop that we could see the beds lying unconformably one upon the other from these supposedly Cretaceous conglomerates to the lavas capping the John Day formation. It was here, too, that one young woman was inspired to take home some ants for her schoolroom. A "velvet" tobacco can was borrowed from Leo, his porcupine quills being hastily thrust into her glasses case. The can was filled with ants and their young, and a dash was made for the car. (Her fellow travelers had about decided to leave her behind. They were skeptical of ants as passengers.)

Just beyond Mitchell Junction we entered Picture Gorge. Here the story of a stream cutting its bed sharply and cleanly with no wasted energy through many layers of basalt is portrayed. As one leaves the Gorge the view as one looks back leaves one speechless. There -- the torturous channel cut through the hills, even the meanders were impressed in every detail.

Soon after leaving the Gorge we drove into the T. J. Weatherford ranch. Here, Mr. Weatherford brought out his fossils. Camel's teeth, rhinoceras teeth (several species), teeth, leg bones, and well preserved skulls of the little five toed horse, and teeth and leg bones of his cousin who lived in a much later time who was larger and had only three toes. There were teeth of the great cats, the Creodonts, and many other large animals living in Oregon since Eocene time. There were tusks of various sizes from those of the Oreodon to the mastodon. Even Pleistocene man was represented by a perfectly formed molar tooth. It was a large tooth for a man but geologists have so identified it. Geologists have told Mr. Weatherford it is the only human tooth of that age found anywhere in the United States. He has also the jawbone and teeth of an animal that no one in the world has ever found one like. Men have tried very hard to get this speciman. Great men and good have come to him, even from foreign lands, to beg of him a "bone". Mr. Weatherford has a very wonderful collection of fossils which we hope will someday find its way into a museum, perhaps -- Oregon's own.

It was after six o'clock before we left the Weatherfords. We had a long way to go, yet before we could have food, but how unimportant food on a day like this. Most of us had had a cool drink at the pump on the ranch, while some had found their way into Mrs. Weatherford's motherly good nature and were treated to fresh young carrots from the garden, and Leo, more masterly, had luscious red raspberries for his repast. Returning through the Gorge we stopped for a moment to look at the prehistoric Indian writings on the cliff face just above the road bed. The sunset found us going down hill into Mitchell. It bade us "good-afternoon" as we settled down in Mitchell Auto Camp for the night.

8:30 next morning (Monday) found us on the cliffs across the highway from the auto camp looking at their formation. They are known definitely to be Cretaceous conglomerates. They lie conformably under the Eocene red beds. This bed contained many granitic rocks and much angular material which was not noted in the bed on the John Day.

About one and one half miles from Mitchell we made our first official stop for the day. Here we were to find ammonites along the road cut and

on the hills. Some were very favored and brought home some fine Cretaceous ammonites. But some were sleepy heads and were not yet awake, so went for a walk instead. They found a pleasant little road nearby and meandered along its course. Someone suddenly cried, "Look, those are butterfly eggs! I must take them home with me. The children at school will enjoy them very much." Someone else exulted, "Look at all of those choke cherries! I must take some home to my mother." The butterfly eggs (???) and the choke cherries were gathered. The girls returned to the cars a few moments earlier than the ammonite hunters, there, to be met by the sheriff and the owner of the Auto Camp! But let someone else tell you that.

About two miles beyond the Redmond Junction we stopped at a type locality for fossil leaves in the Eocene beds. The best leaf impressions were found on the lower slopes of the hill and in the dry stream bed. The material of the upper slopes was a coarser sandstone in which little has been found. This stop was very much enjoyed by everyone as good fossils were easily attainable. Two people found very interesting flower and winged seed impressions. One person found an animal supposedly in the shrimp group or some related type.

Thirteen miles from Mitchell found us turning on to the road to the Painted Hills. This was to have been one of the highlights of the day. At Ben Taylor's ranch we were to have had Miss Taylor as our guide but she had been called to Prineville that morning. Since we had no guide and were behind schedule we voted to leave the Painted Hills for another trip. We ate lunch under the Horse Chestnut trees in front of the Taylor ranchhouse these trees according to Mr. Schminky providing the only shade to be expected hereabouts. During lunch the ants gathered into the confines of the "Velvet" can made their escape, and caused much pain to their captor.

Immediately after lunch we began our trek back to Shaniko via Bridge Creek over narrow winding roads. We left the river near Burnt Ranch and began a steady ascent into the hills. Here nearly everything exposed was the Clarno formation and the Eocene rhyolites. We stopped at about the 2000 foot level to reconnoitre and pick up a few geodes and pieces of opal. To the old timers who have been lugging home quartz and opal for the last three years this was stuff they scorned, but the newcomers found the same old thrill in a beautifully formed quartz crystal.

The caravan broke up at this point. Some hurried along homeward. Others tarried regretting to leave — the sky was so blue, the far vistas a feast to look upon. The sun was still high. There was much of the day left, and it was ours.

Coming out of the hills at the Horse Heaven mine a few moments later we found luck was ours in full quota. The Superintendent of the mine, Mr. Slim Andrus, took us over the "works" and gave us a bit of education and some very fine cinnabar. This ore is rich in mercury, producing about thirty pounds of mercury per ton of ore. One piece which had just been broken and given to Loo began oozing mercury before our very eyes. This mine is one of the ten largest producers of mercury in the world.

Most of the cars found the way to Shaniko, but we, less fortunate or more, missed the turn off and went to Ashwood. At Ashwood we found refreshment and direction at the town's one store. (The town boasts a population of possible twenty-five.) The storeman was in charge of the Post Office, garage, service station, clothing, food, and what not, even the fossils. He gave us several choice nodules, and told us where more could be had. We hurriedly left Ashwood then in order to get to this spot before dusk. We found the nodules, but it was too late to get the choice ones. The sun was gone and the shadows had fallen. We hurried homeward then stopping only at Bear Springs in the Cascades to have some food.

The Musketeers

P.S.

One week later the "butterfly" eggs hatched into 12 beautiful little ticks in that teacher's schoolroom.

Warning: Be sure you know your butterfly eggs when in the country infested with spotted fever.

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THE SUMMER CAMP IN 1938

This Society should be able to sponsor a summer trip of at least one week's duration. This year the response to the week at the coast was disappointing. Why was there such a poor turnout? What type of trip would you like to have next year? The exploration committee is herewith submitting a list of trips, each of which is worthy of at least one week of your time. Please send a card to the chairman of the committee giving your choice, and state if you would prefer one or two weeks in the locality you pick. Or name your own pet locality if it does not appear in this list. Send in your card by Dec. 15th, so that plans for the trip may be started by the first of the year. Here is the list:

IN OREGON

1. The Wallowa mountain area. Main camp to be at Wallowa Lake. Trips to the Snake river canyon and into the mountains. Suggested for July or Aug.

2. The Steens mountains and the Harney basin. Main camp to be at some centrally located ranch. Suggested for the last of June or early July.

3. The Suplee area. Main camp at Suplee. Suggested for early July during the O. S. C. geology camp.

4. The mining districts of southwestern Oregon. Main camp at Grants Pass or Medford.

5. The lakes of the Cascade mountains. Main camp at Crater Lake or at Odell Lake. Suggested for July or August.

6. The southwestern coast line. Main camp at the marine biology laboratory of the O. S. C. on Coos bay. Suggested for July or August.

7. The John Day country. Main camp at some centrally located ranch. Suggested for the last of June or early July.

8. The Fossil Lake region.

IN WASHINGTON

1. The Olympic Peninsula, with a trip to Vancouver Island. Suggested for July or August.

2. The Grand Coulee - Lake Chelan area. Suggested for last of June or early July.

3. The Yakima river area. Suggested for the last of June or early July.

4. The Mt. Baker country. Suggested for July or August.

IN IDAHO

1. The Snake river and the "Craters of the Moon". Suggested for early in July.

2. The Panhandle country. Suggested for July.

IN BRITISH COLUMBIA

1. The Fraser River canyon and Okanagan Lake loop. suggested for July.

2. The headwaters of the Columbia and the Banff - Lake Louise country. A full two weeks trip. Suggested for July.

3. The Cariboo highway to Hazelton in the wilds of northern B. C. Trailing the miners of the old diggings of the early 60s. A real trip for rugged people. A full two weeks required. Suggested for the first of July.

There you are. If you want a geological vacation take your pick and don't delay. The results of your vote will be tabulated for next years committee. This will give plenty of time to arrange for a leader, look up camping sites, check on roads, locate points of geologic interest, learn of historic sites, check on scenic and recreational attractions in the area chosen. Address your cards to -

H. B. Schminky
1030 S. E. 54th Ave.,
Portland, Oregon.

ANCIENT FOSSILS FOUND
(Oregonian 10/3/37)

BEND, Oct. 2 (AP) - Fossil remains of llamas, camels, elephants and sloths were discovered in the plateau of interior Oregon by two Portland explorers, Franklin L. Davis and Tracy Wade, in a trip through Lake county, they said here today.

CLACKAMAS RIVER AND VICINITY
(Between Carver and North Fork)

October 10, 1937 - Clarence Phillips, Leader

This trip is scheduled on condition that the roads are dry. Some of the roads are slippery when wet. The territory covered may be found on the Estacada and Boring Quadrangle sheets. Cars should be in good mechanical condition. Travelling distance: By auto - 98.2 miles; on foot - ½ mile.

Miles	Time (Approx)		Approximate Elevation
00.0	8:15 A.M.	Leave Portland (6th & Yamhill) or if no passengers are to be picked up or transportation procured, the party may be met at	54
18.0	9:00 A.M.	Carver, on north side of river on highway to Estacada. The narrowing canyon will be viewed by walking to the bridge.	160
18.3	9:10 A.M.	View of gravel terraces may be had from cars. No stop will be made.	160
19.1	9:15 A.M.	Stop to study river gravel deposits, silts and quartzite pebbles.	160
20.4	9:30 A.M.	Stream gravels	170
21.0	9:35 A.M.	Silt deposits. Was this a lake bottom?	180
21.1	9:45 A.M.	Exposure of volcanics	180
22.6	9:55 A.M.	Deep Creek. Exposures of silt and gravels.	200
26.3	10:10 A.M.	Approximate center of lake or river terraces.	260
28.2	10:20 A.M.	Eagle Creek Bridge. View of exposures of silt deposits and river gravels	280
29.2	10:40 A.M.	Exposure of river gravels which appear to be of volcanic origin. Move has been made to higher river or lake terraces	290
32.0	10:50 A.M.	Estacada Junction. Rest stop - 5 minutes Accommodations - gas - oil - rest rooms - groceries.	500
38.0	11.05 A.M.	Squaw Mt. Road Junction. No stop.	1142
44.5	11.15 A.M.	Hesperia Junction. No stop. Straight ahead. Please keep cars in line.	1600

Miles	Time (Approx)		Approximate elevation
47.4	11:30 A.M.	Bedford Point Lookout. Remarkable view of topography from unusual vantage point.	2500
49.8	12:00 M.	North Fork Crossing Camp. Lunch. A beautiful grove with forest camp accommodations such as outdoor stoves, tables, water, etc.	2000
	1:00 P.M.	Leave North Fork Crossing Camp.	
51.8	1:05 P.M.	Cold Spring Camp. View of spring at or near summit of ridge.	2100
52.1	1:15 P.M.	Diorite? exposure in quarry. Unusual view of weathering.	2100
55.7	1:30 P.M.	Incline Junction. No stop	1700
56.2	1:35 P.M.	Gravel exposure at high elevation in old stream bed, adjacent to columnar basalt.	1700
65.9	2:15 P.M.	Faraday. Party will walk $\frac{1}{4}$ mile across bridge to exposure of leaf fossils. Large picks may be found convenient.	500 400
67.4	3:15 P.M.	Estacada Bridge. No stop.	500
67.7	3:16 P.M.	Stop to view glacial till overladen with river gravels. No reports are made of glacial evidence west of this point.	500
72.0	3:40 P.M.	View of Clackamas valley from south side of river, exposing possibility of lake with panoramic view of river terraces. Caravan will disband at this point.	600
80.2		Carver.	160
98.2		Portland.	54

It has been reported that large fossil bones, agatized wood, etc., have been found on Bedford Point in the vicinity of the Lookout. Your scouting party did not find the exact location, but there will be time for further scouting for those who care to participate.

While travelling through the National Forest, please observe forest rules, including "No Smoking while Traveling".

Mrs. DORIS WOLCOTT JONES
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PORTLAND, OREGON

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol. 3 - No. 20 Portland, Oregon October 25, 1937

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

LECTURES

Oct. 22, 1937 (Friday) - Illustrated lecture by Carl Richards, Kenneth Phillips, A. J. Gilardi. Subject: "Geology of Glaciers of the Oregon Country.

Over a period of years these men, all members of the Mazama Society, have devoted considerable time to the study of glaciers. The slides showing positions of glaciers during a period of years are of great interest and as time goes on will become more valuable as a record of these glaciers.

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TRIPS

Oct. 24, 1937 (Sunday) - Northern Clark County.

Leader: C. Holdredge.

Nov. 14, 1937 (Sunday) - Klickitat River Dry Ice Well.

Leader: J. C. Stevens.

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THE TRIP TO SUNFLOWER FLATS

Sept. 19, 1937

Russel Collins - A. D. Vance, leaders

On Sunday morning, September 19th, a G.S.O.C. party of 35 hardy souls assembled at Sandy in hopes of being able to break through the dripping clouds and view the Torquoise Pool (Little Crater Lake) in the Clackamas Lake country. Leader Collins admitted defeat at the hands of the elements and suggested that his trip be postponed to more favorable weather. The group insisted on a trip, so Mr. Schminky called the Bear Springs ranger station and was assured that it was not raining there. Mr. Vance then took the lead and the group started rolling to Sunflower Flats, which are about five miles east of Bear Springs.

Sunflower Flats in a grassy, dried lake bed, very flat and entirely devoid of trees, well up on the eastern slope of the Cascades. The party stopped about a mile short of the flats on the northerly slope of Quartz Butte. There the members deployed in search of quartz specimens, which were not at all hard to find. Many interesting finds were made during the two hours spent there, and undoubtedly more than one fireplace or rock garden benefited from the trip.

The chalcedony material was found on the valley floor and for some distance up the slopes, in the form of nodules that have been weathered, presumably, from their rhyolite matrix. These nodules are filled with quartz crystals, agate or opal, or with various combinations of these three. Pieces of rhyolite that seemed saturated with clear quartz displayed their twisted flow structure in a very colorful manner. At the place where the caravan stopped, the largest pieces were found on the southerly side of the valley and not over a hundred feet above the floor. On the north side the pieces were smaller and seemed to die out at a lower elevation. This north slope ended in a low ridge capped with andesite. No exposures of rhyolite were noted. Several fallen trees had pulled up weathered andesite fragments with their roots. No andesite was noted on the south side. No basalt was noticed anywhere. But the area was not completely covered, so it is not safe to say too much about the apparent lack of a basalt covering on the old rhyolite flows. The mother lode containing the chalcedony materials seems to have disappeared under the over lying flows a little more than three miles from Bear Springs. We did not see its eastern limits.

After everyone had gathered their fill of specimens, the group kicked the gumbo from its boots and moved back to the Bear Springs forest camp. Here in the shelter of a perfect camp kitchen, luches were eaten. To someones remark about the comforts of the place, Mr. Vance made the bright reply that no one could get much rest on "Bear Springs!" Clarence Phillips gave a short description of the trip he is to lead early in October.

The party gradually disbanded and returned to Portland, hoping that the rain jinx which had followed our outings would soon be broken.

W. G. Rapraeger

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SATSOP GRAVELS AND THE SNIPES CONGLOMERATE

Ray C. Treasher

The purpose of this paper is to summarize the existing information on the conglomerate of the Columbia Gorge, originally called the Satsop formation, to present some pertinent data on the Yakima Valley deposits, and to point out some critical details which demand solution.

Bretz[1] records occurences of red-stained and weathered gravels in the Chehalis River valley in Washington which lie unconformably on Tertiary sediments. Their decay and staining is greater than known Admiralty glacial deposits and probably represent Pleistocene stream gravels in Pliocene and early Pleistocene channels. This is the material which he later designated as the Satsop Formation.

Subsequent studies caused Bretz (141) to extend the limits of this formation to the shores of Willipa Bay where a Pleistocene gravel bed had been identified by Condon (297) in 1871; to the mouth of the Columbia River; in the Cowlitz River valley and down the Oregon coast by inference from the literature. He stated that the Satsop is a widespread fluviatile deposit, deposited along almost the entire Pacific Coast of Oregon and Washington, up the Columbia River into the Yakima Valley, and in the lower Willamette. Stratigraphic relations and fossils show a Quaternary age for the coastal phase. It is folded with the Cascades, rising to elevations of 4000' and is therefore older than the Cascades. Later he concluded that it rests unconformably on Columbia River Basalt, and represents one epoch of stream deposition in the Pliocene or early Pleistocene. The Dalles beds are Satsop in their lower part and at Arlington the formation yielded vertebrate fossils. Two drainage courses are represented, in eastern Washington; one across from Priest Rapids to Lyle; the other by the present Columbia River Course. Williams (1925) followed Bretz' ideas to some extent although he indicated some dissatisfaction with the interpretation.

The Satsop formation is lithologically characterized by the red staining of the gravels and the relative decay of the andesitic pebbles. The Yakima Valley and Columbia Gorge areas contain large numbers of quartzite pebbles which are well rounded and frequently possess a fine desert varnish. These are so characteristic as to be frequently called"Satsop pebbles".

Other students have become dissatisfied with this blanket Satsop formation and at various times have presented evidence which indicate a certain amount of error in the original determination.

RHODODENDRON FORMATION

In his studies of the Columbia Gorge, Hodge (802, 815) noted that the so-called Satsop occurrences along the lower Sandy River apparently consisted of two epochs of deposition. The earlier one he called Rhododendron Formation consisting largely of pyroclastics which were deposited on eroded Columbia River basalt in Late Pliocene or early Pleistocene. These deposits buried the lowlands, threw barriers across the small progenitor of the Columbia River to the south, and Lake Condon was formed in the interior behind these deposits.

Allen (12) correlated this deposit with the Dalles Formation to the east on the basis of lithology and concluded that it may correlate with the Madras Formation (Pleistocene).

TROUTDALE FORMATION

The material overlying the Rhododendron is called Troutdale by Hodge. It is supposedly reworked Rhododendron which was deposited as an enormous piedmont fan, later excavated and largely removed. Its age is early Pleistocene. Allen(12) states that it is composed of 30% andesite, 40% basalt, and 30% quartzite pebbles. The basic pebbles tend to be well decayed, while the quartzites are quite resistant. Both the Rhododendron and Troutdale are pre-Cascade andesite.

THE DALLES BEDS

The Dalles beds represent portions of Bretz' orginal Satsop and there is considerable controversy regarding their age. Hodge (807) describes them as lying on the Shaniko and Coriba surfaces; 90% is stream-deposited gravels, muds and pyroclastics separated by thin flows of lava representing 10%. They form a lenticular mass from south of the Dalles to the gap between Tygh Ridge and the Cascade Mountains, and were formed in Late Pliocene or early Pleistocene.

Condon (287) discovered bones of extinct animals in the beds near The Dalles, which were exposed by the "great freshet of 1865". Since that time some collecting has been done from these beds and the area studied by Hodge, Buwalda, Chaney, Piper, and others. Chaney (226) fixes the age a late Pliocene or early Pleistocene on the basis of leaf fossils.

[illegible]

Buwalda (169,171) describes the beds as composed of rounded volcanic river gravels and peculiar bluish and gray cross-bedded tuffaceous sandstone and ash beds, similar to the Ellensburg (Upper Miocene) of central Washington. Its position is not definitely known to be conformable on Columbia River Basalt but at least its strata are essentially parallel to the lavas and folded to the same degree. It is more indurated than Quaternary Ringold and Pliocene Rattlesnake and appears to correlate with the Mascall. The name Hood River Formation is proposed for it to differentiate it from later beds also called The Dalles beds. Other localities are cited, and evidence is presented to definitely take this formation from the Satsop.

He visited the Yakima Valley where he noted similar relationships of a conglomerate bed which he feels is Hood River Formation but which he says is at the base of the Ellensburg. Evidence will be presented to show the error of this statement. However, the bluish tuff he describes at Hood River is characteristic of the Ellensburg in the Yakima Valley. Buwalda concludes that the Hood River Formation is Middle or Upper Neocene.

Piper (1407) concludes that the Dalles Beds are Middle or Upper Neocene and should correlate with Ellensburg formation. His description of the beds is quite complete.

ARLINGTON FORMATION

The Arlington Formation is described by Hodge (807, 832) east of The

Dalles. Its deposition began in upper Dalles time and continued afterwards, consisting of stream gravels and lake beds near Umatilla. Pleistocene fossils were found.

RINGOLD FORMATION

The Ringold Formation was originally noted by Merriam and Buwalda (1206) along the White Bluffs of the Columbia River north of Pasco and determined as Pleistocene on the basis of fauna. Jenkins (892) reports an unconformity with steeply tilted Ellensburg beds. The Formation has not been extensively studied but Buwalda is of the opinion that it correlates with the silts in the Yakima Valley.

SNIPES CONGLOMERATE

A seemingly persistant stratum of conglomerate and sandstone occurs in the Yakima Valley, which was included in the Satsop formation by Bretz, and placed at the base of the Ellensburg by Buwalda. Both these men made only hurried reconnaissance trips over the area and it is not surprising that they overlooked critical data which was located only after a very careful search by the writer who was raised in that area. To avoid confusion with Satsop and Hood River Formations, the name Snipes Conglomerates is tentatively proposed until such time as the stratigraphic relation ships can be thoroughly worked out.

The conglomerate bed was noted by early investigators; such as Waring[2] and Russell[3] who described most of the localities.

In the Yakima Valley this conglomerate contains characteristic pebbles of bluish and pinkish-white quartzite which are well rounded and when exposed to the weather develop a fine desert varnish. Other material includes metamorphic pebbles, basic igneous pebbles and quartz sand, and tuffaceous material. The gravels grade from cobbles 8 inches long to pebbles an inch long, the pebbles being smaller toward the Columbia Gorge. The unusual shape and color of the quartzites draw immediate attention and give the casual student the impression of a higher percentage of them than actually exists, which is 25% - 40% of the total pebbles. Layers and lenses of coarse sand composed of quartz, feldspar and mica and other minor constituents is present, as is tuffaceous and pumaceous material. There is a tendency for the igneous pebbles to be well weathered and rotten, although many are still firm and resistant. The metamorphics are harder and less weathered, and the quartzites most resistant. Surface exposures average higher in desert varnished quartzites, probably because the more easily weathered material has been removed.

The stratigraphic column of the Yakima Valley consists of Miocene Yakima basalt, Upper miocene Ellensburg sandstone, Upper Miocene Wenas Basalt, "Snipes Conglomerate"; these may not necessarily be conformable, but the strata are apparently parallel. The strata were deformed, and then followed deposition of Pleistocene Ringold and erratics.

The Yakima Valley is a northwest-southeast trending syncline with Snipes Mountain as a minor fold lengthwise of the Valley. It lies as an ellipitcal dome, apparently a continuation of Toppenish Ridge; of the westward portion only the north limb remains, the south limb having been removed by erosion.

The ends of the dome are symettrical. The north limb dips 15° - 20° and the surface is practically a dip slope covered to varying degrees by the Yakima Valley Silts. In the south limb dips range from 50° south to 20° north, overturned, and the succession of beds is well exposed by erosion. At and adjacent to the crest of the dome in Sec. 32, T. 10 N., R. 22 E., above Emerald, the folding is apparently quite severe as 20° northward dips occur within 100 feet of 70° southward dips. Some faulting may account for this apparently sharp break but none was noted.

The type locality of Snipe Conglomerate is in the SW¼ of Sec. 34, T. 10 N., R. 22 E., on the south limb of the fold. Gravel, with interbedded sands dipping 70°, S. 12° W., lies parallel to the basalt, which in turn overlies Ellensburg sediments. The conglomerate is unconformably overlain by Valley Silts, and its measured section consists of 238 feet of quartzite bearing gravels, tuffaceous sandstones and arkosic sands. This clearly shows that the Snipes Conglomerate is not at the base of the Ellensburg; that it was deposited before the deformation and is therefore probably older than Pleistocene.

A similar deposit was found on the flank of the Horse Heaven Hills, south of Mabton, evidently the same locality mentioned by Buwalda. The Conglomerate-basalt contact is well exposed, the conglomerate dips 73° due north and was deposited before deformation pebbles are firmly enclosed in the margins of the sandstone with their long axes parallel to the bedding. The position of the Ellensburg sediments was not determined at this point; however Ellensburg sediments are exposed along the highway in Glade Creek which is south of the crest of the monocline. Its position would indicate that it occurs below the Conglomerate. The valley silts form a heavy mantle over the monocline and effectively mask the underlying rocks.

A four foot layer of this massive silt containing many small quartzite pebbles distributed at random unconformably overlies the deposit. On Snipes Mountain, foreign erratics are found lying on top of the valley silts. On Toppenish Ridge, these erratics were noted to an elevation of 1100 feet.

Near Goldendale, on a portion of the Horse Heaven Plateau, quartzite-bearing gravels are exposed for a distance of 5 miles along the Satus Pass Highway. The pebbles are smaller than those in the Yakim Valley, averaging 1-2 inches in size although many larger than these are found. The deposit is 404 feet in thickness, the bottom being nowhere exposed. Interbedded sands suggest a low dip to the southwest similar to that of the underlying basalt. The gravels are frequently capped with a gray, olivine-bearing lava to a total thickness of about 50 feet. This lava is something similar in appearance to the later Cascade flows.

CONCLUSION

It is thus seen that the Satsop, as originally described by Bretz in the Columbia Gorge and Yakima Valley, is under considerable controversy as to its age determination. In part it is represented by late Pliocene and early Pleistocene Rhododendron, Troutdale, and Dalles Beds; by Pleistocene Arlington beds; by upper Miocene Hood River Formation; and by Snipes Conglomerate which may be upper Miocene or Pliocene but pre-deformation. The Snipes Conglomerate lies on top of upper Miocene Ellensburg sediments and Wenas basalt as illustrated by outcrops on Snipes Mountain in the Yakima Valley.

The conglomerat beds in the Columbia Gorge and eastward present a problem which will take some very careful study of lithology and stratigraphy to settle the question. This area is adjacent to Portland and it is hoped that some group will undertake a study of these deposits.

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Clarence D. Phillips spoke before the Mazama club members at a regular meeting Wednesday evening, September 29th, in an address, "The Story in the Rocks".

Claire Holdredge spoke before the U. S. Department of Agriculture Club Tuesday noon, October 19th. Subject: "Diamond Mining in South Africa".

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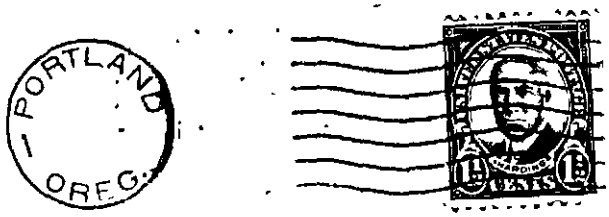

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LECTURES

Nov. 12, 1937 (Friday) - Professor M. E. Opler of Reed College will talk on "Indian Cultures of the Northwest". Something concerning the archeological work done in the region will be included in the talk.

TRIPS

Nov. 14, 1937 (Sunday) - Klickitat River Dry Ice Well.

Leader: J. C. Stevens.

LUNCHEONS

We wish to again remind the members of the Society of the weekly Thursday noon luncheon at Hilaire's Resturaunt, 622 SW Washington Street. If you are downtown come and bring your friends.

PINS

Some of our new members have asked where they can buy the official pin, the "Geological Pick". MR. JAMES C. OLSEN, 2700 SW PATTON ROAD, BE 8463, makes these attractive pins and will be glad to fill your order for one.

Buwalda, John P.

GEOLOGICAL FEATURES OF THE JOHN DAY REGION, EASTERN OREGON

Geological Society of America, Bulletin, No. 39, Page 269-70, 1928.

The main features of the geology of the John Day region were described in able fashion by J. C. Merriam twenty-five years ago. Detailed area mapping and structural and physiographic studies now in progress in the Mitchell and Picture Gorge quadrangles are furnishing extensive additional evidence corroborating these earlier views.

The formations are a pre-Cretaceous crystalline complex; the Chico, Upper Cretaceous; the Clarno, probably Oligocene; the John Day, Upper Oligocene; the Columbia lavas, Middle miocene; the Mascall, Middle or Upper Miocene; and the Rattlesnake, Pliocene. Of these only the Chico Cretaceous is marine in origin.

The detailed mapping has brought forth very clear evidence, usually of several kinds, indicating nonconformity between the Chico and the pre-Cretaceous, the Clarno and the Chico, the Columbia lavas and the John Day, and the Rattlesnake and the Mascall. Additional evidence for conformity of the Mascall on the Columbia lavas has been secured.

The Columbia lavas are somewhat unique in this region in the large fraction which fragmental igneous materials constitute in the section. The fissure origin of the lavas is demonstrable at numerous localities.

Faulting of normal type, but generally east-west trend, occurred in post-mascall pre-rattlesnake time, but has continued in post-Rattlesnake time. The main features of the physiography has been developed through folding however; their east-west trend contrasts rather sharply with the dominantly meridional axial directions of the greater ranges to the east and west.

THE PLEISTOCENE MAMMALS

OF

OREGON

The Pleistocene included a group of mammals now extinct, forms now known only in the Old World, and the ancestors of our modern animals. Man was then in existence in the old world and possibly on the West Coast, if not in Oregon.

The recent attention focused upon Pleistocene deposits of Oregon by Allison, Hodge, Piper, Felts and others now makes it possible to recognize several stratigraphic divisions of the Pleistocene sediments of the Willamette Valley. It should thus soon be possible to date fossils that are found in place. Mr. Wayne Felts has recently plotted and attempted to date as many of the recorded occurrences of Oregon Pleistocene mamals as possible. The results are not yet very satisfactory because the recorded localities have been very vaguely described.

Future discoveries should be carefully checked by competent persons and definite age of the sediment in which they are discovered determined and recorded. Only in this way will it be possible to establish the geologic ranges of our Pleistocene mammals.

The distinction between Pliocene and Pleistocene mammalian faunas is not always easy to draw. One is based on the assumption that the moose (Ales); bison (Bison); goat (Oreamnos); musk-ox (Ovibos); red deer (Cervus); bear (Ursus) and reindeer (Rangifer) arrived in North America by way of the Bering Portal at the close of the Pliocene. Another is that certain South American Edentates, the ground sloths and glyptodons appeared at about that time.

The close of the Pleistocene on the West Coast is thought to be indicated by the extinction of the sabre-tooth tigers, lions, dire-wolves, mastodons, mammoths, and the extinction of camels and horses in the western hemisphere. The existence of man in caverns along the Colorado River evern prior to the last occupation by ground sloths indicates either a great age for man in the west or late survival of these strange beasts.

Pleistocene fossils have been found at scattered localities throughout the state. Extensive mammalian and avian fauna have been obtained only at Fossil Lake in Central Oregon.

This fauna as revised by H. O. Elftman (1931) includes:

Carnivora:

Canis cf. dirus	dire wolf
Canis cf. occidentalis	wolf
Canis lestes	Coyote
Vulpes sp.	fox
Felis sp. major	possibly a lion
Felis sp. minor	size of a small cougar
Arctotherium, sp.	extinct bear
Taxidea, n. sp.	badger

Rodentia

Castor, n. sp.	beaver
Fiber oregonus	muskrat
Microtus montanus	meadow mouse
Thomomys townsendi	pocket gopher
Lepus sp.	jack rabbit

Edentata

Mylodon lavlani	ground sloth

Proboscidea

Pareleplias columbi	columbian mammoth

Perrisodactyla

Equus pacificus	pacific horse
Equus, n. sp.	extinct horse

Artiodactyla

Antilocapra cf. americana	pronghorn antelope
Platygonus cf. vetus	extinct peccary
Platygonus, sp. minor	small peccary
Camelops hesternus	camel
? Tanupolama	camel
Exchatius sp.	camel

Forty-seven per cent of these genera and sixty-five percent of the species are extinct. This places the fauna in age near to that of Rancho La Brea and Hawver Cave.

The Pleistocene elsewhere within Oregon has yielded in addition to the above list the following mammals.

Nothrotherium shastense	ground sloth
Megalonyx sp.	ground sloth
Mastodon americanum	mastodon
Archidioscodon imperator	imperial mammoth
Mammonteus primigenius	wooly mammoth
Equus cf. pacificus	horse, pacifici
Ovis cf. montana	sheep
Bison antiquus	bison

The evidence now at hand indicates that mammoths, mastodons and horses occur in th latest of the Pleistocene Willamette Valley deposits. Thus the Willamette Valley fauna includes late Pleistocene mammals in contrast to the early Pleistocene at Fossil Lake.

E. L. P.
Paleontology Laboratory
O.S.C., Sept., 1937

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PORTLAND OREG.

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

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LECTURES

Nov. 26, 1937 (Friday) - Dr. Francis T Jones will speak on the subject "The Microscope in Geology". Dr. Jones will have a microprojector and will show thin sections of rocks He will also show some Diatoms and Foraminifera.

Dec. 10, 1937 (Friday) - Mr. Albert Monner will show some of his excellent aerial pictures including the John Day Country of Eastern Oregon and Rocky Mountain views. These pictures will be of interest to members of our Society and friends, and no doubt will make us long for some trips through these sections

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N O T I C E

The Executive Board announces that dues for membership in the Society for the remainder of the year which ends February 28th, 1938 will be $2.00. Those who join now and wish to receive the back numbers of our Bulletin for the year will pay the full ($3.50) membership fee.

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THE FOLLOWING COMMITTEES HAVE BEEN APPOINTED BY THE PRESIDENT OF THE SOCIETY

Nominating Committee

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Miss Mildred Stockwell

Dr. W. Claude Adams

Dr. Edwin E. Osgood

Mr. A. W. Hancock

Annual Meeting Committe

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Mr. Carl Richards - 1431 SW Park Avenue - BR 2022

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G L A C I E R S

with special reference to the work of

The Mazama Research Committee

Summary of the lectures before the Geological Society
of the Oregon Country, Portland, Oregon; October 22, 1937

by

J. Russell Collins,
Carl P. Richards
and Kenneth N. Phillips.

The activities and aims of the Research Committee of the Mazama Club were the subjects of the illustrated lectures at the regular meeting of the Geological Society Friday evening, October 22.

President A. D. Vance introduced the first speaker, Russell Collins, who outlined the history of the formation of the Mazama Club, and related the interesting story of the organization meeting held on the summit of Mt. Hood on July 19, 1894 where an icy wind hurled snow and sleet at the assembled climbers. One of the major objects of the club at that time, and one that is still adhered to, was the acquisition and dissemination of scientific information concerning mountains and mountaineering. It was to promote this thought that the Research Committee was formed in 1925, consisting of Earl Marshall as chairman with Fred Stadter, John A. Lee, T. R. Conway, Ira A. Williams, R. L. Glisan, and E. A. Philpoe as his assistants.

One of the major projects of this committee was to ascertain the rate of movement of the ice of Eliot Glacier and to start a series of measurements of the annual advance or retreat of the Glacier snouts of this and the other glaciers on Mt. Hood.

Mr. Collins attributed much of the committee's success to the enthusiasm and ability of Mr. Carl P. Richards, chairman for many years, and to the present chairman, Mr. Kenneth N. Phillips. The Research Committee at this time is composed of Mr. Kenneth N. Phillips, chairman, Carl P. Richards, A. J. Gilardi, Russell Collins, Donald Lawrence, and Harry L. Clark.

Mr. Richards, the second speaker of the evening, briefly defined the general types and characteristics of the glaciers of today, which are but remnants of the last great Ice Age. The Antarctica and Greenland Ice fields, many thousands of feet thick, are our only examples of continental glaciers. Piedmont Glaciers are mostly found in Alaska, whereas Alpine Glaciers are found on practically all the high mountain ranges of the world.

After outlining the geological functions and explaining the terminology of glaciers, Mr. Richards told of one of the very interesting projects of the Research Committee. It was thought that a complete photographic record of the

glaciers on our northwestern mountains should be made and placed in the libraries for reference of future students of geology and climatology. The only feasible means of doing this was by an aerial photographic survey. A plane was chartered and on October 6, 1936, A. J. Gilardi, Carl P. Richards, Kenneth N. Phillips, and Frank I. Jones left Swan Island airport on a flight around Mt. Adams, Mr. Rainier, and Mt. St. Helens. The Flight was made at an average elevation of about 8,000 feet and at comparatively slow speed, less than 100 miles per hour. On the trip, which was clockwise about each of the three mountains, nearly two hundred pictures were taken and were later incorporated into a bound volume. Three copies of this were made and distributed as follows: One copy was placed on file in the Mazama Library, one copy was given to the Portland Public Library and the third copy was sent to Dr. Matthes, Chairman of the Committee on Glaciers of the American Geophysical Union at Washington D. C.

The findings and results of the 1936 Flight were such that another flight was planned for 1937. On September 24, the plane was again chartered and this time A. J. Gilardi, Carl P. Richards, H. J. Thorne and Harry L. Clark, piloted by Seth S. Strachan, left Swan Island airport bound for Mt. Jefferson and the Three Sisters. Upon reaching Mt. Jefferson the plane was turned south, passing both Three fingered Jack and Mt. Washington on the east. When the plane arrived at the north side of the North Sister it was turned eastward to go between Broken Top and the Three Sisters. Photographs were taken, in rapid order, of the east sides of North Sister, Middle Sister and South Sister and then at an elevation of about 8000 feet, the south side of South Sister. The plane was turned to the north and pictures were taken of the west sides of the three mountains, and also the west sides of Mt. Washington and Three Fingered Jack.

The plane approached Mt. Jefferson from the southwest and a complete circle of this peak was made so that many excellent pictures were taken before returning to Portland.

Mr. Richards explained that the pictures gathered on this flight were also to be bound and would be on file in the library of the club, the library at Portland and with Dr. Matthes in Washington D. C.

Mr. Kenneth N. Phillips, chairman of the Research Committee, used as the subject of his lecture the glaciers of Mt. Hood. The Committee has taken detailed measurements of the snout of Eliot Glacier since 1925, of Coe Glacier since 1928, and of Ladd Glacier since 1927. These measurements indicate that the glaciers on Mt. Hood, in common with the majority of the glaciers of the northern hemisphere, are retreating.

Photographic records are being kept of these glaciers and are to be compared, from time to time, with photographs made by Professors Harry Fielding Reid and Lyman and others of the preceding generation.

Mr. Phillips also told of the accomplishments of Mr. Gilardi and the others of the committee with the cryocinemeter. This instrument, the work of Mr. Gilardi, was patterned after similar instruments used in Switzerland. The cryocinemeter consists of a clock body with certain gears re-

moved, a staff, some fine wire and a weight. The staff, holding the recording instrument, is set up some distance from the ice and then the wire is stretched from it to the glacier snout. As the glacier moves, the wire is drawn over a pulley attached to the gears of the "cyro", so that the movement is recorded on the face of the clock. The measurements of this instrument are so delicate that the temperature must be noted each time a reading is taken in order to allow for the expansion or contraction of the wire.

Some of the other activites of the committee, such as the investigation of the fumaroles in the crater of Mt. Hood, and preliminary work on the more accessible glaciers of Mt. Rainier were briefly mentioned by the speakers of the evening.

The excellent slides used to illustrate the lectures were the work of Mr. H. J. Thorne, a member of the Mazama Club. Mr. A. J. Gilardi heightened the interest of the lectures by having on display some of his very fine photographs of the various mountains discussed during the course of the evening.

Harry L. Clark

SOME NOTES ON GLACIER CHANGES - HERE AND ELSEWHERE

By Carl Price Richards

In the Geological News Letter of May 25, 1937 (Vol. 3, No. 10, Page 108) there is an article by Kenneth N. Phillips on "Glaciers", in which was abstracted a report by Dr. Matthes, Chairman of the Committee on Glaciers of the American Gerphysical Union. In it is a tabulation of the recent changes (recession or advance) of the glacier termini in Western U. S. A. which showed that nearly all of these glaciers are receding from, approximately, 20 to 100 feet a year, and that a few register an advance of from 5 to 20 feet in the year.

Recently there was received from England a copy of an editorial that appeared in the "Manchester Guardian" of September 21, 1937 which tells, in a form for popular consumption, of changes in the glaciers of Switzerland. For the purpose of comparison this brief article is quoted in full:-

Restful Records

> In these days of passionate striving to attain the ultimate felicity of travel at a mile a second, it may be pleasing for some to pore over the speed records of the 69 of Switzerland's 1,077 glaciers which are considered worthy to be kept under close and sustained observation. So leisurely is their mode of travel, indeed, that 58 are actually backing; five are just slightly shuffling about where they stand; and only six are heading for the horizon

The "speed ace" would appear to be the glacier of Dama, in the Gothard region, which last year advanced nearly 37 feet. Consolation prize goes to a minus-competitor, the glacier of Tourtemagne, Valais region, that receded 97 feet, for a foul should be given against the showing of the lower glacier of the Aar (receded 131 feet) since man interfered by creating the big reservoir of Grimsel.

The famous glacier of the Rhone receded last year by almost 32 feet, but the Grindelwald glacier raced ahead six feet. The Glacier Noir serenely pursued its whirlwind progress by nine feet. In the Reuss region the only plus-competitor was the Brunni glacier, with an advance of twelve feet.

Schlossberg glacier resorted to shifty tactics which tended to complicate the issue. It really retired 15 feet, but, incorporating some huge blocks of ice that came toppling down the Schlossberg mountain, it built on to itself a sort of prow which made it appear to a casual beholder to have advanced slightly. But even the local snails are still unworried.

The significance of the comparison lies in the fact that the Swiss glaciers and our own are behaving in a similar manner. Being in much the same latitude, that might reasonably be expected; but it would be desirable to know what is happening to the glaciers in southern latitudes, such as those in the New Zealand Alps and the South American Andes.

In 1939 the United States will be host to the International Geodetic and Geophysical Union (which includes the International Glacier Commission) and it is hoped that the occasion will bring out the answer to that question. If it does not, on account of the information not being available, it should at least institute the process of research which will obtain the required measurements.

Such information is of importance. The behaviour of glaciers is indicative of long-period climatic changes, or oscillations, such as have occured constantly throughout the various geological periods. That such a change is now taking place in the direction of a warmer climate is evident from the records quoted above. But, whether such a trend is world-wide or merely regional, can be determined only by extending the records to include all the glacial areas of the world.

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The following table was compiled for the lecture before the Society on October 22 last. It is of interest in that it helps to visualize the extent of glaciers on the surface of the Earth. The values given are necessarily in "round" figures, but are sufficiently close that the percentages shown are accurate to the first decimal.

AREAS OF THE EARTH WITH RESPECT TO GLACIERS

	Square Miles	% of Total World Area	% of Total Land Area
Total Land Area	58,000,000	29	100
Total Water Area	139,000,000	71	240
Total of the Earth's Surface	197,000,000	100	340

AREAS OF THE EARTH WITH RESPECT TO GLACIERS

	Square Miles	% of Total World Area	% of Total Land Area
Antarctica Ice Sheet	4,150,000	2.1	7.15
Greenland Ice Sheet	750,000	.4	1.3
All Other Glaciers	100,000	.05	.17
Total Glaciated Area	5,000,000	2.55	8.62
U. S. A.	3,025,000	1.5	5.2
Oregon	96,000	.05	.16
Emmons Glacier, Mt. Rainier	4.7		

The influence which glaciers have had, and still have, on world economy and human affairs is not generally appreciated. When the great ice sheets covered the northern areas of this continent and Europe in the late Pleistocene, the amount of water they held out of the oceans was such as to cause the sea level to be lower than the present by over 200 feet according to some authorities. Conversely, if the present great ice sheets of Antarctica and Greenland were to melt, it is estimated that the resulting rise in sea level would be about 90 feet. At that level ocean waves would be lapping the third floor of the Meier & Frank's store! However, to set at rest the fears of those who wish to take advantage of the next "Bargain Day", it should be added that such a calamity will not occur without the warning of at least a century or two!

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SCIENCE REBUILDS OLD 'SHIP-LIZARD'

Ancient Bones From Texas Used to Make Model

Cambridge, Mass., Oct. 9 (AP) - Harvard scientists working with fossil bones today finished reconstructing one of the weirdest of the world's ancient inhabitants, a "ship-lizard," which lived in Texas 225,000,000 years ago.

Fossilized remains of the animal were discovered in the Red river beds of northwest Texas by Professor Alfred S. Romer.

This eight-foot predecessor of the massive dinosaurs gained its name from a sail-like fin about two feet high, rising from the backbone. Scientists can find no explanation for the fin.

Scientifically known as "edaphosaurus," the creature was about half tail and half body. Its head was only six inches long.

Edaphosaurus was a sluggish vegetarian. Its bones also have been found in Europe and Asia.

GRANITE ERRATICS

Diller, Joseph Silas

Extract from the Seventeenth Annual Report of the U. S. Geological Survey, Page 486, Beginning at 3rd paragraph to end of second paragraph, page 487, 1895-1896.

At various places along the western side of the Willamette Valley, between Forest Grove and Corvallis, a number of bowlders of granite and schist were observed under conditions that strongly suggest transportation by ice, probably in the form of icebergs, floating upon the Willamette Sound.

The first one noted was upon the hill slope near the county stone quarry, a mile south of Dilley, at an elevation of 120 feet above the sea. The bowlder is of biotite granite, and is about 22 feet in diameter. Chlorite bowlders were seen near Amity, at an elavation of 190 feet. A few miles north of Corvallis granite bowlders occur, and 12 miles southwest of that city bowlders, not only of granite but also of glaucophane schist, were seen by the roadside at an elevation of over 250 feet above sea level. No striae or other marks showing glacial origin or ice transportation were seen on the bowlders, but that they are erratics, carried there from the mountains is evident, for no such rocks are known in the places where they occur. Mr. W. A. Pomeroy, of Oswego, Oregon, informs me that in the vicinity of the Prosser mine, 8 miles south of Portland, there are angular bowlders of syenite, ranging in weight from a few pounds to several hundred, widely scattered in valleys and on the tops of hills and knolls 800 to 1,500 feet high.

During the Glacial period, as pointed out by Professors Newberry, Russell, and others, glaciers of the Cascade Range were large and extended almost if not quite into Willamette Valley; for those of Mount Shasta in California at that time reached the very base of the mountain upon the western side. Thus small icebergs could have been readily formed to carry bowlders of rocks from the western slope of the Cascade Range and float upon the broad expanse of Willamette Sound. As they melted they dropped their loads of stones to the bottom, where the stones now appear scattered thoughout the valley

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VAST CANYONS IN SEA ARE PLUMBED; ROCKS OF 'RECENT PLIOCENE' DUG UP

Harvard Scientists, Led by Dr. Stetson, Are Mystified by Speed with Which Great Valleys were formed--Animal Fossils Found on Marine Cliff Walls

(The New York Times - - - Sunday, October 3, 1937)

Woods Hole, Mass., Oct. 2.-AP--The Atlantis, scientific ship of the Oceonographic institution here, went fishing for rocks from submarine canyons last Summer and is back with evidence of new worldbuilding forces.

Marine valleys, equal in depth to the deepest on earth, such as the Grand Canyon, were found to be of recent origin. Rocks that formed the canyon sides were found to have been laid down during the Pliocene Period, the geological era which preceded Pleistocene, or recent times.

The puzzle lies in the astounding speed at which these young canyons must have been built. The explanations of geologists as to how Grand Canyon and all the fissures and mountains of the earth were probably built involve a lapse of scores of millions of years.

Mountains rose very slowly and rivers cut the land canyons with equal slowness. But these explanations do not fit the sea canyons.

Dr. Henry C. Stetson, Research Associate in Paleontology at Harvard, who has been "fishing" on the Atlantis, explains in The Collecting Net, Woods Hole scientific journal, how the submarine canyons were found and what puzzles they offer.

The new method of echo sounding revealed most of the ocean canyons. A sound made under water at the bottom of a ship sends back its echo from the bottom of the sea, and by its timing tells the depth.

Because the geologists at first imagined that rivers flowing into the sea had dug these canyons they did not get excited over the fact that echoes revealed great canyons on both coasts of North America, both sides of Mexico both sides of Japan, both sides of South America, off Africa, Portugal, France, the British Isles, India, Korea, Zanzibar and even the Hawaiian Islands.

But suspicion was excited about two years ago by finding numerous canyons off coasts where there had been no rivers to dig them. It was peculiar, too, that many of them were so uniform. One main type was V-shaped, five to twelve miles long, two to six wide. These canyons all went down about 8,000 to 10,000 feet below present sea level. There wer thirty of this kind in the Georges Banks alone.

"To account for their origin," Dr. Stetson said, "we are faced with the dilemma of altering the relationship of land and sea to a seemingly impossible extent, or else appealing to submarine currents whose behavior is utterly at variance with the data which modern Physicaloceanographers are accumulating.

"Yet there they are--huge valleys extending to more than 10,000 feet below present sea level--produced by forces not local or regional in their scope, but which operated simultaneously the world over within comparatively recent times".

Seeking the answer to this riddle, the Atlantis went rock fishing. With her echo-sounding apparatus at work she would locate the edge of a canyon. Then she would slowly across the canyon until the echo told of a steep cliff jutting upward from its bottom.

After passing over the submerged cliff, the Atlantis would stop. She would drop a raking dredge at the end of a mile of wire cable. The rake would swing against the face of the cliff. The Atlantis then would haul this rake up the cliff by steaming slowly along at about two knots.

Loose material picked yp by the rake, such as might have been deposited by outwash from glaciers, never put a strain more than 3,000 pounds on the wire "fish line". Strains of 7,000 to 10,000 pounds meant that the dredge was biting into the rock walls forming the backbone of the cliff.

As evidence that the dredge tore original rock from the walls, freshly broken faces, as well as old, weathered ones, were found on the rocks in the hauls.

Fossils Dating the Walls

In these rocks were fossils of animals and plants. The fossils marked the approximate ages of the formation of the canyon walls.

"The fossiliferous strata indicated that the east coast canyons cannot be other than Pliocene," Dr. Stetson said.

"In their youth lies their significance. For if these valleys are the work of streams, either the continental margins have risen uniformly a matter of 8,000 to 10,000 feet, or the sea has dropped an equivalent amount, or powerful and mysterious agents have been operative about which we know nothing, and these events have occurred only yesterday and right in our own dooryard."

If the continental margins rose 10,000 feet, rivers cut the canyons while the land was above the ocean, and then the land sank, canyons and all. There does not appear to have been enough time for this to have happened.

To find out whether submarine currents now flowing might have cut the canyons, the Atlantis last year measured the currents in the bottoms of three Georges Banks valleys. The water there was flowing not faster than two-tenths of a knot, too slowly to account for cutting a canyon by erosion.

Mud Flow and Ice Cap Theories

Professor R. A. Daly advanced a theory of sediment flowing downhill

under the sea with enough velocity to scour out canyons. The idea is that some time in the last million years the level of the ocean was right for waves to stir up bottom mud just on the edge of fairly steep underwater banks. The mud flowing downward would accelerate as it descended, creating a fast, muddy stream.

Dr. Stetson said that under proper conditions this mud stream mechanism could be made to work as theorized.

Another supposition is that Arctic ice caps were once vastly greater than at present. The Arctic Ocean is assumed to have been completely frozen over, making a platform on which more snow and ice could accumulate.

Locking up so much water in the form of ice would lower the levels of the oceans. But Dr. Stetson pointed out that the drop in sea level from this cause could not at most have been more than 2,000 or 3,000 feet.

Rivers from the land could have cut canyons down to this 3,000 foot depth, but that, Dr. Stetson said, still left the lower depths of the submarine valleys to be accounted for.

PORTLAND
1 ORE.

DR. ARTHUR C. JONES
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PORTLAND, OREGON

THE GEOLOGICAL NEWS LETTER

Official Bulletin
of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Vol. 3 - No. 23 Portland, Oregon December 10,1937

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

LECTURES

Dec. 10, 1937 (Friday) - Mr. Albert Monnor will show some of his excellent aerial pictures including the John Day Country of Eastern Oregon and Rocky Mountain views. Those pictures will be of interest to members of our Society and friends, and no doubt will make us long for some trips through these sections.

STAFF LENS MAN AMONG AUTHORS OF CAMERA BOOK

Morning Oregonian-Dec. 4, 1937

Alfred A. Monner, staff photographer of The Oregonian, is one of the contributors ot a recently published book, "Photographic Hints and Gadgets," edited by Frank R. Fraprie and Franklin I. Jordan.

Mr. Monner's article entitled, "Gadgets for the Photographer," deals with easy methods of constructing photographic accessories such as lens shades filter holders, tripod heads, parabolic reflectors and siphoning gadgets for transferring solutions.

The book, just off the press, was published by the American Photographic Publishing Company.

Dec. 24, 1937 (Friday) - Christmas Eve - no meeting.

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TRIPS

Dec. 12, 1937 (Sunday) - Buxton and vicinity.

Leader: H. B. Schminky.

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LOCAL ENGINEER'S PAPER WINNER OF TOP AWARD

Oregon Journal - Dec. 3, 1937

J. C. Stevens of the Portland engineering firm of Stevens & Koon, will receive the Norman gold medal awarded annually by the American Society of Civil Engineers for his paper entitled "Teh Silt Problem". The presentation will be at the January meeting of the society in New York city. The medal is the top annual award for an outstanding contribution to engineering science.

The paper, written in 1934, is a statistical study of all major reservoir dams in the world, pointing out the rapid rate at which they fill with silt. Several great dams in the Old World have become utterly useless because their reservoirs have been completely filled with silt, the paper states.

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THE 1938 SUMMER CAMP

Ballots for the summer trip for 1938 should be coming in. See your "Geological News Letter for October 10, 1937, pages 210 -211" for suggested localities. Then send your choice to:

H. B. Schminky
1030 S. E. 54th Avenue
Portland, Oregon.

Bowen, N. L.

SOURCE OF PLATEAU BASALTS

Geological Society of America, Bulletin N. 40, Page 105, 1929

Most hypotheses of the source of the great basaltic floods have sought it in a layer of the earth of basaltic composition. The present paper discusses the possibility that the magma originates in the selctive fusion of a peridotite zone of the earth.

Etherington, Thomas J.

TERTIARY ROCKS OF PART OF CHEHALIS VALLEY, WASHINGTON

Geological Society of America, Bulletin No. 40, Page 256, 1929

The rocks of this area are all of Tertiary age, with a maximum thickness of 12,000 feet. The sedimentary rocks are all fossiliferous but the writer's work has been concentrated upon the Wahkiakum formation, of middle Eocene age. These collections are now being studied and comparisons are being made with the fossils of similar age from Oregon to California, in the Museum of Paleontology, University of California.

Thayer, T. P., petrology of later Tertiary and Quaternary rocks of the north-central Cascade Mountains in Oregon, with notes on similar rocks in western Nevada: Geol. Soc. Am., Bull., Vol. 48, pp. 1611-1652, 5 pls., 3 figs., November 1, 1937.

In the paper just cited Thayer reviews the structure and stratigraphy of the Cascade Range in Oregon 1/ and describes in detail the composition and texture of certain igneous rocks involved. As the background for his paper, Mr. Thayer points out: (1) early investigations by Hague and Iddings (1883), Dill and Patton (1902), and others pertained to lavas from the youngest volcanic peaks and led to the concept that the Range was a rather simple accumulation of andesitic lavas surmounted by volcanoes composed of similar rocks; (2) from this early work it was by no means known, nor is it yet known, how many volcanic epochs are represented by the rocks of the Range, how many types of rocks occur, nor in what proportions; (3) I. C. Russell (1897) and Callaghan (1933) showed that the volcanic rocks of the Range could be divided into an older group and a younger group (or that the Range could be divided into western and eastern segments, respectively), and that the older rocks were extensively deformed and eroded before the younger rocks were formed; and (4) that it is dificult if not impossible to discriminate many of the fine-grained and glassy rocks except by chemical analyses to supplement examination in thin section by the petrographic microscope. The paper pertains to certain of the older lava rocks not described by Buddington and Callghan 2/ and to all the younger lavas along the North Santiam River except those of Mt. Jefferson.

In summary, Thayer says:

> "The lavas of the Cascade Mountains in Oregon are divided into two main groups, the Western Cascade and High Cascade, on the basis of a marked unconformity and consistent differences in chemical composition.
>
> "The Western Cascade lavas, probably Miocene and older, have been folded, faulted, intruded by dioritic plugs, and locally mineralized. Petrologically they consist of two main interfingering types, the Stayton lavas and the Sardine lavas.
>
> "The Stayton lavas are black and gray basalts similar in many respects to the Columbia River basalts. Both gray and black basalts contain more or less olivine, are characterized by ophitic textures, and have a salic: femic ratio of 1.25:1 to 1.4:1. The gray basalts contain some cristobalite.

1/ Thayer, T. P., Structural relation of the central Willamette Valley to the Cascade Mountains (abstract): Geol. Soc. Am., Proc., 1933, p. 315, June 1934; Structure of North Santiam section of Oregon Cascades (abstract): Geol. Soc. Am., Proc., 1934, pp. 324-325, 1935; Geology of the North Santiam River district, Oregon: Geol. Soc. Oregon Country, Geological News Letter, vol. 2, no. 11, pp. 7-9, June 10, 1936.

2/ Buddington, A. F., and Callaghan, Eugene, Dioritic intrusive rocks and contact metamorphism in the Cascade Range in Oregon: Am. Jour. Sci., 5th ser., vol. 31, no. 186, pp. 421-499, June 1936

"The Sardine lavas, about 6000 feet thick, range from olivine basalt to rhyolite, but andesites predominate. The most common lava type is basaltic andesite characterized by glomeroporphyritic textures and containing as much as 75 percent (by volume) feldspar. The salic : femic ratio, in contrast with Stayton basalts of similar silica content, is over 2 : 1.

"The High Cascade lavas are divided into several groups on the basis of structure, but are petrologically homogeneous. All these lavas are very fresh and apparently retain initial dips. The sequence as a whole, except the large pre-Wisconsin peaks such as Mt. Jefferson, is composed mostly of rather light-gray olivine basalts. Pyroxene andesites and hornblende-pyroxene andesites are represented by comparatively few flows. The basalts are characterized by light color, platy fracture and superficial resemblance to andesites. Hypersthene is usually present, and olivine is probably present in nearly all lavas containing less than 55 percent silica; the average basalt contains 52.5 to 53.5 percent SiO_2. The outstanding feature of the lavas is the high salic : femic ration of 2.5 : 1 which is reflected in a maximum feldspar content of 68.5 weight percent. The basalts were extruded from micro-norite plugs containing both olivine and cristobalite, as do some of the basalt flows. The andesites, some of which are dacitic in composition, are characterized by hypersthene and large amounts of cristobalite and tridymite.

"No systematic variation of lavas from basic to acid or vice versa was noted in either Western or High Cascade sequences. In the Western Cascade lavas lateral variation is fully as great as vertical. In the High Cascades basalts predominate throughout, but andesites are probably most abundant in late Minto and Olallie time.

"The High Cascade lavas are in gneral richer in Al_2O_3, CaO, and Na_2O and poorer in FeO and K_2O than those in the Western Cascades. The smoothed curves of composition variation diagrams indicate a rather sharp break at the end of Western Cascade time marked by changes in the curves for all elements, but particularly for alumina and iron oxides. The Stayton basalts lie on neither High Cascade nor Western Cascade composition curves and apparently reflect complications in the course of mamatic differentiatin."

For those who may wish to study the original paper, the less common technical names and terms are explained by the following glossary:

Glossary

Albite. (See Plagioclase)
Andesine. Do.
Anorthite Do.

Aphanitic. Having a texture so fine that the individual grains or crystals can not be distinguished with the naked eye.

Bytownite. (See plagioclase)

Chrysolite. (Identical with and commonly termed olivine)

Clinopyroxene. Any one of the several minerals in the pyroxene group that crystallize in the monoclinic system commonly diopside or augite. A metasilicate of calcium and magnesium or iron, or both; with or without alumina.

Cristobalite. Silica in octahedrons (pseudo-isometric?). "High-temperature quartz", which forms at 1,470°C. or above. Of the other two crystalline varieties of pure silica, quartz forms below 800°C.,, and tridymite between 800° and 1,470°C.

Crystallite. A small, rudimentary, or embryonic crystal, not referable to a definite species.

Dacite. A fine-grained igneous rock, generally volcanic, containing essential calcium-sodium feldspar (plagioclase) and quartz with little ferromagnesian minerals, also with potassium feldspar (orthoclase); "quartz andesite".

Dendrite. An aggregate of crystals in a branching pattern.

Deabasic texture. a particular variety of poikilitic fabric in which pyroxene acts as a matrix for tabular or bladed crystals of feldspar.

Dichroism (pleochroism). The property of exhibiting different colors in different directions by transmitted light.

Extravasate. A synonym for extrude; applied to the pouring out of igneous rocks which solidify after reaching the land surface.

Felsic. A short term applicable to the group of felspathic minerals and quartz and to the rocks composed predominantly of those minerals.

Femic. In the quantitative classification of igneous rocks, the "standard" minerals of the second group which are high in iron, magnesium, or calcium but low in silica. (Not to be confused with mafic or subsilicic.)

Fluidal. As a textural term applied to igneous rocks, the arrangement of mineral particles caused by movement or flow in the mass when it was but partially crystallized. (See hyalopilitic.)

Gabbroid (gabbroic) texture. In the igneous rocks, the texture or fabric that results when the several crystalline constituents are equally developed, showing that they formed nearly simultaneously. "Equigranular" is a rough synonym.

Glomerocryst. In a prophyritic rock, an aggregate of feldspar crystals analogous to a phenocryst.

Glomerporphyritic. A textural term denoting those porphyritic rocks whose phenocrysts are aggregates of crystals rather than single large crystals.

High-temperature silica. (See cristobalite and tridymite.)

Holocrystalline. A textural term applied to those rocks that consit entirely of crystallized minerals as distinguished from those with more or less glass.

Hyalopilitic. A textural term, denoting an igneous rock composed of glass in which innumerable slender microlites (commonly feldspar) are embedded with irregular distribution and orientation; also known as andesitic texture. An antonym for fluidal.

Hyalophitic. A textural term denoting an igneous rock composed of glass and of crystalline constituents in the ophitic arrangement - that is, having earlier-formed crystals of labradorite surrounded by later-formed and abundant crystals of augite.

Hypersthene. A mineral of the pyroxene group, which differs from the common diopside and augite in containing no calcium and in crystallizing in the orthorhombic rather than the monoclinic system. (See orthopyroxene.)

Labradorite. (See plagioclase.)

Labradorite andesite. A volcanic rock which resembles basalt in containing calcium feldspar (labradorite) but resembles andesite in containing relatively little pyroxene.

Latite. A volcanic rock of fine texture composed of potassium feldspar (orthoclase) and calcium-sodium feldspar (plagioclase) in about equal amounts with a subordinate amount of ferromagnesian minerals. Latite is discriminated from andesite by the presence of orthoclase and from dacite by the absence of quartz.

Mafic. In petrology, pertaining to or composed dominantly of the ferromagnesian rock-forming silicates. (Not to be confused with femic)

Metacristobalite. (See Cristobalite.)

Micrographic intergrowth. An intergrowth of two minerals microscopic in grain, which in cross section has some resemblance to Hebrew and cuneiform writing. Caused by simultaneous growth of crystals in a near-stable state; commonly an intergrowth of quartz and feldspar.

Micronorite. An igneous rock of microscopic grain but wholly crystallized, composed of sodium-calcium feldspars and orthorhombic pyroxene, usually hypersthene; a variety of gabbro.

Mode. In the quantitative calssification of the igneous rocks, the actual mineral composition of a rock expressed in percentages.

Norm. In the quantitative classification of the igneous rocks, the standard mineral composition as calculated from a chemical analysis.

Oligoclase. (See plagioclase.)

Ophitic. A textural term denoting an igneous rock composed of earlier-formed crystals of feldspar surrounded by later-formed and abundant crystals of augite.

Orthopyroxene. One of the minerals in the pyroxene group that crystallizes in the orthorhombic system; commonly enstatite or hypersthene.

Paramorphism. The alteration of one mineral into another without change of chemical composition, as augite into hornblende.

Plagioclase. The feldspars that consist chiefly of silicates of sodium, calcium, and aluminum as opposed to those that consist chiefly of potassium and aluminum silicates. They form a continuous isomorphous series from the sodium aluminum silicate, albite (Ab), to the calcium aluminum silicate, anorthite (An). The sub-species in the series are discriminated by their optical properties; they are shown by the following table:

Composition of the plagioclase feldspars

Name of sub-species	Percentage of $NaAlSi_3O_8$ (Ab)	Percentage of $CaAl_2Si_2O_8$ (An)
Albite	100 - 95	Less than 5
Oligoclase	95 - 72⅔	5 - 27⅓
Andesine	72⅔ - 50	27⅓ - 50
Labradorite	50 - 27⅓	50 - 72⅔
Bytownite	27⅓ - 5	72⅔ - 95
Anorthite	Less than 5	95 - 100

Phenocryst. In a porphyritic rock, one of the individual and relatively large crystals of the gneration first to form.

Poikilitic. A texture or fabric of igneous rocks, in which relatively large crystals act as matrix for numerous small crystals of other minerals, the smaller ones lying in all orientations with respect to one another and somewhat uniformly scattered.

Porphyritic. a Textural term for those rocks which have larger crystals (Phenocrysts) set in a finer groundmass, which may be crystalline or glassy, or both.

Salic. In the quantitative classification of the igneous rocks, the "standard" minerals of the first group, which are charactorized by dominance of silica and alumina. Chiefly quartz and feldspar.

Seriate porphyritic. A porphyritic texture in which the sizes of the crystals vary in a continuous series.

Subhedral. Bounded in part by crystal faces proper to the mineral itself and in part by surfaces formed agains preexisting crystals.

Tridymite. Pure silica, SiO_2; hexagonal or pseudo-hexagonal; indistinct prismatic cleavage; forms between 800° and 1,470°C.

Arthur M. Piper.

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Clarke, Bruce Lawrence and Vokes, H. E.

Summary of Mrinc Eocene Sequences of Western North American (Geological Society of America, Bulletin v. 47, pp. 851-878, 2 pls., 3 figs., incl. correlation tables, June 30, 1936) OrCa OrP OrU

Stages of deposition (with descriptions and correlations); Martinez, Meganos, Capay, Domengine, Transition, Tejon, and Gaviota. Factors in correlation; Eocene avenues of migration, temperature facies of the California Eocene. Evidence of intercontinental correlation. The route of migration getween European and Western America regions was across the Atlantic Ocean in the tropical region, and through a portal in the Central American area. Migration occurred from east to west during the larval period.

	OREGON	WASHINGTON
Gaviota	Keasey & Bassendorf Shales??	Grios Ranch Beds??
Tejon	Coaledo & Spencer Formations	Cowlitz formation
Transition		
Domengine	Tyee Formation	Port Crescent Beds
Capay	Umpqua Formation	
Meganos		
Martinez		

(RCT)

CLACKAMAS RIVER AND VICINITY

(Between Carver & North Fork)

Clarence Phillips had another fine trip for us, planned in his own meticulous style, on October 10th, 14 cars filled with 49 eager fans assembld at Carver to join him in his preambulations along the Clackamas River between Carver and Estacada.

At carver, near Baker's Bridge, we stopped at a road cut which contains many of the famous faceted quartzite pebbles which have been split in two. This splitting is generally conceded to have resulted when volcanics extruded through the gravels. Lavas overlie the gravels on both sides of the stream at the bridge.

Looking up the river, we began to feel there was something familiar about this place. Ah, it dawned! It was here on the "Mysterious Valleys" trip that our great ramancer and philosopher played a cat and mouse game with us. And so, we find ourselves here again, but without Dr. Hodge; Claire Holdredge and Ray Treasher are going to be the cat and the mouse.

Mr. Phillips reviewed the physiography of the Clackamas canyon. Above Estacada the river comes out of a narrow gorge. Below Estacada the canyon widens to approximately twenty-five miles half way between Carver and Estacada. Near Baker's bridge the river again enters a gorge, and widening toward Oregon City. It is definitely established that the Clackamas River above Estacada follows an old glacial channel. The glacier formed its U-shaped valley at a higher elevation and the river has since cut its channel much deeper in the bottom of this old glacial bed.

We stood and queried these things: What factors entered into the sulpturing of the lower valley? Why does it have such a shape? How can one account for the thick deposits on its floor of clays, silts, and gravels? Surely, this is a "Mysterious Valley."

Soon we were off on our exporations for the day, and oh! what a day and what a trip! To record it stop by stop has been impossible for your poor faithful reporter. In desperation she has lumped the important features together and given you some of the gleanings and some of the SUPPOSITIONS, and hopes that the whys and the wherefores do not continue to haunt you as they do her.

Silts and Clays

The great thickness of the beds of clay and silt found throughout the valley above the bridge cause one to fall back on the "dammed Lake" supposition. The beds appear to be typical quiet water deposits and to form them without a lake is a REAL problem. Wouldn't you like to know the extent of these silts and clays and how far under the lavas they extend? And wouldn't you like to know how much deeper the river has to cut before reaching bedrock under them?

The clays are fine grained though somewhat gritty with a high percentage of sand in some places and form the underlying, thickest beds of

the valley filling. The clay is usually blue and weathers to reddish brown which is evidence of the presence of iron. The silts above the clays are coarser grained than the clay but show many of the same characteristics, and neither are stratified. Quantities of the mica were found in the silts which lie under the surface gravels. Clays, silts and gravels -- what an eloquent story! Who can tell it?

Gravels

Thick beds of gravel lie on top of the silts and clays thoughout the Clackamas Valley between Carver and Estacada and contain many of the so-called "Satsop pebbles." These pebbles do not show the characteristic red staining which is thought by some to be evidence of a type of weathering known as "desert varnish". They also show faceting and are well rounded but are less decayed than the other pebbles found with them.

The igneous pebbles associated with the quartzites are less weathered than those usually found with the quartzites. Mr. Treasher said this did not check with the Snipes Conglomerate in the Yakima Valley. Mr. Holdredge felt that these gravels were not part of the Troutdale formation because of the low degree of weathering of the igneous pebbles, the beds are not as well indurated as Troutdale beds, and that the quartzites did not travel far since faceting.

Theories for Faceting of Quartzite Pebbles.

Theories to account for the faceted quartzite pebbles have been in the air for many months and these gravel deposits contain such quantities of them that the argument began anew. Mr. Holdredge stated that if the facets were caused by glacial-shoe action, that is, pebbles picked up by a glacier and carried along with it while suffering brutal scouring, they should be sub-angular and striated instead of finely polished. The most positive proof is that they are now found in beds lower than any known Tertiary glaciation. Landslide action was discountenanced because these pebbles are too widespread and should show striations caused by rubbing against bedrock. Instead, they show the action of polishing agents.

Mr. Holdredge believes this agent was wind activity. The polish is more than a desert varnish, the result of wind blown particles being rubbed against the pebble. He has seen evidence of this sort in the deserts of Arizona and Nevada where the pebbles are loosely held in shifting sand so that in time as they turn over, another side is exposed for faceting. The pitted surface of so many of the pebbles was cited as further evidence of the "wind blown" theory.

Mr. Vance promptly jumped into the area of argument with many pertinent questions, which when answered, tended to clear some points and make others still more complex. Mr. Treasher suggested that polishing might have been done by running water in a stream bed; that the pebble might have been wedged between other rocks and as swiftly flowing water swirled fine silt over the pebble that facets developed. It was felt by some that the pebble would not remain in one position for a sufficient time to develop a facet.

The question of accounting for a resistent matrix was brought up and countered with the illustration of polishing rocks with plaster of paris as a cementing medium, the polisher operating at the same level thoughout the exposed surface. Mr. Holdredge proposed that during an arid Pliocene, river channels exposed gravels. Winds, carrying sand and silt, blowing up these channels could polish and facet the gravels lying there; cementation by ground water would account for their induration. Polishing was necessary before induration.

Supposing

If Old Columbia River flowed southward at the dalles prior to Cascade deformation, it must have flowed westward somewhere. Some of us like to think about Old Columbia's having carved the original Clackamas Valley. Then, if the pyroclastics making up the Rhododendron Formation did bury the lowlands and did throw a barrier across the small progonitor of the Columbia River in late Pliocene or early Pleistocene time and did cause Lake Condon to be formed in the interior behind these deposits, we have a possible stream carrying a large enough volume of water to have cut out the Clackamas Valley. Finally, overflow from Lake Condon caused the "Columbia" to superpose a new course along its present route while the Cascades were forming. Later, a glacier flowed down the old river channel to Estacada, - glacial till is not found down valley. It has either been excavated by the present stream or is covered by the gravels.

At this point even the "supposing" seems to end. We don't even know enough about this Clackamas Valley between Estacada and Carver to suppose, as yet. Let's have some more trips out there. During lunch-time the arguments still waged fast and furious but didn't seem to spoil anyone's appetite.

Diorite Outcrop and Cold Springs

Near the summit of the ridge just beyond the North Fork Crossing Camp, we found Cold Springs, a flowing spring of fresh water, and results from some underlying structural feature. Nearby is an outcrop of rock identified as diorite. If this diorite is an intrusion, it might form a sub-surface dam and cause the spring. It may also be that the ridge is mainly diorite and that the water accumulates in the soil on top of the rock and outcrops at Cold Springs.

The great mass of diorite lies on top of columnar basalt. How did this diorite get here? It was found to be very porous, with feldspar crystals sticking into the openings (a secondary mineralization process?). There is a rude alignment of vesicules which suggest flow structure and many of the long, slender feldspar crystals were likewise orientated. If the mass flowed did it flow up vertically with a lateral pressure or did it occur as a surface flow? No answer was indicated at this point.

The quarry exposes an excellent example of deep weathering, for the diorite weathers rapidly. Frost action pries the rocks apart. This is aided by the different coefficients of expansion of the light and dark minerals, the latter are unstable and oxidize quickly.

Mr. Holdredge felt that this diorite came up, or out, about glacial time or perhaps earlier. He thought it might possible belong to the High Cascade series. He based his assumption on its porosity and secondary mineralization, as there is no evidence of secondary mineralization in Coriba or older. The diorite is not a good building stone as it is too porous and weathers easily. It does not even make good road metal.

Gravels at High Elevation and Intracanyon Basalt

It is to be believed that Mr. Treasher meant it when he said, "This IS a tough one", when we stood in the bed of a stream that once flowed at this elevation (1700 ft.) a few miles west of the diorite quarry. We stood looking at the gravels here, the present Clackamas River; higher on its slopes are remnants of the old glacial floor, and here an old stream bed with its filling of intracanyon basalt. It is more like High Cascade basalt; olivine crystals are easily noticable.

The Gravels lie on top of the intracanyon basalt and adjacent to it, Mr. Holdredge unfolded a story of a possible stream valley here, having been overridden with glaciers and filled with gravels. Intracanyon basalts filled the valley. Gravels were laid down on this basalt, so a stream must have flowed here after the basalt came in. Mr. Treasher explained the different theories for exfoliation, using the exfoliated boulders in the upper portion of the deposit as examples. The lower portions were not as badly weathered, they consisted of water worn rather than exfoliated boulders.

In Conclusion

The story of this trip is like the story of geology. It has no beginning and it has no end. I leave the rest to you.

Eva Catlin

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THE GEOLOGICAL NEWS LETTER

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of the

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LECTURES

Jan. 14, 1937 (Friday) - Dr. Warren D. Smith. Subject: "The Geomorphology of Oregon or the Evolution of Oregon's Facial Expressions."

TRIPS

Jan. 9, 1938 (Sunday) - Salem - Silverton area.
Ray Treashor: Leader.

CHRISTMAS GREETINGS

The Christmas season is upon us. Therefore, it is fitting and proper that rock specimens and fossil crabs should rest in comparative safety for a time.

It is fitting and proper and also a great pleasure for me to extend to every member of the Geological Society of the Oregon Country my sincere hope that your Christmas may be exceedingly merry and that the New Year may bring great happiness to each of you.

A. D. Vance,
President.

The Editor hopes that nature - our Santa Claus - will bring to every member of the Geological Society of the Oregon County promise of many glorious trips in Oregon's out-of-doors, many new discoveries and a deeper and deeper realization of man's relaion-ship to nature.

Dr. E. T. Hodge.

NOMINATING COMMITTEE'S REPORT

The Nomination Committee, in accordance with the By-Laws of the Society has filed the following report:

"The President and Executive Committee
Geological Society of the Oregon Country
Portland, Oregon

"Gentlemen:

"In accordance with your instructions of September 22, 1937, we, your nominating committee, report the nomination of officers for the ensuing year as follows:

"President	Ray Treasher
Vice President	J. R. Collins
Secretary	Mrs. Amza Barr
Treasurer	Claire Holdredge

Respectfully submitted,
Chester A. Wheeler, Chairman
W. Claude Adams
H. Mildred Stockwell
A. W. Hancock
Edwin E. Osgood"

Publication of the above report constitutes notice by the Secretary of such nominations.

Lillian Neff, Secretary

Attention is called to Article VIII of the By-Laws, if any members 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 priorto 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."

MILWAUKIE & OREGON CITY TRIP

November 14, 1937

Leader: H. B. Schminky

Due to the fact that Mr. J. C. Stevens was out of town and therefore unable to lead the trip to the Klickitat River Dry Ice Well, the following emergency trip was held in its place. Leaving S. W. 6th and Yamhill St. at nine A.M. (0.0 Miles) the party proceeded to Grand Avenue and Division street (1.8 Miles), where the purpose of the trip was outlined: namely the study of the Willamette river valley and the valley that parallels it on the east from the Clackamas River to the former Stevens Slough at Portland.

The first stop being at the now filled Stevens slough, it was pointed out that river boats were once able to enter the old slough as far as the present Milwaukie Avenue. The original drainage into this slough was a small spring fed stream that headed in the vicinity of the Southern Pacific R. R. shops near Holgate Street. From Holgate Street the drainage of this inland valley is southward to Milwaukie by Johnson Creek and its branch known as Crystal Springs Creek. Between Milwaukie and the Clackamas River The drainage is the northerly flowing Kellogg Creek.

The caravan than proceeded to Milwaukie Avenue and followed it south along the ridge dividing the two valleys. A stop at the McLaughlin Blvd. undercrossing (3.6 Miles) gave a good view of the terrain. On the Willamette River side the ground drops off in a steep bluff, while to the east a gentle slope leads to the valley bottom. In the Portland area the eastern valley floor is at an elevation of some 50 odd feet with the Willamette itself at practically sea level. The dividing ridge averages about 100 feet. It was noted the cut for the highway undercrossing was made entirely in a sandy soil

Continuing south through the Sellwood district the dividing ridge loses elevation and then rises again before the town of Milwaukie is reached. The southern end of this ridge at Milwaukie was found to be composed of basalt. A stop at mile 6.0 gave the impression that this basalt may be of a different age than the so called Columbia River basalts. This lava is cut by Johnson Creek as it flows into the Willamette. Kellogg Creek also cut rock in its flow into the Willamette, but it is only a narrow ridge as no rock is exposed on the lake side of the highway.

Leaving Milwaukie the road cuts along the super-highway revealing a sandy soil apparently much like that seen in Portland at the Milwaukie avenue undercrossing. This sandy soil is quite deep at Lakewood Station (7.3 Miles). As the highway climbs out of the Kellogg Creek valley to the Willamette valley slope it crosses several old river terraces. Some places on these terraces are almost swamps.

The caravan turned left from the super-highway into Courtney road (8.1Miles) and then right on the Oatfield road. The route was then south along the westerly slope of the dividing ridge between the two valleys. But now conditions are reversed. The ridge averages about 300 feet in elevation. But it is the eastern slope that has the abrupt drop into Kellogg Creek valley while on the Willamette side there is a comparatively gentle slope to the river. The bottom of the Kellogg Creek valley is about 100 feet while the Willamette is still near sea level.

As we traveled along the Oatfield road it was noted the soil seemed to be deep and no rock was exposed, but large boulders were noted along some of the cultivated land. At mile 9.8 gravel appears in the road cut on the left. These gravels were about 50 percent weathered. The first thought is this is Troutdale. But in this case we probably will need a lot of question marks with that thought. These gravels seem to extend to the summit of the ridge and are visable along the road for the next three quarters of a mile. No gravel was noted in the cultivated land to the right of the road. At the end of the gravels, lavas appear and continue to the southern end of the ridge. At mile 11.6 it was found that these lavas overlie a much weathered basalt. The younger lavas originate from local volcanoes several of which may be seen from the road.

The real objective of the trip was to determine if one of these volcanoes contained a crater lake. On the plat of Township 2 South Range 2 East, which was surveyed in 1852, the surveyor shows that the southeast corner of section 17 was set on the east shore of a lake within a mountain. The writer had always wanted to see this place but had never tried to locate it until this trip was scouted. It is in the grounds of the Seven Day Adventist's camp (old Chatauqua grounds -entrance at mile 12,0). When the caretaker was asked about it, he said, "yes there is an old mud hole back there, but it isn't worth looking at." However it proved to be well worth looking at, as all the group agreed on the day of the trip. The lake is about 100 feet across north and south and probably 150 feet east and west. The crater rim is composed of lava with a light soil covering in places. Off hand the rim seems to rise 25 to 50 feet above the surrounding ground level, and it is quite irregular in its height above the lake - probably ranging from 5 to 25 feet. The lake only occupies a small part of the area within the crater rim. The lava is a basalt. This area is well worth a detailed survey and study.

Lunch was eaten in the old Chautaqua hall after which the caravan crossed along the north side of the Adventist camp grounds to the old 82nd Street road to Oregon City. At mile 13.7 on the right hand side of the highway a road cut revealed beds of sand gravel and clay with a very decided northerly fore-set structure. This would indicate that at some past time a stream was flowing in the opposite direction to that in which the Clackamas River now flows. The young lavas were mixed into the upper beds as erosion boulders. This question of the reversed stream flow brings up the second main point of the trip; namely: were the ridges that we had been following once islands in the old Willamette? If so did the young lavas divert the entire flow into the present channel? Did the Clackamas River which had originally discharged into the eastern channel then find it easier to cut back into the Willamette through the temporary dam than to continue flowing in the old east channel? These questions should be answered by more study. It may be noted that all these island would have had a lava buttress to protect their southern ends from erosion.

The next stop was in Oregon City at the old McLaughlin home. Here the caravan saw the basalt canyon through which the Willamette flows. Then on the east side of Oregon City where it was found that sedimentary beds of fine clay and sand lie in horizontal beds in back of the basalts that so boldly stand out on the river and give the appearance that they would extend indefinitely into the hill they front. From these bedded silts material was taken to furnish the fine binding needed in making asphalt pavement. Then a bed of silicon was uncovered, that was sold as tooth powder. Certain of the beds yield a good quality of modeling clay. This opens the third question of the trip: What is the nature of the depression that was filled with these sediments? Was it only a pocket in the basalt, or is it the original lost valley? A study of well logs if available in this area may reveal something of real interest in this respect. So ended an emergency trip that gives food for much study in our own back yard to quote Ray Treasher.

H. B. Schminkey