# GEOLOGICAL NEWS LETTER

OFFICIAL PUBLICATION OF THE

VOL. 5 NO. 1 to 24 PORTLAND, OREGON 1939

GEOLOGICAL NEWS-LETTER
Official Publication of the
Geological Society of the Oregon Country
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AUTHOR INDEX FOR VOLUME V.
(Ruth E. Campbell).

## AUTHOR INDEX FOR VOLUME V (continued)



## SUBJECT INDEX FOR VOLUME V.

SUBJECT INDEX FOR VOLUME V (continued)

SUBJECT INDEX FOR VOLUME V (continued)

# GEOLOGICAL NEWS LETTER

VOL. 5 NO. 1 PORTLAND, OREGON JAN., 10 1939

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GEOLOGICAL SOCIETY OREGON COUNTRY

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DR & MRS A C JONES
3300 S E HEATHER LANE
PORTLAND, OREGON

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

## Executive Board




THE GEOLOGICAL NEWS-LETTER

Official Publication of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY


## Editor-in-Chief & Business Manager


Raymond L. Baldwin
345 U. S. Court House,
Portland, Oregon


## Associate Editors




News-Letter issued semi-monthly on the 10th & 25th

Yearly Subscription $2.00 Single Copies $0.15


All communications and material for publication should be sent to the Editor-in-Chief. Change of address is required 30 days in advance of the date of proposed change.

# MEMBERSHIP APPLICATION

## GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

### Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ____________

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

______________________________
Address

______________________________
Business Address

______________ ______________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ______________

______________________________

Sponsored by ______________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________
Signature

## ANNOUNCEMENTS

### Lectures

Friday Jan.13,1939 — Doctor Ira S. Allison, Professor of Geology, Oregon State College, will discuss some phases of the glacial drainage problem of the Columbia Plateau. Dr. Allison has specialized in a study of the effects of Pleistocene glaciation in northeastern Washington and in western Oregon and always has something of great interest to members of the Society.

Friday Jan. 27 — Mr. Kenneth N. Phillips will "vacation" for us. The Phillips family had a most interesting vacation trip this past summer and Mr. Phillips has an unusually fine set of color slides that were taken at that time. He will show his slides and describe the various features that they visited. Mr. Phillips has lectured to the Society a number of times and his talks are always interesting, full of fun and valuable information.

Friday Feb. 10 — Dr. Kunz, University of Oregon, will lecture on"Meteors". Dr. J. Hugh Pruett has arranged with Dr. Kunz to deliver his lecture for him, as Dr. Pruett is unable to make personal appearances He has assured us that Dr. Kunz is very able to substitute for him, and will give Dr. Kunz his material and his slides. This will be one of our important lectures.

Friday Feb. 24 — Annual meeting. Election of officers. Review of the past year. This is NOT the annual banquet but it was deemed advisable to remove this Society business meeting from the annual banquet and leave that activity free for more important things.

Friday March 10 — Annual Banquet proposed for this date.

Friday March 24 — Mr. Thomas A. Carney and Mr. E. H. Rockwell will present a very unusual group of colored slides of polished rock sections. There are about 150 slides in this collection and, to our knowledge, they have never been shown in this area.

### Field Trips

Sunday Jan.15,1939 — Mr. Earl K. Nixon, Director of the State Department of Geology & Mineral Industries, will lead a group into Columbia County for a review of the Columbia County iron ore situation. This subject is of particular importance in recent years in connection with its possible use with Bonneville power. Mr. Nixon is well qualified to lead such a trip, and this date should be saved by all Society members.

Sunday Feb. 26 — Leaders: Dr. Francis Jones and Prof. Watson. Tualatin Valley.

In our January 10th issue of last year we printed Dr. Hodge's article "T he Cascade Plateau Province". We are fortunate in having for the first issue of this year another instructive article by Dr. Hodge, "Mount Multnomah". This should prove of interest to those who are interested in geology of the Three Sisters section.

* * ** * *

This is just to remind those who wish to have their bulletins bound - the index is complete and will appear in an early issue. We have not had a definite figure as to what binding will cost this year, but will endeavor to get same price as last year.

* * ** * *

Dues of current year are now payable. The officers of the Society would appreciate having dues paid as soon as possible; in that way our officers can have some idea of the amount of money they will have for work throughout the year.

* * ** * *

Extension Course Announcement

Second Term Course in Geology
Begins January 5, 1939.

G 201p. General Geology. Three terms, two hours each term. An introductory course dealing with the processes at work changing the face of the earth; the internal structure, composition, and acitivities of the earth; the economic geologic deposits; a survey of the main events in the history of the earth; and a study of prehistoric life, including man and current events having geological backgrounds. Dr. Hodge.
Thursday, 7:15, Room 110.

* * ** * *

THURSDAY LUNCHEON

L'Abbe's French Dinners - 910 S. W. Salmon Street,
Roosevelt Hotel
Prices are 40¢ - 45¢ - 50¢ and up. You have your own choice from menu. Drop in every Thursday noon. You will enjoy the fellowship and the food is good.

* * ** * *

Our newsy items telling what members of the Society have been doing throughout the previous month, have been a source of interest - so let's have more of these articles.

# MOUNT MULTNOMAH

By Edwin T. Hodge

Mountains, like men, sometimes lose their heads. Thus, like men, they may lose their heads due to the explosive forces of internal passion. For instance, Oregon's greatest mountain once suffered this catastrophe and stands, today, a gaping crater 10 miles in diameter.

Many volcanic mountains have to a small extent lost their tops by explosion. Mountains, however, which have lost along with their heads their entire body, are exceptional. Less than a half dozen examples are known over the entire face of the earth. One hitherto unrecognized and ranking as the largest in the world, is in this paper, presented to the public, Mount Multnomah, the ancient ancestor of the group of mountains making up the Three Sisters region.

In the early days Mount Multnomah stood as a gigantic peak towering 15,000 feet into the air, whose steep slopes extended as far west as Belknap Springs, as far north as Mount Washington, as far east as the town of Sisters, and as far south as Elk Lake. This outer and more gentle portion of its slopes, however, extended farther westward than Eugene and to equally great distance in all other directions. The entire upper portion of this mountain was destroyed either by explosion or subsidence, leaving a gigantic caldera ten miles in diameter. This caldera, if not the largest, is only equalled by two other similar ones in the world. In the days of its perfection one might have stood on the edge of this enormous caldera and looked out across an azure blue lake ten miles in diameter and over a mile in depth. Such a sublime spectacle, however, was never meant for the eyes of man to see. It existed long before man made his appearance in the state of Oregon, or for that matter, on the face of the earth at all. Since that time this caldera has suffered such severe erosion that its walls are only represented by the erosional remnants of the North Sister and Little Brother on the north, the Husband on the west, the Sphinx, Wife and Devil's Hill all forming part of the south rampart, and Broken Top on the east. Within this caldera, since that time, there has been built the Middle and South Sisters and on its outward sloping walls there has developed the sporadic cones of Black Crater, Scott Mountain and Bachelor. In very recent times lava have flooded over 70 square miles of its northern portion and in its southern portion lavas of a slightly different character have spread over seven square miles.

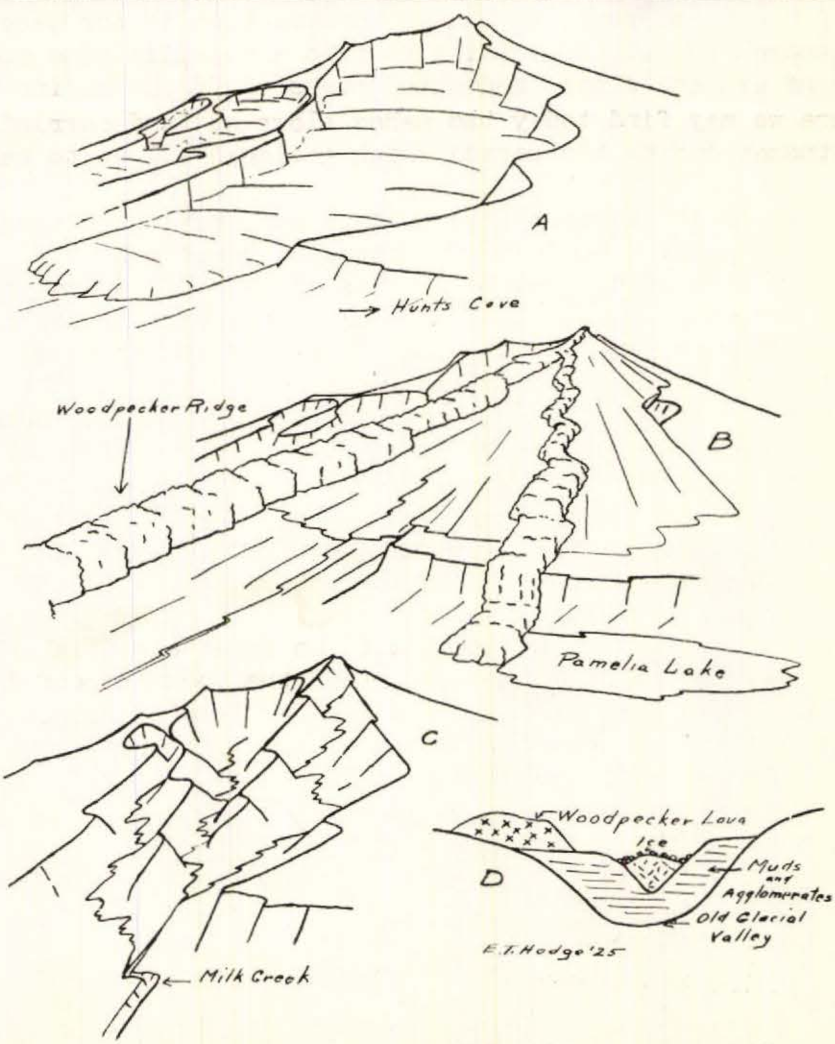
The history of Mount Multnomah is fascinating. This history has been worked out in such careful detail that every stage of its development, from a period over 10,000,000 years ago down to the day before yesterday, can be translated from nature's pages of stone. The story I am about to tell, perhaps, might properly be called a business of geological lithographing. The story, though primarily told because of its own interest is, nevertheless, of extreme importance because therein lies the explanation as to the origin and development of the Cascade mountains and of the Oregon Coast range.

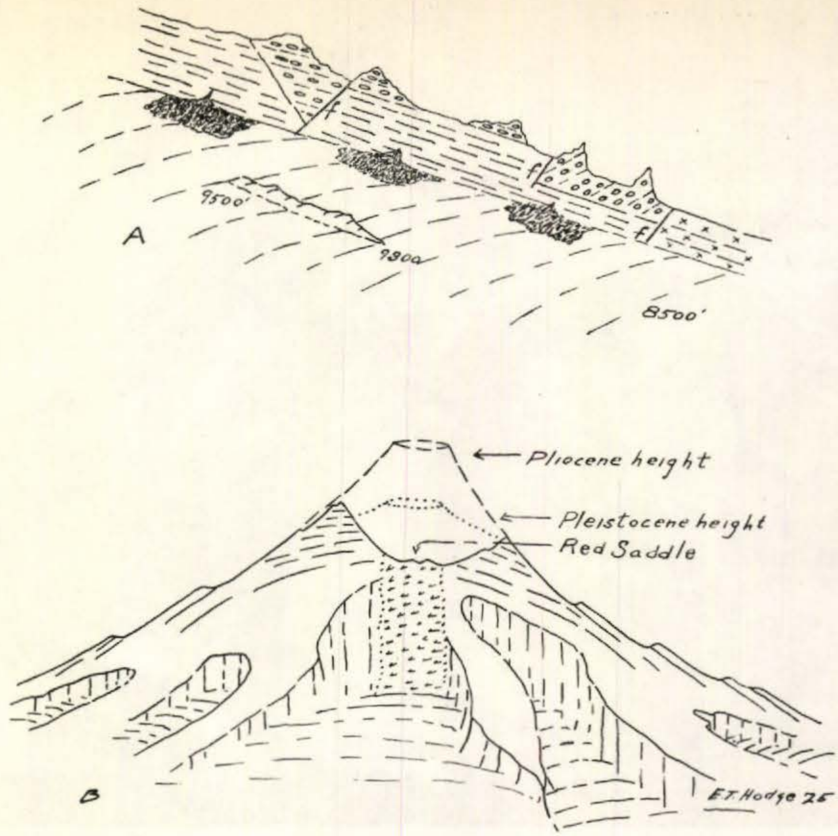
The story of Mount Multnomah begins 10,000,000 years ago, when the great arm of the Pacific Ocean extended over the state of Oregon and washed against the western slopes of the Rocky Mountains.

At this time only two islands gave future promise of our glorious state. One, the Shoshone, occupied northeastern Oregon, and the other, the Siskiyou, occupied southwestern Oregon. Geologists call this period the Eocene, because in other portions of the world, and perhaps on these two islands many forms of mammalian life witnessed their dawn of life.

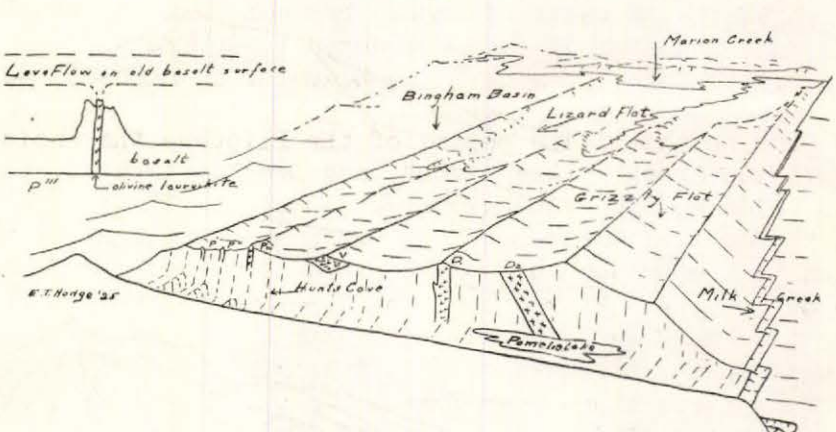
At the close of this period an enormous fracture occurred along the present axis of the Cascade range. This fracture is still in existence and marks the line of volcanoes from Bogosloff in Alaska through Mount Hood, Mount Multnomah, Mount Mazama in Oregon, Lassen in California, and on down through Mexico and South America to Tierra del Fuego The effect of this fracture in Oregon and Washington was to permit the molten rocks and repressed gases an opportunity to escape to the surface. The first effect, which lasted all through a geological period, was largely the escape of volcanic gas. This gas carried up with it rock mist which fell in showers of frozen ash over much of the state of Oregon. We know for certain that Mount Multnomah was active at this period. Perhaps other peaks along the same line were likewise active. If so, these peaks began the construction of the Cascade range. Mount Multnomah was at first built up into a volcanic cone composed almost exclusively of ash and other fragmental rocks. In the marine rocks of the Coast range we may find today the ashes blown out and carried seaward from Mount Multnomah during the period which geologists love to call the Oligocene.

The next period is very important to the state of Oregon. The effects of this period have had a profound influence on the industries, the flora and fauna and the life of the people of this state. It was at this period that the molten lavas reached the surface and poured out in thousands of separate volcanic flows over much of the state. All of the volcanoes of this time were very active, and Mount Multnomah was undoubtedly the largest. All through the Miocene, a period of about three million years, Mount Multnomah built its cone higher and higher and poured its lavas farther and farther outward, until at its climax at the close of the Miocene, it stood as a mountain over 15,000 feet high and with its base extending outward from the center a distance of over a hundred miles. Other volcanoes existed at this time not only along the line of the great fracture but over many portions of the state. The lava which poured out at this time covered nearly all of the state of Oregon, Washington, and parts of Idaho and Utah with an immense mantle of volcanic rock. My readers must not imagine, however, that the rock whereof I now speak, is the lava rock which now covers much of the surface of Oregon. The present volcanic rock is of a much more recent date. The lava flood of the Miocene lies buried deep beneath the more recent lava flows. Near the fish hatchery on the Columbia River, and to a large extent in the vicinity of Mount Multnomah and in many of the deeper canyons of Oregon, the older rocks are visible.

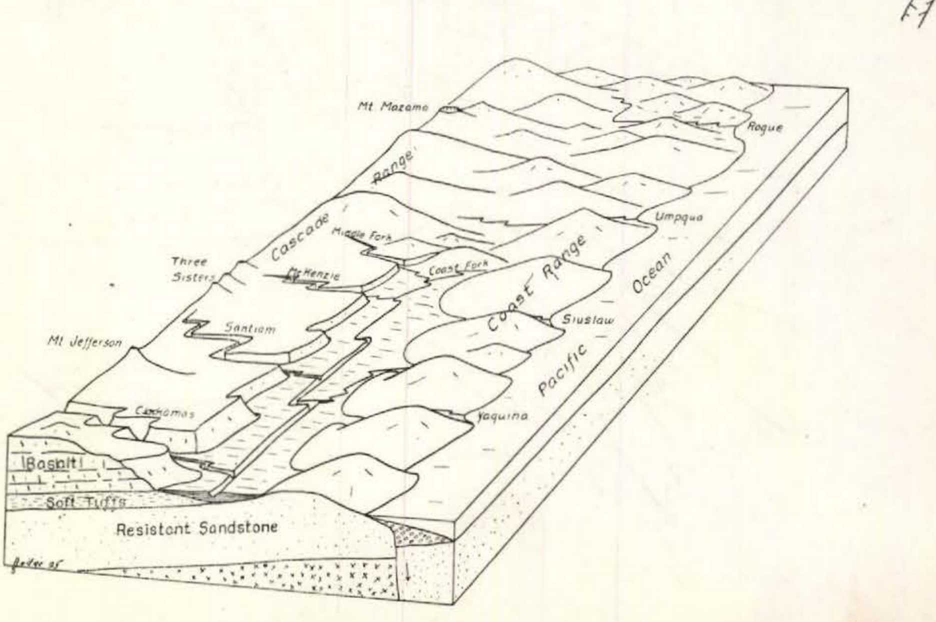

A
→ Hunts Cove
Woodpecker Ridge
B
Pamelia Lake
C
← Milk Creek
Woodpecker Lava
Ice
Muds and Agglomerates
Old Glacial Valley
D
E.T. Hodge '25



f
9500'
9300
A
8500'
Pliocene height
Pleistocene height
Red Saddle
B
E.T. Hodge 25

Marion Creek
LavaFlow on old basalt surface
Bingham Basin
Lizard Flat
basalt
olivine
Grizzly Flat
E.T. Hodge '25
Hunts Cove
Milk Creek

Mt. Mazama
Rogue
Range
Cascade
Umpqua
Middle Fork
Three Sisters
McKenzie
Coast Fork
Coast Range
Ocean
Siuslaw
Santiam
Mt Jefferson
Pacific
Yaquina
Basalt
Soft Tuffs
Resistant Sandstone

The next geological period geologists call the Pliocene. For our purposes it must be divided into three periods, each of which lasted over a million years. In the first period the entire top of the mountain disappeared. It may have sunk into the depths in the same fashion as Mount Mazama disappeared. It is more probable that an explosion occurred which must have rocked the foundations of the world and hurled the entire top of this mountain away. In the history of mankind two such explosions have occurred. In 1883 Krakatau was destroyed. The shock of this explosion was felt over the entire world. The ashes and rock fragments were blown so high that they did not settle out of the atmosphere for over three years, and in the upper streams of air, were carried entirely around the earth. In June, 1912, Katmai of Alaska was destroyed. The ashes and rock fragments of this mountain afforded brilliant sunsets over most of the earth, and some of these ashes fell in disagreeable amounts as far south as the state of Oregon. Neither of these explosions gave rise to calderas comparable in size to that of Mount Multnomah. Below is a list of the world's greatest calderas and their approximate size and character:

Lage di Bracciano, Italy - Diameter in miles $6\frac{1}{2}$, depth 300-500 feet.
Lage di Bolsena, Italy - Diameter in miles $10\frac{1}{4}$ x 9.
Gulf of Santorin, Grecian archipelago - Diameter in miles 6.
Krakatau, Straits of Sunda, between Java and Sumatra, East Indies - Diameter in miles 5; depth 3,000 feet.
Crater Lake, Oregon Diameter in miles 5; depth 500 - 2,000 feet.

During the middle period of the Pliocene the ancient Santiam, McKenzie, Separation Creek, "Lake River", and Deschutes cut deeply into the flanks of this caldera, and eventually breached its walls in the following places: 1. the Santiam between North Sister and Little Brother; 2. the McKenzie between Little Brother and the Husband; 3. Separation between the Husband and the Sphinx; 4. "Lake River" between Devil's Hill and Broken Top; 5. The Deschutes between Broken Top and the North Sister. The courses of these streams have later been greatly deranged, but glaciers and lava floods give clear evidence that former valleys occupied these positions. In the last portion of the Pliocene, vulcanism broke out anew. A little to the east of the present South Sister, were built two volcanoes to a height of about 12 to 13 thousand feet. The east half of the former mountain has been destroyed, but the west half remains intact. The latter mountain protrudes its time worn head through the eastern side of the comparatively young South Sister.

The next period is the ice age. During this period an upward hoist of the entire Cascade range made it possible for this range to intercept and capture practically all the moisture of the westerly winds. This moisture fell in the form of snow. This snow accumulated to such a large extent that glaciers were formed over much of the Cascades. In the Three Sisters region enormous glaciers moved northwest down the Santiam Valley, perhaps as far as Detroit. Down the McKenzie valley they reached to Belknap Springs; to the east they extended 10 or 15 miles. At the close of the ice age the Cascade region was again depressed. The moisture laden winds passed over unrobbed.

The glaciers disappeared and with a continued submergence these glaciers have continued to disappear. The effect of these glaciers was profound. The magnificent scenery is due to the ice sculpturing of this period.

In the present or recent period there has been a revival of vulcanism. Over 50 volcanoes have been built within the limits of this area. One of the most interesting is Bleknap crater. This crater is a cinder cone over 7,000 feet in height from whose sides issued a flood of lava which has covered over 70 square miles of area. For the most part this flood poured down the ancient Santiam. This flood, as a result, dammed off the headward portions of the Santiam and formed Clear Lake, Lava Lake, and Fish Lake. A similar flood poured down the McKenzie valley from Cinder Cone. Around the base of the South Sister are four great lava floods which are so recent that not even lichens have had time to secure a foothold upon them. Perhaps the present crater of the South Sister may be related to this period. It is a cone which looks no more eroded than Vesuvius and in whose perfect crater is lodged a lake nearly three-fourths of a mile in diameter.

Thus, briefly told, the history of Mount Multnomah dates back to the time when Oregon was a portion of the part of the Pacific Ocean and shows the successive steps by which this state has developed down to the present time. Visitors to this area can read this history for themselves for it is plainly written and apparent to all after the key to the situation has been given. Particularly impressive is the wall of this gigantic caldera. Here within the confines of our state we may see one of the great wonders of the world. No longer is it necessary for us to make long voyages to distant points of the world to see such a feature, and shortly tourists will begin to pour into this region, just as they now visit the Grand Canyon, in order to see for themselves the wonderful handiwork of God in his development of the earth.

If this area contained only the enormous caldera of Mount Multnomah it would still remain one of the great monuments of nature. Other features remarkable in themselves but not comparable to the great caldera in importance may be briefly stated. On the north side beginning at Cinder Cone there is an area of over 70 square miles of recent lava. Some of this lava may not be more than a few hundred years old. Much of it perhaps has poured out within the present era. It is perhaps the largest single area of recent lava in the United States.

This area contains over 50 volcanic cones. It contains in the South Sister, which is 10,352 feet high, one of the high volcanic peaks of the Pacific chain. This mountain, however, stands almost alone in this great chain of mountains in that it possesses at this high elevation a crater lake over three-fourths of a mile in diameter. The Three Sisters region, except for the diminutive glaciers on Shasta, is the southernmost limit of glaciation in the United States. This area contains a greater acreage of ice fields than any similar area within the United States. Thus if we eliminate the great caldera, the other exceptional features such as great lava fields, numerous volcanic cones, the great crater lake over 10,000 feet high, glaciers at low altitude and the size and number of these glaciers all make this area one which every tourist interested in natural phenomena will want to visit.

There will be many people in the future, just as there have been in the past, who will visit the Three Sisters region, not because it stands as one of the great monuments of the world, but because of its scenic beauty and because of the facilities it affords for out-of-door pleasure. The Cascade forest, one of the largest remaining stands of timber in the United States, extends to its west side. Surrounding it like a string of pearls are dozens of mountain meadows. These meadows are knee-deep with mountain flowers, dotted with beautiful lakes, echo with mountain streams, and are adorned with fine timber. From these meadows in every direction stretch panoramas of the Sisters or of the Cascade Range. Within the encircling meadows are the Three Sisters, so named because of their beauty.

If the Sisters area did not contain so many natural wonders or such lavish beauty, it would still be Oregon's playground. In the high, dry atmosphere of this natural park one may play both summer and winter. In the winter one can snowshoe, ski, toboggan and skate. In fact one may do all these things which have made European winter resorts famous; and this area will compare with any of them both as to accessibility and opportunity.

In the summer many mountains, all decidedly different, call alike to the veteran mountaineer or to the beginner making his first climb. There are lakes in which to fish or swim. There are glaciers, forests, mountains, volcanoes and lava flows to explore. All the sports of winter may be enjoyed in the balmy climate of the Oregon summer. The area is suited equally to horseback exploration as to hiking. But more than this there are flowery meadows and shady nooks for the man who just wants to loaf around. Every day one can move his camp to a new meadow for new sports and scenery - yet by so doing it will take a month to exhaust the region. No single area in the United States is so accessible and contains more natural wonders, more beauty or an opportunity for more fun and sport.

(Ed. Note: For the reader who wishes a more complete discussion of Mount Multnomah, reference should be made to the monograph by Doctor Edwin T. Hodge, entitled "Mount Multnomah, Ancient Ancestor of the Three Sisters"; published by the University of Oregon, Eugene, Oregon, August 1, 1925.)

## REVIEWS

It seems that the origin of Crater Lake is still under discussion. Was Mt. Mazama destroyed by explosion or by the top falling in (assimilation) ? Evidence has been presented to support both contentions and still the argument goes merrily on. Dr. Williams has added a valuable contribution to our knowledge of the early history of Mt. Mazama and Crater Lake in his abstract of a paper presented to the Geological Society of America. He believes the final struggle was that of collapse, and tersely tells the story as follows:

Williams, Howell

Origin of Crater Lake: (abst.) Geol. Soc. of Am., Proc. for 1937, p. 120, 1938.

The basin of Crater Lake was formerly occupied by a volcanic cone, Mt. Mazama, approximately 15,000 feet high, formed mainly during Pleistocene period in a depression between older cones that rest on gently folded Eocene-Miocene volcanics. Mt. Mazama grew principally by effusions of hypersthene andesite; explosive eruptions were relatively few. During growth, the cone was mottled with glaciers whose records are visible in the fluvio-glacial deposits and moraines interbedded with lavas on the caldera walls and in U-shaped valleys on the outer slopes.

After the building of the main cone, an arcuate series of vents opened on its north flank. From these, viscous flows of dacite were extruded, generally after explosions of dacite pumice. About the same time, parastic cones and basaltic cones broke out on all sides of Mt. Mazama.

Finally, there were Vulcanian outbursts of dacite pumice culminating in tremendous Pelian eruptions of glowing cloud that rushed down canyons for 35 miles. Possibly 15 cubic miles of pumice were ejected. The summit of Mt. Mazama then collapsed into the partly evacuated magma chamber, forming a caldera 5 miles across and 4,000 feet deep. This catastrophe occurred about 10,000 years ago, followed by the growth of two cones on the caldera floor and the rise of Crater Lake.

History of the mountain resembles Krakatau, Aso, Santorin and many other great calderas. Less violent withdrawal of magmas at depth produces calderas of Kilauean type.

(R.C.T.)

SODIUM BICARBONATE

Thick reefs of sodium bicarbonate, perhaps the first ever found in nature, have been identified by Dr. William F. Foshag, Smithsonian Institution Curator of Mineralogy, from cores brought to the surface from depths of about 300 feet under an ancient California lake bed.

Used by housewives and dyspeptics for generations, sodium bicarbonate has always been a manufactured product, made from a base of ordinary table salt by a complex chemical process. A few years ago came the first reported discovery of any of the natural mineral. It was detected by a British geologist by chemical analysis of material obtained in encrustations scraped from the wall of an ancient Roman aqueduct near Naples. It was declared a new mineral and given a name. Further tests have placed the discovery in some doubt, however, and the material identified by Dr. Foshag may be rated as an original discovery. It was found under the dried bed of Searles Lake, California, a treasure place for rare mineral combination. There are about 150 feet of brine-bearing salt beds, deposited from the waters of an ancient salt lake. From these beds, by means of shallow wells, potash and borax are being recovered on a commercial scale. In the drilling of these wells a complex of minerals is obtained.

Some time ago Dr. Foshag suggested that drillings be made below the brine layers. When holes were driven to the 300-foot level it was found that layers of almost pure sodium bicarbonate and clay alternated. This time, Dr. Foshag says, there is no question at all about the identification.

From samples obtained from the lower levels of the brine deposit Dr. Foshag has also identified another new mineral, hitherto known as an artificial chemical compound, which has been named "burkeite". It is a double sulfate and carbonate of sodium, occurring in small quantities.

- Smithsonian Institution

METEORITES

Washington, D. C., August 24, 1938. - Specimens of 70 meteorites - vagabonds of the heavens - have been added to the collections of the Smithsonian Institution during the past year, 62 of them representing new falls, and making a record in this division of the Smithsonian researches.

This brings the Institution's total number of meteorites to nearly 700, or more than half of the known meteorites reported to have hit the earth. The U.S. National Museum has a record of almost 1,200 different meteorite falls. Of last year's increase to the Museum, about 55 percent of the new meteorites came from foreign lands. However, when the weights of the specimens are considered, 152 pounds of American meteoric material were acquired against 90 pounds of foreign material. The largest specimen acquired last year weighs close to 90 pounds and the smallest only a few grams.

The Smithsonian is eager to obtain as many as possible of these visitors from outer space, they being the only tangible evidence we have of the composition and structure existing on other celestial bodies. Only a few of the shooting stars entering this atmosphere ever survive the flight through the air. They are streamlined to extinction by the increasing friction of the atmosphere on their mad flight to earth. The air acts as a brake and greatly reduces the speed, but in doing so, much of the outer surface is stripped away. Only the outer surface of a meteor gets heated by the resisting air, so when they fall on the earth there is not sufficient heat in their mass to cause a fire.

Records show that only a few are seen to fall each year - a surprisingly few compared to the numbers that are seen to flash across the sky. Assuming that meteors have been heading toward this earth at the same rate for countless ages - an assumption that may or may not be correct - a vast number of these celestial urchins have probably been spectacularly buried on the surface of our world and lie awaiting someone's keen eye.

The Smithsonian is actively engaged in building up a great collection of these meteorites for study and encourages people to search for them. The students of meteorites to a large extent depend upon the chance discovery of them by the people throughout the country, and to stimulate the search the Smithsonian rewards the finder.

A rule-of-thumb way of suspecting a peculiar stone to be a meteorite is by noting its weight. Meteorites are all very heavy for their size, and much heavier than the average rock on this earth, the reason being that they sometimes consist of an alloy of iron and nickel, usually over 90 percent iron. When the stony meteorites are found they consist largely of heavy magnesium silicates and usually contain inclusions of the iron and nickel alloy. The iron alloy is attracted to a magnet or will influence a compass needle, so look for heavy, dense objects whose surfaces appear to have been streamlined and test them either with a horseshoe magnet or a compass.

No meteorites contain any metals worthy of the cost of recovery. Their value lies in the scientific information they contain which can only be obtained by careful laboratory study of their structure and composition.

Limestones, sandstones, and shales are common types of rocks on this earth; nevertheless nothing similar to them has ever been found in the 1,200 meteorites so far studied. The most widely distributed mineral on this earth, quartz, is almost an unknown mineral in meteorites, says E. P. Henderson, of the Smithsonian Institution. Many of the minerals in meteorites are similar in composition to some on this earth but the former always have peculiar physical structures which have not been duplicated in any rock so far found to be native to our earth. Mr. Henderson says there is no reason why meteorites should be more abundant one place than another. However, in areas strewn with rocks or covered with heavy vegetation their detection is most difficult and it is here the Smithsonian Institution largely depends upon the recovery of shooting stars actually seen to fall.

\- Smithsonian Institution

## ANNOUNCEMENTS

### Lectures

Friday Jan.27 Mr. Kenneth N. Phillips will "vacation" with us. The Phillips family had a most interesting vacation trip this past summer and Mr. Phillips has an unusually fine set of color slides that were taken at that time. He will show his slides and describe the various features that they visited. They visited Yosemite and Sequoia National Parks, Santa Catalina Island, and enjoyed a short trip into Mexico. Mohave Desert, Death Valley, and the "Canyon" parks, Zion, Grand, and Bryce. Also Mr. Phillips will show some scenes in the Oregon Country, chiefly Cascade Mountain views. This looks like an evening of enjoyment for the Society. Mr. Phillips has lectured to the Society a number of times, and his talks are always interesting, full of fun, and packed with valuable information.

Friday Feb.10 Dr. Kunz, University of Oregon, will lecture on "Meteors". Dr. J. Hugh Pruett has arranged with Dr. Kunz to deliver his lecture for him, as Dr. Pruett is unable to make personal appearances. He has assured us that Dr. Kunz is very able to substitute for him, and will give Dr. Kunz his material and his slides. This will be one of our important lectures.

Friday Feb.24 Annual Meeting. Election of Officers. Review of the past year. This is NOT the annual banquet, but it was deemed advisable to remove this business from the annual banquet and leave that occasion free for more important things.

Friday Mar. 3 Annual Banquet. At Reed College Commons

Friday Mar.24 Mr. Thomas A. Carney and Mr. E. H. Rockwell will present a very unusual group of colored slides of polished rock sections. There are about 150 slides in this collection, and to our knowledge, have never been shown in this area.

### Field Trips

Sunday Feb.26 Leaders: Dr. Frances Jones and Prof. Watson. Tualatin Valley.

Sunday Mar.12 Leaders: Albert D. Vance and Raymond L. Baldwin. Clackamas River - Pete's Mountain, and way points.

NEW MEMBERS

| | | |
|---|---|---|
| Mrs. Elizabeth Griswold | BE 7789 | Envoy Apts., 2336 S.W. Osage Street |
| Mr. Lloyd L. Ruff | | 1708 N.W. 25th Avenue |

Doings of Our Members

University of Oregon, Eugene, January 9. Lloyd Ruff left his position as instructor in geology here to accept an appointment as United States engineer in connection with the Willamette Valley project. Ruff, who is now stationed in Portland, will start field work soon, it was stated.

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Thursday evening, January 12, Leo Simon gave a talk to the Audobon Society - Subject of his talk, "Water Fowls of Crystal Springs Area". January 14th, Mr. Smon gave this same talk at Men's Resort, 4th and Burnside.

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Some of the ladies of our society are talking geology. Last Tuesday Mrs. J. D. Butler addressed the Susan Lee Barlow Chapter of the Daughters of American Revolution, her subject being "Geology of Oregon".

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Franklin Davis has been elected Vice-president of Oregon Technical Council.

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O. E. Stanley has been elected President of Society of Professional Engineers of Oregon.

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The national wage-hour law was discussed by Edward A. Boyrie, attorney, at the luncheon meeting of the Retail Credit Association of Portland at 1 p.m. Thursday, January 19, at the Olds & King studio room. Mr. Boyrie described what effect the law has had on capital, labor and consumers, pointing out the good points and the dangers of the measure.

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Mr. Earl K. Nixon was elected chairman of the Oregon Section of the American Institute of Mining and Metallurgical Engineers, at their annual meeting on January 14,1939. Mr. Arthur M. Swartley was re-elected to serve as Secretary.

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That the Bend country is interested in our activities is evidenced by a recent letter from Mr. Phil Brogan, who states that he and Mrs. Brogan are planning to be with the Society at their annual banquet.

The Portland Extension Service indicates that Dr. Lawrence M. Gould will be in Portland to conduct geography classes during the summer session. Dr. Gould was written, and invited to join with the Geological Society in its activities for the summer. He replied, "-- "I shall be very glad indeed to renew my acquaintance with the Geological Society of the Oregon Country when I return to Portland next summer. I hope I shall have opportunity to take some field trips with you and the Society". Will the new Trip Committee please take notice, and attempt to arrange some trips that might appeal to Dr. Gould, as well as members of the Society?

Mr. Earl K. Nixon addressed the Longview Kiwanis Club, on Thursday, January 19. His talk dealt with the necessity of an industrial population for the Pacific Northwest, who can consume the agricultural products now raised and produced. The sale of electric power in large blocks, and the production of mineral resources play an important part in developing such a situation. Mr. Nixon was accompanied by Mr. Ray C. Treasher.

A letter has been received recently from Mr. Claire P. Holdredge, who is engaged in oil-geological work in Colombia. Mrs. Holdredge and the youngsters have joined Claire, with headquarters in Bogota. Claire is busily engaged in "taming the jungle" and taking color movies. He promises that he will have a reel of color movies for our inspection one of these days. He and Mrs. Holdredge desire to be remembered to their friends. About the round robin letter which was written last fall, he says, "I was strangely moved by it and was taken right back among you for a short stay. And what a pleasant stay it was too. When the letter was finished I remained in a sort of trance for a moment before coming back to Colombia again".

The State Department of Geology and Mineral Industries has just received a complete file of "Northwest Science", the official publication of the Northwest Scientific Association; volumes 1 - 12. An exchange agreement has been made with Dr. O. W. Freeman, editor of Northwest Science, whereby the Department will continue to receive this publication in return for its bulletins. In addition, the Geological Society of the Oregon Country is placing a complete file of the News-Letter with Northwest Science. In event the State Department ceases to function, the file of Northwest Science will revert to the Geological Society.

Anyone interested in studying the files of Northwest Science may do so at the Department's offices, 329 S. W. Oak Street, Portland.

The Society owes a debt of gratitude to Miss Hickman for Index to Volume IV which appears in this issue. This represents many hours of painstaking work and keeps up the fine standard of work which Mr. Treasher began with volume I.

Annual Banquet of

Geological Society of
Oregon Country

Come One - Good Eats Come All

Stunts Music

Friday, March 3, 1939 7:00 P.M. Reed College Commons

Price--$1.25 per plate.

Tickets sold by plat. Refer to plat below and make your selection; don't delay making your purchase. This should be a sell out. Tickets will go on sale at the next meeting of the Society, on the evening of Friday, January 27, 1939, Auditorium, Public Service Building. Tickets may be purchased at all subsequent meetings of the Society. Leo Simon, chairman of Ticket Committee,

Mail orders should be addressed to:

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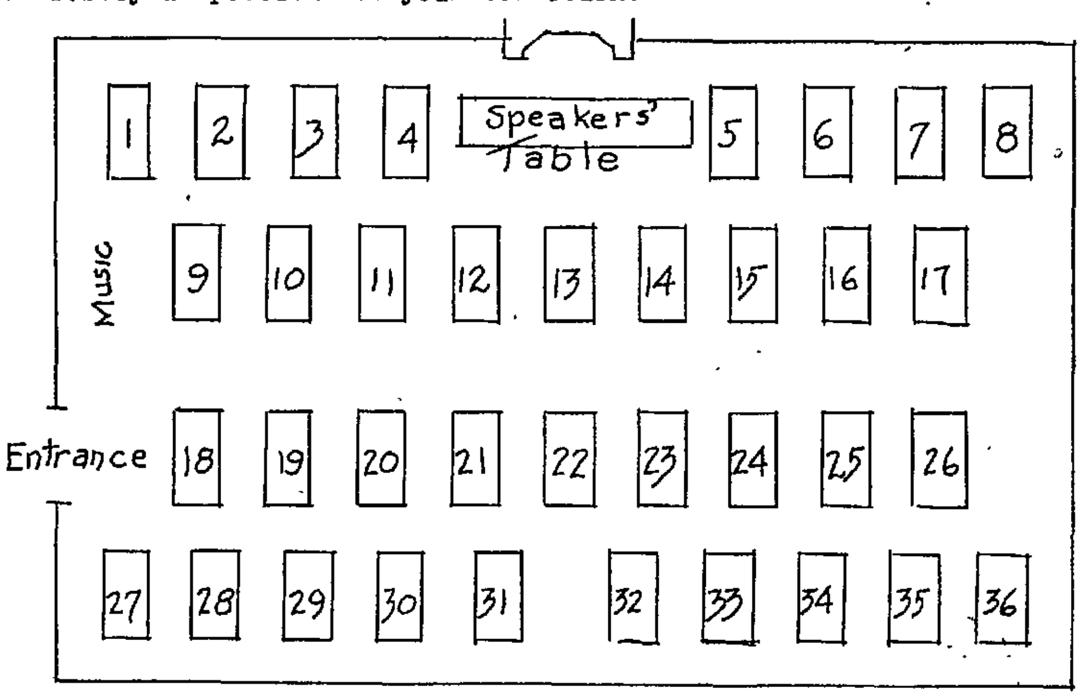

## Meteorite from Pennsylvania

Washington, D.C , December 20 1938. - On the evening of June 24th a Chicora, Pennsylvania, farmer, sitting on his front porch, heard a sound like that of an airplane directly over his house and accompanied by a gust of wind. Almost simultaneously there arose a dreadful commotion in his poultry yard. The next day a heavy, curious stone about the size of a clenched fist was picked up in that same poultry yard. Search revealed a similar object, about half the size of the first, a short distance away. Also the farmer had to call the local veterinarian to treat one of his cows who had a curious laceration in her flesh and was extremely nervous.

Both the farmer and the cow had reason to be profoundly thankful. The latter may have been - since she cannot talk there is no proof of it - actually sideswiped by a meteorite. The same meteorite fell within a few yards of the farmer. It might have passed unnoticed except for the work of a well-known scientist who lives in the vicinity, who received reports of the same celestial visitor, seen as a fireball trailing a smoke cloud, in several nearby towns. He started at once the most intensive investigation of a meteor's path yet reported. The stones found in Chicora have just been sent to the Smithsonian Institution for petrographic analysis.

His procedure was to interview everybody in the area reported to have seen the fireball. He questioned each one on the exact position, to the best of their memory, where they first saw it, and the direction in which it seemed to be moving. Also he tried to ascertain the exact time. The observers, of course, had been taken by surprise and had not examined their watches. Fortunately, however, the event had taken place at about six in the evening when many of them were resting from the day's labors on their front porches and when a Pittsburgh radio station was broadcasting. Some of them remembered exactly what was coming over their radios when they saw the fireball.

Checking these reports with the records of the broadcasting station, the scientist was able to time the meteor quite precisely from point to point where it was seen. From the accounts of the observers as to the position of the fireball he was able to obtain angle elevations. One person, for example, might report that when he first saw the object, when the words coming over the radio indicated it was 10 seconds before 6 p.m., it seemed about ten feet above a certain treetop. He would then obtain this angle elevation. With the aid of a friend, an artillery officer, he was able to plot these various positions and thus obtain a very accurate path of the celestial visitor.

When the object first came into view, he estimates, it was moving at a speed of from two to three miles a second faster than the velocity of the earth. It might be considered as chasing and finally overtaking the planet. When about six miles high, he calculated, the meteor must have been about 100 feet in diameter, and probably weighed several tons. But it already had hit the atmosphere of the earth and was "boiling away" from the heat aroused by the friction. Otherwise it might have been a sad story for the farmer's chickens and the cow. The scientist estimates that the outer shell of the meteor was heated to about 2,000 degrees centigrade.

The meteor left behind it in its path through the atmosphere, eye-witnesses said, a luminous smoke path a little wider than a full moon. One thought that an aviator was "sky-writing". The trail was described as "twisting". The smoke, of course, came from the vaporization of the rock at the intense temperature to which it was subjected..

The meteor is believed to have exploded a few seconds before it hit the earth. There is a possibility of other fragments which have not been located in the neighborhood of the Chicora farmhouse. The fragments themselves, as yet examined only superficially by the Smithsonian experts, appear to be those of a type of stony meteorite which will permit some detailed petrographic study.

While objects of this sort must hit the earth frequently, they are seldom observed directly. When they are seen, the witnesses usually are so taken by surprise that their testimony is of little value. Most scientific observations have been made on shooting stars high in the atmosphere and there has been very little valid evidence on their behavior close to the earth.

Smithsonian meteorologists say that the work of the Pennsylvania scientist may well serve as a model for that of other scientifically trained men who happen to be in neighborhoods where meteors are observed to fall and can question eye-witnesses while the events are still fresh in their memories.

Smithsonian Institution

# GEOLOGICAL NEWS LETTER

VOL. 5 NO. 3 PORTLAND, OREGON FEB 10 1939

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Portland, Oregon

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY



THE GEOLOGICAL NEWS-LETTER

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Editor-in-Chief & Business Manager

Raymond L. Baldwin
345 U. S. Court House,
Portland, Oregon

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| | |
|---|---|
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| Arthur M. Piper | C. D. Phillips |
| Ray C. Treasher | K. N. Phillips |

News-Letter issued semi-monthly on the 10th & 25th

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All communications and material for publication should be sent to the Editor-in-Chief. Change of address is required 30 days in advance of the date of proposed change.

MEMBERSHIP APPLICATION

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ________________

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

________________________________
Address

________________________________
Business Address

________________ ________________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ________________
________________________________

Sponsored by ________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

________________
Signature

## ANNOUNCEMENTS

### Lectures

Friday Feb.10 — Dr. Kunz, University of Oregon, will lecture on "Meteors". Dr. J. Hugh Pruett has arranged with Dr. Kunz to deliver his lecture for him, as Dr. Pruett is unable to make personal appearances. He has assured us that Dr. Kunz is very able to substitute for him, and will give Dr. Kunz his material and his slides. This will be one of our important lectures.

Friday Feb.24 — Annual Meeting. Election of Officers. Review of the past year. This is NOT the annual banquet, but it was deemed advisable to remove this business from the annual banquet and leave that occasion free for more important things.

Friday Mar. 3 — Annual Banquet.. At Reed College Commons.

Friday Mar.10 — No meeting.

Friday Mar.24 — Mr. E. H. Rockwell, assisted by Mr. Thomas A. Carney, will present a very unusual group of colored slides of polished rock sections. There are about 150 slides in this collection, and to our knowledge, have never been shown in this area.

### Field Trips

Sunday Feb.12 — Dr. Hodge will meet the Geological Society of the Oregon Country for a study of the points of interest on Mount Tabor. Come prepared to ask questions about the geology of Mt. Tabor. This trip is planned to find the questions which most deserve to be answered for the benefit of all visitors to this famous city park. J. C. Stevens has arranged to have the chosen questions and answers placed on a plaque and displayed at the crater in the park for the benefit of tourists. Come out and help us tell the world about Mt. Tabor. Members will assemble on the top of Mt.Tabor at 10 a.m.

Sunday Feb.26 — Leaders: Dr. Francis Jones and Prof. Watson. Tualatin valley.

Sunday Mar.12 — Leaders: Albert D. Vance and Raymond L. Baldwin. Clackamas river-Pete's mountain.

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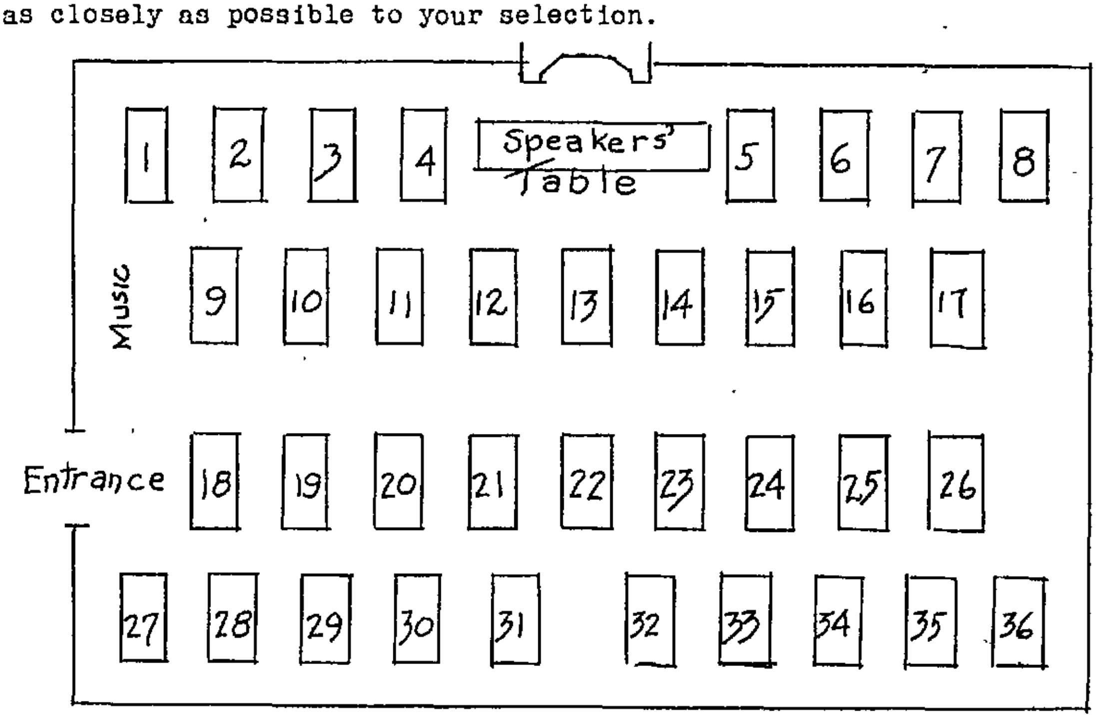

## RIDDLES

What could we have this year to take the place of a liars' contest, the limericks, or the songs? When asked for ideas Clarence Phillips replied, "Oh, just think about it a little bit and a hunch will come. You'll see!" Several days went by and still no hunch. What to do was certainly a riddle -- and there it was -- a geological riddle!

But what was a geological riddle? No one knew. It seemed too much of a riddle when, out of the blue, Mrs. Vance broke through with:

Why am I a geologist?
Because I don't want to be a widow.

That was the spark that burst into flame. Then came:

Why does the geologist pick?
Because the old fossil wood (would)

and then: What made the dina-saur? (sore)
The Cretaceous fossil beds.

But we won't give you any more. We'll keep them for the banquet. Write a riddle, oh, a half-dozen or so, and send them or give them to one of the following:

Dr. Arthur Jones, 3300 S.W.Heather Lane
Mr. Raymond L. Baldwin, 345 U.S.Courthouse Bldg.
Eva Catlin, 1802 S.W.10th Avenue.

Send your riddles in by February 27th. A committee will pass on them, and arrangements made with you regarding their place on the program.

## WHAT A RELIEF!

On the campus of Babson Institute in Boston there is now being assembled a relief map of the United States that is said to be the largest map of its kind in the world. On a horizontal scale of about 1 foot to 50 miles, the map will measure 63 feet from coast to coast, and 46 feet from southern Florida to Northern Maine. If the same vertical scale were to be used, the maximum elevations would be only about half an inch above sea level; hence an exaggerated scale is used that will make the higher mountains about a foot above sea-level.

The map is curved to simulate the curvature of the earth. When completed, it may be inspected by visitors from a gallery 15 feet above the map surface.

The map is intended primarily for business students; but it should be of value for students of earth forms.

(KMP - from Current News)

## News Items

Word has been received of the death of Mrs. A. M. Piper's father. The deepest sympathy of the members of the Geological Society goes out to the Piper family at this time.

Mr. Earl K. Nixon left February 8 for New York, where he will attend the annual meeting of the American Institute of Mining & Metallurgical Engineers as the delegate of the Oregon Section. Mr. Nixon will go on to Washington, D. C. to attend the meeting of the American Association of State Geologists.



Mr. Clarence D. Phillips addressed the 70 Club on Wednesday evening, January 31, subject of his talk "What Father Time and Mother Nature have done for Oregon".

Saturday afternoon, January 28, a group of Camp Fire Girls under leadership of Mr. Leo Simon studied the geology of Rocky Butte.

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## SILICIFIED WOOD IN DOLOMITE

Julian D. Barksdale

Small logs and broken pieces of jet black silicified wood occur in dolomite beds of Karnic age outcropping in the Sonoma Range, Nevada. In thin sections some of the specimens of wood, tentatively identified as Araucarioxylon, show perfect preservation of their cellular structure by the infiltration of siliceous solutions now crystallized as quartz. Single anhedrons of quartz sometimes include several cells, filling even the smallest openings in the cell walls. The crystallization of the quartz in other specimens has disrupted the cell walls, and produced a coarse pseudo-cellular structure controlled by the crystallographic directions in the growing quartz grains as they attempted to clear themselves of the carbonaceous material. The difference in type of preservation is thought to be due to the difference in condition of the woods at time of silification. The black color of the wood is due entirely to its carbonaceous content. Chips fired in a ceramic furnace have the appearance of unglazed white tile.

- The American Mineralogist,
Vol. 23, 1938.

# NEPHELINE BEARING ROCKS

# NORTH OF NIGHTHAWK, WASHINGTON *

Charles D. Campbell
State College of Washington

Many geologists have studied the rocks along the Washington-British Columbia boundary west and northwest of Oroville, Washington. But an article by R. A. Daly, published in 1906, included the first announcement of a small intrusive of nepheline syenites and the similar though darker rock, malignite. The outlines of this intrusive were accurately mapped; and though no detail within the mass was shown, there was given an excellent description of the various rock types (Daly 1906, pp. 349-352). As the work was done while Daly was the geologist for the International Boundary Survey, his report of the syenite mass appeared later, in expanded form, in a memoir of the Canada Geological Survey (Daly 1912, pp.448-455), together with his now well-known explanation of the manner of formation of such unusual rock types.

Of the four reports on the geology of that area issued prior to 1906, none included an account of the nepheline-bearing rocks; and one by Smith and Calkins stated that there were no such rocks along the border. Since that date, the geologists who have worked in the region have accepted and transmitted Daly's findings, having had no occasion for re-examining the rocks. The writer therefore considered that these rocks might be studied with the object of applying some of the more recent hypotheses on the genesis of the feldspathoidal rocks to the boundary area. To sum up, six months of field examination and many months of intermittent petrographic study on the rocks collected failed to change the conclusions reached by Daly who had spent only a few days in field study of the intrusive.

The Kruger alkaline mass is named from its occurrence on Kruger Mtn. which lies on and north of the International Boundary between Oroville and Nighthawk, Washington. It is a crescent-shaped mass bowed to the northeast, with its slender southeast tip on Ellemeham Mt.; and nine miles away its blunter northwest end lies halfway down the steep east slope of the Similkameen river valley in British Columbia.

The Kruger mass is intrusive into the greenstone-schists and quartzites with their early injections of gabbros and ultrabasic rocks; the presumably Paleozoic complex typical of much of this part of North America. One large granodiorite batholith appears to be older than the Kruger syenites, as it shows evidences of crushing and recrystallization unapproached in the Kruger rocks. In the southwest curve of the alkaline body lies a huge batholith of younger granite whose extent from here to the southwest is not yet known accurately.

Most of the Kruger alkaline mass consists of a gabbroid rock, malignite, whose chief minerals are augite and microcline, with lesser amounts of nepheline and amphibole. Most of the malignite is black, with pink spots about the

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* This paper was presented before the Northwest Scientific Association meeting in Spokane, Washington, December 29, 1938.

size of peas. These are not phenocrysts of feldspar, but simply places where for some reason no dark minerals crystallized. The texture of the spots is exactly the same as that between spots, but they consist of only microcline and nepheline.

Second most abundant rock type is an ash-gray nepheline syenite consisting of the same minerals, but with a great predominance of microcline, and more amphibole than augite. This nepheline syenite forms dike-like and irregular masses cutting through the malignite, with merged contacts in most places, chiefly near its convex border with the greenstones. Most of the microcline crystals are coated and intergrown with albite.

Third and last Kruger rock is a fine-grained dark nepheline syenite which cuts both the malignites and gray nepheline syenites with sharp contacts. In the dark variety, the color is due to about forty percent of amphibole, augite and biotite in about equal proportions. There is some sixteen percent of the lime-iron garnet, melanite.

The amphibole, present in all three rock types, is a soda-rich variety called hastingsite (determination based on axial angle, pleochroism, and indices of refraction). It occurs as large separate crystals and as "jackets" on augite, and its presence confirms the evidence of the nepheline, that the magma from which the Kruger rocks crystallized contained much soda.

A great deal of the nepheline is altered to an aggregate of mica and natrolite. It occurs between grains of the other minerals, and therefore seems later in its crystallization than the others. In some of the malignite, the nepheline forms rough prisms as evidence that in these places it was among the first minerals to form. Both these facts and its nearly constant (10%) proportion in all three rock types show that its formation was not a short-lived phase in the crystallization of a magma.

In the ensuing discussion of the genesis of the origin of the Kruger magma, it is important to note that there are no signs of pegmatite formation by that magma. In this respect, the Kruger nepheline-bearing rocks are quite unusual among rocks of that type; and the fact that many hypotheses about the origin of alkaline rocks are inapplicable to the Kruger area, does not weaken the general usefulness and plausibility of these arguments.

The manner of intrusion of the Kruger magma is open to question, as Daly pointed out. After his necessarily cursory examination of the area, he concluded that the mass was wedged into place, and should therefore be called a chonolith or a thick dike rather than a stock. In this distinction he implied that the term "stock" should be restricted to intrusions of the proper size, which have made their way upward by melting or magmatic stoping, and should not apply to intrusions which have been forced in. If this was meant as a distinction, it has not gained wide usage. At any rate, it is interesting to note that Daly did not think the Kruger magma made its way up by magmatic stoping, though he himself was the author of that hypothesis now so widely recognized. It is true that there are few, if any, xenoliths of the wall rock in the wall rock in the main body of the Kruger mass, and that the contacts with the older rocks are not blocky. But it is likewise true that the structures in the wall rocks are practically undisturbed in most places seen; a condition not likely to exist if the magma had forced its way in. Apparently neither stoping nor forcible intrusion has any evidence in its favor.

Because of this dilemma, the writer tried the application of a more recent hypothesis on the mode of emplacement of the alkaline magmas. It was originated by Holmes (1931) to account for the ring-distribution of the acid and basic rocks of certain intrusions in western Scotland, and extended by Backlund (1933) to explain the similar distribution of rock types in many alkaline intrusions. It says that a magma may melt its way upward into a pipe or cone-shaped mass if convection currents have free progress upward along the central axis, and downward along the walls. Rapid currents are assured if the alkaline magma has a large concentration of mineralizers (as most of them apparently had). In such a magma, the felsic minerals such as feldspars and feldspathoids crystallize first and are swept along with the currents to the top of the pipe where they either remain or are carried downward along its walls. As the walls finally become coated with these crystals, the downward circulation decreased until the upward, central currents continue to bring heat from the lower levels; and thus the top of the pipe begins to widen out and set up a circulation of its own.

If this idea is to find support, alkaline bodies must show ring-shaped outcrops of the different rock types, concentric to their nearly circular perimeters. Also, the oldest rocks should be on the outside, and should be of felsic composition. This is the case with many large intrusives of such rocks; those of the Kola Peninsula in Russian Lapland, the Ilimausak batholith of the southeast coast of Greenland, a number of Scandinavian occurrences, and others.

There is a crude concentric distribution of the Kruger rocktypes. In this respect, the hypothesis could fit the Kruger intrusion. But the oldest rock is the malignite, a basic not an acidic type. And it occupies the center, not the periphery of the mass, though it might have filled the whole space just prior to the injection of the nepheline syenites. It shows no foliation which would betray the former existence of magmatic currents. And above all, there is a conspicuous absence of the pegmatites which would have been formed in the presence of abundant mineralizers. Thus this interesting prospect of a magma fusing its way upward has to be abandoned, at least so far as the Kruger rocks are concerned.

This leaves us without an explanation of how the Kruger stock reached its present position. The opposition to the stoping hypothesis is weakest, and therefore it might be accepted, though in the expectation that some wholly new idea may appear.

Concerning the reason for the unusual composition of the Kruger magma, the writer is almost as badly off as he was about the mode of intrusion. Field and microscopic evidence were carefully sought, to try to support some one or another of the several current hypotheses on the origin of the feldspathoidal rocks. Most of the data found were disproof or noncommittal.

Particularly, the hypotheses of Daly, Bowen, Gillson, Smythe, and Holmes were tested. And from the results, the writer is sorely tempted to revert to the simpler attitude of Ussing or Kranck who merely assume the presence of a suitably alkaline sub-silicic magma, and go right ahead from there. It was not reassuring to read (Kupletsky, 1936, p. 336) that on the Kola Peninsula alone were at least three such magmas whose associations proclaimed three different modes of origin.

Daly believes, and is backed by the observations of Shand, Foye Brouwer and Stansfield, that a normal high-silica magma may lose much silica by reaction with limestone or dolomite (Daly, 1910). Calcium-magnesium silicates are formed and then sink, being heavier than the magma. Thus the magma is left with its original quota of alkalies, but is poor enough in silica to allow the formation of some feldspathoids instead of the usual high-silica feldspars. Two things must be looked for, in a test of this idea: limestone at the contacts (or calcite in the igneous rock) and lime-silicate minerals in the intrusive. The Kruger stock is not in visible contact with any limestones. But as the limestones of this part of northeastern Washington occur in isolated pods, it is not impossible that such a pod existed here before the intrusion engulfed it. The only calcite in the Kruger rocks is obviously a result of weathering, and would have no bearing on the problem. One lime-silicate mineral was found sparingly scattered in the malignites and abundantly in the dark nepheline syenites: the lime-iron garnet, melanite. Its abundance in the late-injected syenite is not too encouraging, as it is secondary, following the cleavage cracks in biotite, and so could hardly have been the original desilicating agent. The garnet of the malignites is euhedral, however, and could be so interpreted. This is the extent of the evidence found by the writer to favor Daly's idea.

Bowen has proposed three ways in which an uncontaminated basaltic magma may produce a low-silica alkaline magma, given the right conditions, instead of the more usual granitic magma. Two of these find no data from the Kruger area, either in support or disproof: the early control of silica content by ferromagnesian minerals, and the late reduction in silica content by breakdown of polysilicates into quartz and low-silica liquid. But there is a glimmer of proof for his third proposal (Bowen, 1928, pp 253-257). The presence of pseudoleucites (pseudomorphs of nepheline and orthocalse after leucite) in some injected rocks, led Bowen to think these were formed by reaction between leucite and the surrounding low-silica sodic magma. Above about 1100° C. leucite crystallizes in a granitic magma instead of the more silicic orthoclase, even in a liquid rich in silica. As the temperature drops, the leucite reacts with the liquid to form orthoclase, and the end product is a granite. If, though, most of the magma were strained off from the leucite crystals at the high temperature, before normal reaction could occur, the remainder of the liquid which subsequently reacted with the leucite could not convert it wholly to orthoclase, lacking the silica to do so. Instead, the leucite could only react with the liquid to give orthoclase and then (as soda became concentrated) nepheline.

Naturally, the best evidence for this idea should be the pseudoleucites themselves, though Bowen shows that all traces of their existence may be obliterated after they have performed their office of desilicating the magma. The Kruger malignites are spotted. These spots, consisting of microcline and nepheline, might be interpreted as pseudoleucites, although crystal outlines are lacking, and the texture of them is not that of undoubted pseudoleucites. No clinching proof can be offered in support of this application to the Kruger rocks, and no disproof can be given; and this explanation of the low silica content of the Kruger magma may be considered an alternative to Daly's hypothesis.

Three other hypotheses were considered, in an effort to find a satisfactory explanation of the problem. Without going into detail, it may be said that they all fail because they assume the presence of an unusually large quantity of thin, volatile mineralizers; and of these there are no traces in the Kruger rocks.

Neither Daly's nor Bowen's idea has much to support it in the Kruger rocks, but the others have nothing. Consequently, the situation having been presented, these ideas must be offered as alternatives for explaining the composition of the Kruger rocks, and no basis given for favoring one over the other. The main contribution is to show that Bowen's hypothesis, unpublished at the time of Daly's work, is a possibility.

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Kupletsky, B. M.; "On the Question of the Genesis of the Alkaline Rocks": Acad. Science, U.S.S.R., Bulletin, pp.329-339, 1936.

## REVIEWS

Phillips, Kenneth N., "Our Vanishing Glaciers", Mazama Annual, pp. 24-41, 23 photographs, bibliography, 1938.

The last issue of the Mazama Annual carries a very interesting article by the chairman of their research committee, who is a member of the Geological Society of the Oregon Country, Mr. Kenneth N. Phillips. Mr. Phillips discussed the glaciers that are found on many of the Oregon peaks, particularly concerning their rate of recession. The article is profusely illustrated with beautiful cuts, many of which represent the photographic work of Mr. Phillips.

The Mount Hood glaciers are described, with notes on their recession.

| Glacier | Years of Observation | Total Recession in Feet |
|---|---|---|
| White River | 35 | 1840 highest in the |
| Newton Clark | 37 Longest time | 500 aprox. |
| Eliot | 35 | 426 |
| Coe | 10 | 120 |
| Ladd | 10 | 10 |
| Langille | 29 | Positive; amount unknown |
| Glisan | 29 | " " " |

The names for Glisan and Langille glaciers were sponsored by the Mazamas. Data on the rate of recession are based on repetition of early photographs, studies of Mount Hood topographic map, airplane photographs, and observations from base lines near the termini.

Mount Jefferson's Waldo glacier is separated into two lobes, the northerly one is moraine covered. Timberline glacier, a new discovery, lies entirely below timberline and has miniature moraines. Milk Creek Glaciers were originally supposed to be one in number, and then two; Mr. Phillips presents data to indicate that snow avalanches may account for this apparent discrepancy.

Jack glacier (name suggested by Mr. Phillips) is the only one on Three Fingered Jack. It lies in a deep cirque on the northeast side, at levels below most glaciers; in fact it is entirely below timberline. On Broken Top, Bend glacier shows effects of recent ablation. Crook glacier discharges its melt water into a small lake since 1928. Crater glacier, also names by Mr. Phillips, has receded several hundred feet and is an active glacier. On Bachelor Butte, Dutchman glacier has decreased in size. On Diamond Peak, Russell in 1903 described a glacier, no longer existent. However, a small glacier, here called Diamond glacier, was identified by Clark and Phillips. This glacier has not been previously recorded, and is believed to be the most southerly in Oregon.

The article is delightfully written and should be read by every member of the Geological Society.

(R.C.T.)

"FINISHED"

One definition of the word "finished" given in Webster's dictionary is - "polished to the highest degree of excellence; complete; perfect; consummate". Used in this sense it is the adequate adjective to describe the lecture which Tom Carney gave before our Society on December 9th. His subject was Yellowstone Park and Death Valley and he had spared no effort in preparation, nor omitted anything which could contribute to a more acceptable presentation of his theme.

Tom's voice, as he realizes, is not exactly stentorian, nor of double forte proportions, so, to ensure that the occupants of the more distant seats in the hall would be able to catch every word, he installed a public address system with two loud speakers on the platform behind the screen. But even that was not sufficient to satisfy Tom's meticulous mind, so the speakers were connected to gramophone records, and, regulating these to correct volume, he gave "color" and background to his words in keeping with his pictures.

So it was that, from start to finish, the entire presentation went through without a hitch and the interest of the audience never flagged. Starting with a description of the structural geology of Yellowstone Park, he gave in a carefully prepared, crisp statement, as complete a mental picture of the Park's structure as it is possible to compress into so limited a time. Then followed a pictorial tour through Death Valley - and, lo! - as Tom's well modulated voice described each successive scene, it was mingled with soft, but melodious strains of classical music, which gave an adddd dignity to his theme.

In due course the reel came to its end and a few moments were required to start the next one, but Tom's foresight provided that this should cause no awkward pause to disrupt the tenor of his story. Immediately the last picture vanished from the screen, there broke forth voluminous tones of beautiful music, in testimony, so it seemed, of Nature's pride in the triumph of her handiwork, which had just been so beautifully revealed to the audience by word and picture.

Gradually the music faded and Tom's voice once more took possession of the loud-speakers as a series of even more colorful pictures took their place on his brilliant, beaded screen. These were his Yellowstone Park views and with them, aided by pointed comment as they proceeded, his audience toured that geologic land scenic wonderland. The geysers and the pools, the falls and the rocks, the mountains and the lakes, one after the other were portrayed in realistic beauty. Then, towards the end, came what some termed the gem of the evening, those brilliantly colored scenes of the Grand Canyon of the Yellowstone, with the three hundred foot torrent of the Lower Falls as the focal point in the picture - truly one of Nature's grandest spectacles!

Replete as the lecture was with rich material throughout, Tom did not let it rest there, but supplemented it by an exhibit of geologic specimens and enlarged photographs, which were eagerly inspected after the meeting.

But the impression should not be given that the success of this memorable evening was wholly due to the unassuming Tom! In every successful enterprise one usually finds that there is in the background, or somewhere behind the scenes, a silent, but highly efficient partner. That was evidently the case regarding this lecture, except that the "silent partner" occasionally occupied the foreground in some of the pictures which appeared on the screen! Teamwork is always helpful, so a share of the honors should, on this occasion, go to Mrs. Carney.

It was not surprising, therefore, that the termination of this lecture was the signal for a spontaneous outburst of hearty applause, sustained and renewed, testifying to the high appreciation all the people in that large audience felt for competent effort, ably and generously bestowed, and meriting to the fullest degree the term "finished".

Carl P. R...ards

## PORTLAND NEEDS A MUSEUM

"You are doing noble work in promoting the advancement of knowledge and encouraging scientific investigation in a land where for years to come commercial activity must necessarily dominate the more intellectual pursuits. It speaks well for Oregon that so early in her development she can boast an organization so potent for good. But you must not rest on your oars. You have a purpose and a task, and there is much uphill work before you. You should not only foster scientific inquiry and become the acknowledged c ter of information respecting the geography and natural history of your State; you should also strive to secure the erection of a state museum, where your ethnological treasures, your geological strata, and your exceedingly interesting fauna and flora may be represented."

"What is needed is not a heterogeneous assemblage of relics and specimens of animals and plants from all parts of the earth, but a REPRESENTATIVE collection of the natural history of the Northwest. Such a museum need not be housed, at first, in a costly building, nor need its support be an appreciable tax on the commonwealth. If thought advisable a small admission fee might be made to cover the cost of its administration. Oregon needs such a museum to display her natural resources and productions; you need such a museum for consultation; your children need such a museum as one of the educational advantages to which they are entitled. The educational value of properly arranged and labeled collections cannot be overestimated, and the time is not far distant when well selected types of the various groups of animals, plants, and minerals will be considered necessary adjuncts to our schools. Already the advantage of object lessors in natural science is universally recognized, and teachers, perhaps more than any other class of persons, must have access to collections for reference and study. It is not essential to begin on a large scale, for few things grow more rapidly than museums, when once the seed is fairly planted. Will not you 'put your shoulder to the wheel' and establish the nucleus of a collection that will some day be the pride of Oregon?"

Does the above sound like a recent release from the Society's Committee on Establishment of a Museum? Believe it or not, it is quoted from an address to the Mazamas by Dr. C. Hart Merriam, U. S. Department of Agriculture naturalist, on Sept. 22, 1896. Probably no one at that time could have believed that the Museum would still be in the promotion stage after 42 years. What will the next 42 years bring? It's largely up to you.

# GEOLOGICAL NEWS LETTER

VOL. 5 NO. 4 PORTLAND, OREGON FEB. 25 1939

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THE GEOLOGICAL NEWS-LETTER

Official Publication of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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All communications and material for publication should be sent to the Editor-in-Chief. Change of address is required 30 days in advance of the date of proposed change.


## MEMBERSHIP APPLICATION

### GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

### Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ____________________

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

________________________________________
Address

________________________________________
Business Address

____________________ ____________________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ____________________
________________________________________

Sponsored by ____________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

____________________
Signature

## ANNOUNCEMENTS

### Lectures

Friday Feb.24 — Annual Meeting. Election of Officers. Review of the past year. This is NOT the annual banquet, but it was deemed advisable to remove this business from the annual banquet and leave that occasion free for more important things. It has been suggested that each member of the Society take not over two minutes to tell their most interesting geological experience of the year.

Friday Mar. 3 — Annual Banquet. At Reed College Commons.
Speaker of the evening - Dr. Warren D. Smith.
Subject - Crooked Trails.

It looks like a big night for members of the Geological Society of the Oregon Country and their friends. Our own Dr. Smith needs no introduction to this Society. His talks are full of interest and though he may take us far away on a geological journey he will land us safely back in Portland where we will be in time for the next part of our program.

Our toastmaster, Clarence Phillips, assures us other parts of the program are moving on at a satisfactory pace. See next page for seating arrangements at tables.

Friday Mar.10 — No meeting.

Friday Mar.24 — This is a joint meeting with the Agate and Mineral Society. Mr. E. H. Rockwell, assisted by Mr. Thomas A. Carney, will present a very unusual group of colored slides of polished rock sections. There are about 150 slides in this collection, and to our knowledge have never been shown in this area.

### Field Trips

Sunday Mar.12 — Leaders: Dr. Francis Jones and Raymond L. Baldwin. Clackamas River and Paul Bunyan Railroad Grade.

Annual Banquet of

Geological Society of
Oregon Country

Come One - Good Eats Come All

Stunts Music

Friday, March 3, 1939 7:00 P.M. Reed College Commons

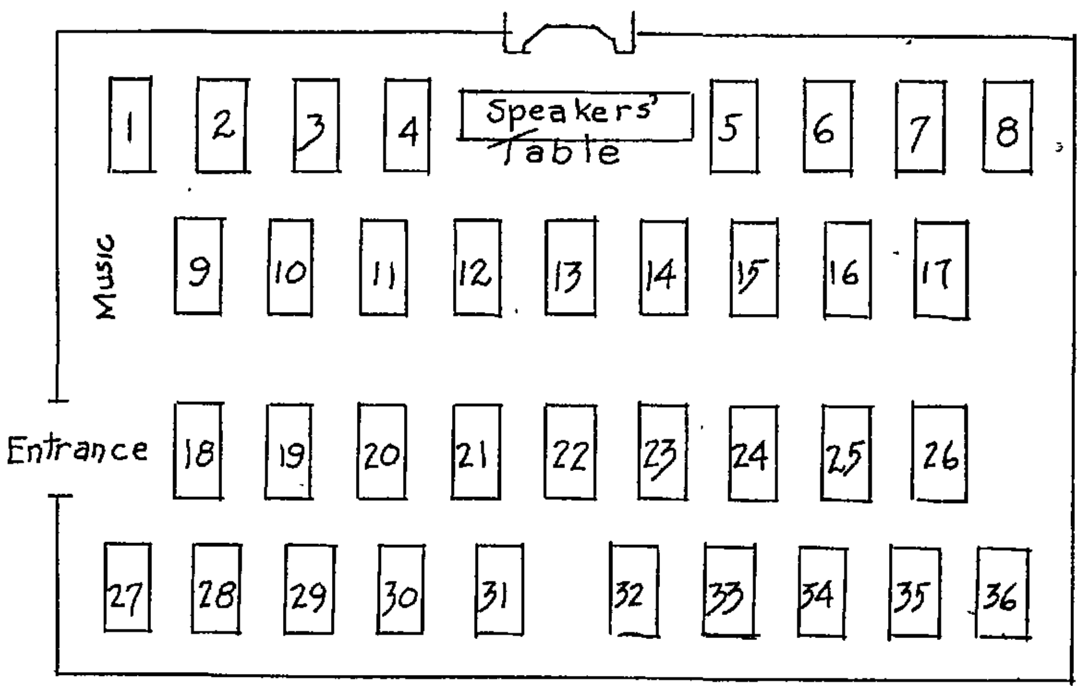
Price--$1.25 per plate.

Tickets sold by plat. Refer to plat below and make your selection; don't delay making your purchase. This should be a sell out. Tickets will go on sale at the next meeting of the Society, on the evening of Friday, January 27, 1939, Auditorium, Public Service Building. Tickets may be purchased at all subsequent meetings of the Society. Leo Simon, chairman of Ticket Committee,

Mail orders should be addressed to:

Leo Simon, c/o Sowell-Simon Studios
531 S.W.Washington Street
Portland, Oregon

Money for tickets should accompany mail orders. Seat preference will be made as closely as possible to your selection.



# DINOSAUR NATIONAL MONUMENT

Vacation notes by two amateur geologists.

Mr. and Mrs. Chester A. Wheeler

When a park has the designation "National" one may rest assured that in no other place in the 48 states will be found a similar type of park. That is particularly true of the Dinosaur National Monument, situated near Jensen, in Utah. The reservation extends for a distance of about 6 miles parallel to the Green river, and about two miles away from it.

Many years ago, sheepherders in that country reported that odd-shaped rocks had been seen in certain places in the hills where they herded their sheep. The persistence of such reports led someone to investigate a little more closely; and then it was discovered that these queer "rocks" were fossilized bones. This information reached Dr. Douglass and impressed him sufficiently to cause him to investigate on the ground, where he at once recognized the bones as those of dinosaurs. The nature and extent of the find were such as to induce the Carnegie Institution of Washington to send an expedition in 1907 to investigate further, and Dr. Douglass was placed in charge.

Well directed excavation immediately revealed a large number and assortment of dinosaur bones. One skeleton (complete except for one or two ribs) proved to be the largest specimen ever found, being 123 feet long, another only 9 inches high, is said to be the smallest. It is estimated that some 900,000 pounds of bone have been removed.

The large amount of work required to carry out the necessary excavation suggested the Monument as an ideal place for the Government to establish a relief camp. This was done about 5 years ago; and there came to it all types of humanity; hoboes, tramps, and just plain bums, some so discouraged they would not give their own names. Dr. Boyle, the geologist who has been in charge of this camp since the beginning, is a wonderful man, not only as a geologist, but as a builder of men. He took there men who were down and out and put them on their feet, once more able to earn a living.

One day he suggested that they start some classes in science, which he would teach in the evening after work. There were 210 men in the camp at that time. He did not expect very many to attend; but before the week was up all of them were attending class and they wanted seven nights a week. They compromised with three nights a week. He sent to Salt Lake City, to the library, and got books, and received permission from the University of Utah to give college credits in these classes. So today, there are men who, without completing grammar school, have college credits in mining, geology, mineralogy, and metallurgy. Through his efforts 84 men were returned to civil life, able to earn their own living.

Dr. Boyle also suggested that they send specimens to the State Universities of their home states. These specimens were collected outside the reservation. Nineteen of the men followed his suggestion. The specimens were acknowledged by the colleges, and one sender was entertained by the president of the college.

He also had the men write poems and write songs which they sang in the evenings. He asked one young fellow if he could paint in color, dinosaurs similar to the pictures on the cover of the Sinclair Oil Co. road map. The boy replied that he was no painter, but if he had the paint he would try; this he did, with very creditable results. One man asked why they could not have an emblem like those of other parks and monuments. So Dr. Boyle told him to go ahead and design one that would be suitable. He designed and painted a dinosaur emblem, about 10 feet high. The postmaster at Jensen learned of this design and informed Dr. Boyle that for every letter mailed from the camp with this design, he personally would put on the required postage. The first day he had about 80 letters on which to put the stamps. Some time later a shortage of mercurochrome was discovered, and upon investigation it was found that the men ~~were~~ trying to outdo each other in their designs, and were using the mercurochrome for color.

These men in the relief camp were furnished food, clothing, and lodging, and for wages, about 30 cents a week. Dr. Boyle informed us that in the entire life of the camp they had had no labor trouble, except one quarrel, which he settled by putting the two men on opposite ends of a crosscut saw and having them start in on a cord of wood.

This is now a WPA project, and it is one project where the men actually work. I questioned some of them about the work, and they told me it was the most interesting digging they had ever done, as they never knew what was going to be dug up next.

Take the case of Mr. Hicks, who was our guide. He was working on a WPA job several hundred miles east of Jensen when he heard of this camp and asked for a transfer. He arrived at the camp one evening, footsore and tired. Since his arrival four years ago, he has studied minerals and dinosaurs, and today, next to Dr. Boyle, he is the best informed man in camp on the dinosaur. He is so interested that instead of taking his two weeks off each month as required by the WPA, he stays and acts as guide. He has hope that when this park opens up officially, he will be the guide. I hope he makes it. . . So much for the camp.

The dinosaur beds are in the Uinta mountains, an arm of the Wasatch range, the only major range of mountains in the United States which runs east and west. Taking the angle of the tilt at the camp, which is at the east end, and drawing an arc to the west to meet the tilt at the west end, the highest point of this arc would make one of the highest ranges of mountains the world has ever known. Erosion through the ages finally wore down the high peaks and exposed the dinosaur bones, which had been deposited millions of years before. The complete geological story, as told by Dr. Boyle, takes about an hour. It is sufficient to say here that millions of years passed during which the dinosaurs lived and died. Silt covered their bones, the ocean came in, not once, but several times. The land rose, was tilted and folded, and eroded down to the level at which we now find it.

The cut in which the men are working is 385 feet long, and 40 feet wide at the bottom. They have cut back on the north wall to the layer in which the Carnegie Institution quarried 30 years ago. The Sinclair Oil Co. is giving $50,000 so that the laboratory technicians can come out and chisel back on north wall until they come to the bones. The fossils will be left in place, but will be cut out in relief. Later, a concrete and steel building, with plenty of windows, will be erected over the cut. Seats will be built on the south wall, something like a grandstand. There is an element of gamble in the project, but tons of bones have already been taken out at one end of the cut, and bones are in the cliff walls about 100 yards to the east. So the chances are very good that more fossils will be found.

Standing in the cut and looking east, one can see the following deposits, starting at the bottom: Devonian, Carboniferous, Jurassic, Triassic Red Beds, and on top, Nugget Sandstone. The deposit in which the dinosaur fossils are found is called the Morrison Beds, and is of Jurassic age. These beds are colored red, green, and brown.

Dr. Boyle's theory is that the dinosaurs did not bog down and die in the lakes, but migrated up into the hills and died of shortage of food. Also other animals preyed upon the dinosaurs by eating their eggs The cause of the migration was that the valleys began to sink, and cold water coming in, forced the dinosaurs to flee to undesirable places. The ocean came in, and green and blue shales were deposited in great thickness; Jurassic limestone, Triassic sandstones, and Cretaceous shales. Dr. Boyle called our attention to the fact that some of the folds were so sharp, that bones lying athwart the folds were cracked, while those lying along the axis of the folds were not damaged.

Such is the story of Dinosaur National Monument. To get the picture of this remarkable area, you must leave the cut and roam through the hills, as we did, under the guidance of Mr. Hicks.

(Note.- The above talk before the Geological Society of the Oregon Country on Friday evening, Oct. 28 1938 was illustrated with projections of numerous photographs taken by Mr. and Mrs. Wheeler in and near Dinosaur National Monument, on their vacation trip in the summer of 1938).

****

NEW MEMBERS.

| | | |
|---|---|---|
| Frank A. Suter | BE 9715 | 813 S.W.Vista Avenue |
| Mrs. Stella Arnspiger | SU 1418 | 6529 S.E. 92d Avenue |
| Mr. and Mrs. W. A. Norman | AT 1724 | 1724 S.W. Broadway |

****

We are glad to report Mr. Rydell, one of our charter members, is back in town and has renewed his membership in the Geological Society of the Oregon Country. His address is L. E. Rydell, PO Box 895, 2195 N.W. Flanders Street.

MUSEUM TO SHOW NATURAL HISTORY.
Oregonian Feb. 5 1939.

Tentative plans for a modest sized museum of natural history for Portland have been prepared and "there is good reason to anticipate federal aid in construction as soon as the site is acquired and proper sponsorship funds are maid available", it was declared Saturday by John C. Stevens, consulting engineer and newly-elected president of the Portland Museum of Natural History association.

Mr. Stevens was elected at the annual meeting Friday at Congress Hotel. Other officers: Vice-president, Earl K. Nixon; treasurer, Frederick Greenwood; re-elected: secretary, protem, Arch B. Sanders.

The board of trustees will meet shortly and lay plans for immediate action to obtain the museum.

****

We are glad to have two members of our Society on this committee, a project in which we are very much interested.

****

The Thursday morning papers (Feb. 16) carried headlines of a bad fire at Jefferson High School. Wednesday night the Jefferson Dads Club held a meeting at the school and were given a fine geological talk by A. W. Hancock. We have heard Mr. Hancock give several geological talks and we can vouch for the fact any talk he gave was not dry enough to start a fire.

It is rumored around the luncheon club, Mr. Hancock has another speaking date up the Valley soon. Members of our Society seem to be in demand for speaking dates.

****

The Ore.-Bin vol. 1 no. 2 is just off the press. Have you received your copy? This is a free publication put out by the Oregon State Department of Geology and Mineral Industries, taking the place of the Press Bulletins which have been put out in the past. If the two numbers issued are an indication of what is to follow this looks like another publication we want to save and have on hand for reference.

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This is the last call for those who wish to have bulletins bound this year. The price for binding is the same as last year, 35 cents per volume.

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# AN OCCURRENCE OF BEACH TYPE DUNES SOUTH OF UMATILLA, OREGON*

John P. Thomson
Assistant Soils Surveyor
Soil Conservation Service, Region 11

## Introduction

The dune accumulations reported herein are situated in northwestern Umatilla county, Oregon, about one and one-half miles southwest of the town of Umatilla. The topography of the area is characterized by smooth or slightly hummocky, long, gradual slopes except for the rather bold relief on the south and east sides of the basin which contains the dunes.

The climate of this part of Oregon is mild. Strong southwest winds may blow at any season but are most common during the spring. Precipitation is approximately eight inches annually.

The soil is extremely sandy and for the most part, underlain by gravel. In a few restricted localities farming is conducted by the aid of irrigation, from water delivered in concrete lined ditches.

## Physiography

One of the most striking physiographic features of the area is a distinct depression that begins at Cold Springs on the Columbia river about 10 miles east of Umatilla. It is traceable southwest to Hermiston, then west to Westfall school and back to the Columbia at a point about three miles east of Boardman, or 15 miles downstream from Umatilla. The depression distinctly resembles a stream channel.

South of Umatilla, sand and gravel covers the area between this depression and the Columbia river and its structure suggests that of a huge river bar. A profile across the bar, along the north-south section line that intersects Umatilla, shows gentle slopes toward the depression, or secondary channel, with steeper slopes and a small, north-trending valley on the Columbia river side.

Six rather unusual east-west-trending sand accumulations cross the basin. The first, and largest, is near the base of the steep forward edge of the bar represented by the two closely spaced 550 foot contours on the Umatilla topographic sheet. Down the valley (northeast) from this point are five similar deposits, all spaced about 1,000 feet apart. They are composed of wind-blown sand and for the most part, have been well stabilized by vegetation. Interdune areas are relatively flat.

Overgrazing has caused the western end of the largest dune to be reworked into the typical wide, hummocky mounds that are characteristic of the dune

*This paper was presented at the annual meeting of the Northwest Scientific Association, Spokane, Washington, December 28, 1938.

accumulations being formed at the present time, elsewhere in the valley of the Columbia river.

The large dunes are similar to those formed along the present Oregon coast at Warrenton.

## Conclusion

During some past geologic time, wind formed long, straight, dune-like bodies of sand across a northward sloping depression in a very large sand and gravel bar-type deposit.

These wind deposits are not the crescentric or hummocky form usually found on the arid localities adjacent to the Columbia river, but resemble dunes built on barrier, and like, beaches of the ocean.

Some condition existed in the past that has now been removed. Field evidence to date suggests that in the Hermiston and near-by Columbia river area, there was an enormous volume of water. During the subsidence of this water, there were six pauses, each marked by a sandy beach on which a beach-type dune was built.

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## REVIEWS

### QUARTZ FAMILY MINERALS

By H. C. Dake, Frank L. Fleener and Ben Hur Wilson

In this book of fifteen chapters the authors present a general discussion of quartz proper, the cryptocrystalline varieties of quartz and opal. The concluding chapter of 19 pages describes the art of cutting quartz. The book is intended primarily for the layman and mineral collector. The large number of illustrations, together with a free and easy style of presentation has produced an interesting volume which should prove very popular.

Unfortunately, in numerous instances, the statements are either vague or inaccurate. Frequently the cryptocrystalline varieties are referred to as "amorphous", while the formula for opal (p.35) is given as "$SiO2 . H2O$" in which the water is referred to as "water of crystallization". The reader is informed (p.85) that "silica crystallizes only below 800° C"., and that quartz melts at "1600° C." (p.36). Also, in discussing the sequence of crystallization of the various minerals from a magma (P.48), the reader is told that the order of separation is based upon "congealing temperatures". Petrologists are agreed that laws of solubility control the sequence of separation.

While these "oversights" and others are not serious, perhaps, from the standpoint of the mineral collector, they do detract, however, from the scientific value of the book.

W. F. H.

\- The American Mineralogist, vol. 23, 1938.

## COLUMBIA COUNTY IRON ORES TRIP

Elizabeth M. Barr

The iron ores found in Columbia county, Oregon, may be economically mined only when a steel manufacturing plant is established some time in the future, near Vancouver or Portland, in the opinion of Mr. Earl K. Nixon, Director of the State Department of Geology and Mineral Industries. Mr. Nixon headed a caravan of members of the Geological Society of the Oregon Country on Sunday, Jan. 15th, who visited prospect holes and tunnels in the hills west of Scappoose.

These ores are low grade, high in phosphorus, silica and moisture. They would best serve as supplemental ore for blast furnace use, provided they could be found in large enough quantity. They cannot be shipped far, but could be barged at low cost to a nearby blast furnace, so located that its by-products would have a sufficient market. None of the ores are very much below the land surface, would be simple to mine, and the cost would be low. The thicker the bed, the more stripping of overburden could be done. If the bed has a thickness of six feet, it could be mined, while a four-foot bed could not be economically taken out. But a place must be found to use them before the ores are mined at a profit. This may be several years in the future.

The first location visited was on the Colport property. Here two tunnels were seen, one of them entirely caved in. The ore is a low grade siliceous limonite, of nice texture, and could be used for flux by a steel company. The material is badly leached. A third prospect hole visited in the Colport area showed limonite of a different type from the others.

The origin of these deposits is very much open to question, said Mr. Nixon. He referred to theories advanced by Ira A. Williams and Henry M. Parks in a report published by the Oregon Bureau of Mines and Geology in May 1923, under the subject: The Limonite Iron Ores of Columbia county, Oregon. Mr. Williams was at that time geologist for the Bureau, and Mr. Parks was director. Their conclusion was that "these ores originated from basaltic rocks by weathering, and that they accumulated as bog iron deposits distributed intermittently over an earlier land surface than the present topography represents". The bog iron theory was based on the chemical analysis, which the report gives as follows:

"Bog ores form by the precipitation as hydrated iron oxide, limonite, and often some carbonate, of the iron brought in solution in the waters coming from nearby areas of weathering iron-bearing rocks. Basalt is rich in minerals that contain iron and this is dissolved, mainly due to the presence of carbon dioxide from the air, sulphuric acid, when it is present, and decomposing organisms and the organic acids derived from decomposing vegetable matter. Precipitation of the iron takes place when the carbon dioxide escapes or when the ferrous sulphate comes in contact with the air."

As bog iron, the deposits are accumulated in shallow lakes or swampy places. In the Scappoose area the iron is found in spots. It is not distributed in a continuous layer. The deposits are found either at the bottom of a lava flow, where it contacts with the sediments below, or have accumulated on top of a flow, and beneath a later one. In places the lenses vary from one to fifteen fee t thick. Mr. Nixon is of the opinion that most of the iron deposits, which are thin, occur between flows.

Discussions at the various stops on the trip failed to bring out any better theory as to origin than that they are of the bog type. It was suggested that the deposits may be of bog iron and lateritic origin. Leaching is enhanced by a moist climate, and it is thought the weathering and leaching in this district covered a comparatively short time. There was no answer to the question - what set of circumstances brought about the condition that caused this leaching in this particular district to produce iron, and not in other sections? There is considerable basalt west of the Cascade mountains, and the rocks in the Scappoose district are ordinary basalt. It was stated that there has been intensive alteration from southern Oregon, up into Washington, over an areal extent of hundreds of thousands of square miles, and that there is certainly some unusual condition here. Mr. Nixon thinks there must have been transportation of iron, this having been a falt country with a basaltic base, so that pools or bogs could form.

The Scappoose iron deposits are entirely different from those in the Lake Superior region, which are Pre Cambrian, and which are mostly in troughs. This material is limonite, hydrated, already oxidized, is in patches, and is about 45% iron It is not continuous and does not maintain an even thickness. In the 2,000 acres of the Colport property it runs 4 to 11 feet thick.

The geology of the region was discussed briefly by Mr. Arthur M. Piper, of the Ground Water Division, U. S. Geological Survey. He stated that it is old Tertiary. Beneath the whole region from Portland westward to the coast, we have sedimentary rocks of marine origin, Oligocene age. None are extensive We do not know of any marine Miocene in that district. Those rocks are overlain in the vicinity of Portland by basalt considered Miocene. Fossils have been found in various of these marine sediments. Various types of fossils. Those found in the area west of the Wildwood golf course are Oligocene, the same as those found at Pittsburg Bluff.

Leaving the Colport district, the caravan followed the course of Alder creek fro some distance back into the hills to view a different type of iron ore. This was hematite and somewhat magnetic, also harder than the Colport iron. It is much lower in silica. As the iron content increases, the silica decreases. In this case the deposit was baked by a later flow of lava, which accounts for the dehydration. At this point a tunnel had been opened up, now caved in. Good sized boulders of the hematite were scattered about.

The deposit here is thought to be thin, not more than a foot or two in thickness. It is 60% iron, a high grade ore. The hematite looks a good deal like the ore in the Lake Superior region. It is called blue ore. But there is not enough to pay to mine it. It runs 11 cu.ft. to the ton. In the Colport area it is 14 to 16 cu ft. to the ton. The limonite is like that of the Mesabi range in Minnesota.

Some "shot" soil was seen. According to the Williams report, considerable areas in this region are covered with this type of soil. The "shot" are really tiny concretions containing iron, scattered about on the surface of the land.

A fresh prospecting hole was seen high on the hillside, on government owned land.

The group had lunch at this second stop. A grassy place had been selected, but as there were several showers during the morning, one had to either sit on a blanket or stand up to eat. Lunch was only half over when the clouds again conspired against us and the raindrops peppered down for five or ten minutes.

Two more stops were scheduled for the afternoon, but on account of the inclement weather it was decided to visit only the deposit near the Pisgah Home. The Home is located on top of a hill, at an elevation of 2,000 feet, and the site of the prospecting tunnel is about a mile beyond. On this last leg of the trip, some bad road was encountered, and this, in addition to some car troubles, slowed the progress of the caravan. At the top of the hill the party was greeted with a mild snowstorm, lasting only a few minutes but indicating the chill of the atmosphere. The superintendent of the Pisgah Home invited the group to enjoy its hospitality, but on account of the latness of the hour, we were unable to accept.

Specimens of what was termed middle grade ore were obtained from this deposit, which is limonite.

Notwithstanding the chilly and rainy weather, much interest was displayed in the study of these iron deposits in the Scappoose district. The group numbered about thirty-five persons. Copies of vol. 3 no. 3, The Mineral Resources of Oregon, May 1923, were distributed through the courtesy of the State Department of Geology and Mineral Industries.

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## REVIEWS

Many of us remember the field trip which was led by Dr. Thomas P. Thayer some time ago. He took us into the North Santiam country and explained many of the things he had discovered during the course of his field work on a thesis. The following abstract sets forth many of these ideas. These data, and more, will be the subject of a forthcoming bulletin of the State Department of Geology and Mineral Industries, which will include the geologic map of a strip from Salem to Mount Jefferson.

Thayer, Thomas P., History and Glaciation of the North Santiam River, Oregon: (abst.) Geol. Soc. Am., Proc. for 1937, p. 255, 1938.

N.Santiam R. is type of stream which is common in Oreg. Cascades in that it heads on thw est slopes of the High Cascades and cuts thru western cascades. Radial consequent drainage from an old High Cascade cone characterizes the headwaters in the vicinity of Mount Jefferson.

In pre-High Cascade time, ancestral N. Santiam R. apparently flowes west from a divide near south end of Sardine Mt., whereas ancient Breitenbush R. turned E. at site of Detroit and flowed into eastern Oregon. Eruption of High Cascade volcanics dammed the Breitenbush R., forcing it west over the divide, into ancestral N. Santiam R. Integration of present river system in this manner occurred in late Pliocene or early Pleistocene. Breitenbush R. has beheaded Cub Cr., a tributary of Clackamas R., and a combination of glaciation and volcanism twice reversed N. Santiam R., south of Mt. Bruno.

Three glacial stages are recognized. The Mill City glaciation, probably of Sherwin age, is represented by moraines, till, and varved silts exposed between Gates and a point about 3 miles west of Mill City. Altho this glacier traversed the Santiam R. valley, no glacial profile is evident in the gorge east of Niagara. The Detroit glaciation, tentatively correlated with the Tahoe stage, is represented by delta deposits and till below Detroit, at 1400 feet elevation. Wisconsin moraines occur between 2000 feet elevation in the valley and the termini of the glaciers on Mount Jefferson.

(R.C.T.)

# GEOLOGICAL NEWS LETTER

VOL. 5 NO. 5 PORTLAND, OREGON MARCH 1939

OFFICIAL PUBLICATION OF THE

GEOLOGICAL SOCIETY OREGON COUNTRY

PORTLAND 1 OREG.

GEOLOGICAL NEWS-LETTER
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POSTMASTER: Return Postage Guaranteed

DR & MRS A C JONES
3300 S E HEATHER LANE
PORTLAND, OREGON

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Executive Board



THE GEOLOGICAL NEWS-LETTER

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Editor-in-Chief and Business Manager

Raymond L. Baldwin
345 U. S. Court House
Portland, Oregon

Associate Editors

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| Edwin T. Hodge | A. D. Vance |
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Date ____________________

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

________________________________
Address

________________________________
Business Address

________________ ________________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ____________________
________________________________

Sponsored by: ________________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

________________________
Signature

## ANNOUNCEMENTS

### Lectures

| | |
|---|---|
| Friday Mar.10 | No meeting |
| Friday Mar.24 | This is a joint meeting with the Agate and Mineral Society. Mr. E. H. Rockwell, assisted by Mr. Thomas A. Carney, will present a very unusual group of colored slides of polished rock sections. There are about 150 slides in this collection, and to our knowledge have never been shown in this area. |

### Field Trips

| | |
|---|---|
| Sunday Mar.12 | Leaders: A. D. Vance and Raymond L. Baldwin. Clackamas river and Paul Bunyan Railroad Grade. |

## NEWS OF THE MEMBERS

Dr. Adolph Weinzirl spoke to the Chamber of Commerce Forum on the subject of "Public Health in Portland" on Monday, February 20th.

Mr. Earl K. Nixon has just returned from a trip to the East Coast where he attended the annual meeting of the American Institute of Mining & Metallurgical Engineers as the delegate of the Oregon Section. From New York, Mr. Nixon went to Washington, D.C., where he attended the annual meeting of the American Association of State Geologists and directed a discussion on departmental organization. He also met with the Directors of the United States Geological Survey and the United States Bureau of Mines.

Dr. J. C. Stevens has been appointed to serve on the American Red Cross Committee, Disaster Preparedness and Relief Committee, by Gen. Charles H. Martin, chairman. Mr. Stevens' committee has the responsibility of Survey; his group will consider all possible and probable disasters that might affect the Portland area and report on possible damage that might be inflicted.

Mr. Barney MacNab is reported to be improving nicely, by St. Vincent's Hospital. Mr. and Mrs. MacNab were at Sun Valley, Idaho, and Barney became ill. They drove back to Portland where he was ordered to the hospital. The MacNabs rated photographs in the Oregon Journal, Feb. 27, in connection with their Sun Valley trip.

Mr. Russell Collins, past vice-president, was operated upon last Friday, Mar. 3rd, and his tonsils removed. He was back at his desk by Monday, Mar. 6th.

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DUES ARE DUE AND PAYABLE

## EARLY LIFE OF ANOTHER AGE ON NORTH AMERICAN CONTINENT

Wednesday, Feb. 22, 1939. - Armored dragons - giant lizards whose bodies were completely covered with bony plates which overlapped in even rows like shingles or tiles on a roof - crawled over parts of North American about 35,000,000 years ago and perhaps scared the earliest pigmy horses and camels.

The most complete fossil specimens of one of these creatures yet found, consisting of the head, neck, and forepart of the body, has just been described from the collections of the U. S. National Museum by Charles W. Gilmore, Smithsonian Institution paleontologist. Hitherto the animal has been known only from a few broken specimens which gave paleontologists a quite fragmentary picture of what it really looked like. It was the "giant glyptosaurus", member of a family of lizards which flourished and vanished in the Oligocene geological period. Its remains have been found in Utah, Wyoming, Colorado, Montana, and parts of Canada. Except for one questionable specimen in France, it has never been reported outside of North America where it was associated with early crocodiles and snakes.

As the fossil now can be reconstructed, Mr. Gilmore says, it would appear that the creature in life was about three feet long. Perhaps the living animal coming closest to it is the Gila monster of the Southwest, to whose remote ancestors it may have been very distantly related. It was probably a vegetarian, nonpoisonous and sluggish, which depended for survival on its fearsome appearance and its antique type of bony armor.

No other animal, living or extinct, had anything approaching this sort of protection. The tiles are not part of the bony structure of the body but are embedded in the flesh. They are laid in geometrically straight rows and each row overlaps the other about an eighth of an inch. These "tiles" are scales turned to bone, a reverse development from their transformation into feathers in some other reptile family from which the birds arose. But, Mr. Gilmore says, no reptile has such regularly arranged scales, nor any bird such regularly arranged feathers. Even in its day, the animal must have been very rare, as only a dozen specimens have ever been found.

- Smithsonian Institute.

* * * * * * * * * * **** * * * * * * * * * *

TO THE MEMBERS OF THE GEOLOGICAL SOCIETY:

The past year, during which I served as president of your Society, has been a most enjoyable one. This was largely due to the loyal cooperation and willingness of you members to assist with the many duties of the organization. Your token of appreciation, the two bound volumes of the "Lexicon of Geologic Names of the United States", was happily chosen, for I know of nothing that will be of more lasting service to me than this reference work. It will be a constant reminder of your best wishes and of my continuing responsibility to the Society.

- Ray C. Treasher.

****

## NEW MEMBER

A. A. Groening, Professor of Geology, Linfield College,
McMinnville, Oregon.

## METEORS

J. Hugh Pruett
Western Director of the American Meteor Society.

Meteors have doubtless been observed ever since man was a thinking creature. During historical times many theories have been advanced as to their nature and location in space. Many of the ancient people believed them to be omens of coming disaster, supernatural in all respects. Scientists have tried to give natural explanations but have differed among themselves, even in modern times.

The earliest explanation was that they were explosions of gases collecting in the air. The nature of the gases or the cause of the explosions seemed slightly uncertain. Later they were thought to be solid materials that had originally been thrown from terrestrial volcanoes. Some thought they were from eruptions on the moon. Prof. W. H. Pickering suggested that some kinds are the debris strung between the earth and the moon when these two bodies separated in the distant past.

The present view is that periodic meteor showers and many large fireballs are the disintegration products of comets of our own solar system. Some suggest that a planet may have "blown up" and furnished these wandering bits of matter. It is well agreed however, that the computed orbits and hyperbolic paths of some of the large ones indicate clearly that they are strangers making a first call on the sun's system. They likely come from the region of the distant fixed stars.

For careful study of meteors and meteorites, two societies are in operation in the United States. The American Meteor Society was organized in 1914. Since that time Dr. C. P. Olivier, at present head of the astronomy department at the University of Pennsylvania, has served continuously as president. Dr. Olivier is a world-wide authority on matters meteoric, having at one time been chairman of the meteor committee of the International Astronomical Union. The other organization is the Society for Research on Meteorites, formed in 1933. Dr. H. H. Nininger, the Denver expert, is now its president.

While Dr. Olivier is the very active, coordinating head of his society, yet he delegates a great deal of authority to his regional directors in various parts of the country. A regional director usually has more than one state under his supervision. The western director has Montana, Idaho, Washington, Oregon, and California.

The duties of a regional director are to supervise the observational work of all members in his territory, give newspaper publicity regarding expected meteoric displays, to trace (with the help of newspapers) all huge and noisy fireballs which appear over his part of the country, and to assist in the search for resulting meteorites.

Before the organization of this work in the west in 1932, the writer is not aware that any fireball tracing was ever undertaken. Every observer had his own opinion as to where the meteor was and where it went. Extremely conflicting stories appeared in the press in the attempt to favor various opinions. Either there was a whole flock of fireballs, or else the behavior of one was very mystifying since it seemed to be at several places, hundreds of miles apart, at the same time.

Since 1932 the paths of twelve of these huge celestial visitors across this western region have been quite definitely traced, and the plotting maps for most of them published in the newspapers. Seeming inconsistencies of their movement have been clearly explained, and sense brought out of nonsense. The last one traced was the huge fireball of November 16, 1938, which came from far out at sea, floated leisurely across California (much to the amazement of observers) and "blinked out" over the Amargosa desert in Nevada.

Let us use the noisy Yakima fireball of 8:43 p.m., April 20, 1933, as an illustration of the method of meteor tracing. The newspapers the next day carried reports from various places regarding its observation. It had been seen to strike the Coburg hills near Eugene. An autoist had seen it fall into a canyon north of Madras. A Portland resident was sure it dropped into the Columbia river. At Pasco it was seen "floating down" to a spot about three miles west of town. It struck trees in southeast Seattle. It raised a terrible commotion as it passed almost overhead at Yakima, booming and rattling windows and dishes.

At once the Oregon and Washington newspaper representatives of the American Meteor Society were asked to request observers to send data to the regional director. Statements regarding the time of appearance, apparent size, color, noise, duration of flight, etc., were desired, but the most important were the directions of appearance and disappearance, and the estimated height above the horizon at these ends of the visible path. Without these directions we could do nothing in the way of determining the territory over which the fireball passed, or its height at various parts of its journey.

About 75 observers, from southern Oregon to northern Washington, responded promptly. To many who seemed to have the most definite data, further correspondence was carried on. Some were so definite in their first reports that nothing more was needed. It is surprising how the various reports check with each other, fully 80% as a general rule. Some always have to be thrown out as it is clearly seen that the observers were in strange places where directions were uncertain. A few are evidently manufacturing a great deal of their report, as they have meteors behaving in very unseemly ways. (One woman stated the fireball fell until near the horizon, rested a second, then turned around and flew back to the zenith.)

As a rule only the better educated people take the trouble to respond, yet occasionally one who is very illiterate sends a report. The latter often shows clearly that he is a good observer, possessed of rare common sense, and real honesty. The writer has often sent compasses and clinometers to such persons and usually finds them capable of measuring directions and altitudes very accurately.

Several who reported on the Yakima meteor used compasses to determine directions. Some said they had allowed for magnetic declination. Inquiries showed others had not, but these corrections were easily applied. Two had obtained the assistance of professional surveyors. Many furnished maps or diagrams on which they showed where they stood, and over what hills or buildings the meteor appeared and disappeared. Others stated directions, some getting down to such fine distinctions as E by N., etc.

The final plotting is done on a map, constructed for the occasion by tracing from a good grade map of large size. Only the localities from which reports have been received are put on the map. Meridians are usually drawn for every half degree so that north and south lines may be near every station. From these, directions are plotted with protractor.

From each reporting station we draw two arrows; a solid arrow showing the direction in which the observer first noticed the meteor; a dotted arrow the direction of disappearance. The length of the arrow has no significance. Each arrow is labeled with the directions furnished by the observer or calculated from diagrams he furnishes.

When the arrows are constructed from the various places, it will be seen at once that the dotted disappearance arrows practically all run toward a rather restricted locality. This is always very striking. It points out the place over which the meteor ceased to be luminous. The solid "appearance-arrows" do not converge very well toward a spot since observers from various places did not catch sight of the meteor at the same time. In many instances it is below the horizon to some observers, while others see it high in the sky. Despite this lack of convergence, the experienced plotter has little trouble making them fit into the scheme of things.

After the arrows are placed on the map, the approximate projection of the meteor's path along the ground is usually fairly simple. This path is indicated by a comet-like figure, the tail showing the visible path, the head the point of disappearance.

When a map is prepared for publication, the great majority of the arrows are omitted in order to prevent crowding. A dozen or fifteen from widely separated localities are used. Figure 1 shows the completed map of the Yakima meteor's path as projected on the ground. This of course, shows only the component of its motion in a plane parallel to the earth's surface. This is quite sufficient for newspaper publication. (For very accurate solutions which are worked up later for publication in astronomical magazines, we take into account the curvature of the earth).

Figure 2 shows the approximate path of the Yakima meteor in a plane which is perpendicular to the earth's surface. Calculations from the pile of data received from observers showed that this meteor became visible when about 80 miles high, and very nearly over Mt. Thielsen. From there it went down at a gentle slope and in 8 second disappeared at a height of 10 miles over a locality about 30 miles almost north of Yakima.

The light of a meteor is caused by criction with the earth's atmosphere as it tears along at speeds of from 10 to sometimes more than 50 miles a second. Although some become visible at heights above 100 miles, yet the atmosphere is so thin at that altitude that it is almost non-existent. The smaller meteors become visible, on an average, at heights of about 80 miles, and become completely burned to ash by the time they reach the 50-mile limit. Larger ones come much lower, some even landing on the earth before being entirely consumed.

Contrary to popular opinion, there is no authenticated account of a meteor's remaining luminous all the way to the earth's surface. The big ones usually cease to glow at heights of 20 or 30 miles, yet some are known to have been incandescent at 10 miles. The Paragould meteor was certainly visible to 5 miles, but this is very unusual. By the time the meteors reach the denser lower air they are so slowed down that they lose heat faster than they acquire it. Stony meteorites are usually not uncomfortably warm when picked up at once after falling. Iron meteorites, being better conductors of heat, are sometimes too hot to handle.

The light of the head of a meteor is thought to be caused by an immense layer of incandescent gas which extends far beyond the solid center. Small meteors would not give the great amount of light they do under any other circumstances. It is generally considered that the smaller "shooting stars" are no larger than a grain of sand.

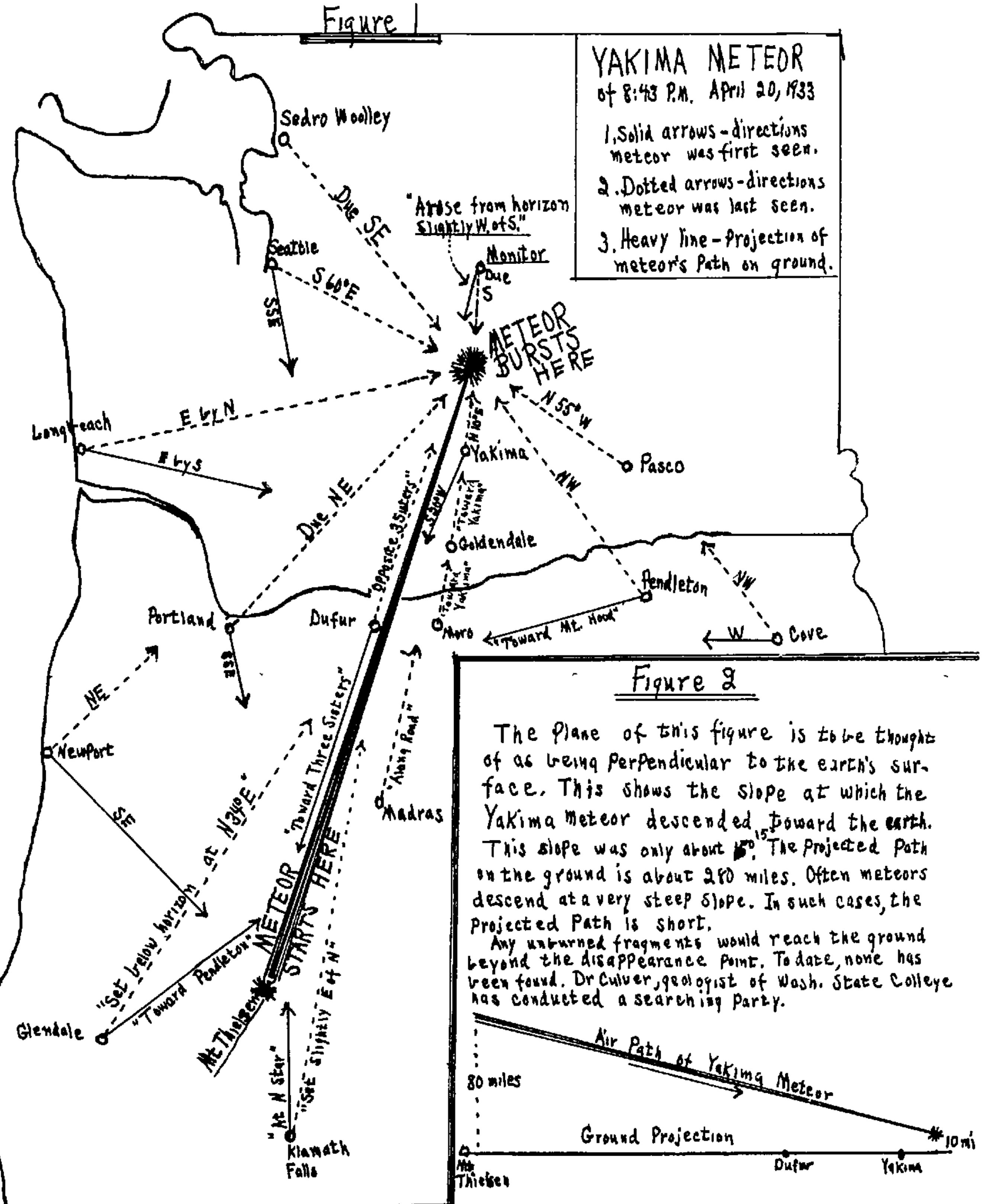
A string of sparks is often seen following directly behind meteors and disappearing almost immediately. They are evidently luminous molten material which is being washed off the surface by the terrific blast of air encountered. These sparks show various colors and are usually referred to as the tail.

Of an entirely different nature and appearance is the faint line of light that often remains visible for several seconds, or even minutes, after the meteor passes. These "trains" are usually many miles long and often a mile or more in width. Viewed telescopically, they show they are in the form of a hollow tube. They cannot be air heated to incandescence as air would not continue at a high temperature for any length of time. Nor can they be hot materials washed off the surface of the meteor as they would be cooled in a second or two. The general theory is that when a meteor passes through a certain region, it produces ionization of the air near it, either because of its heat or some sort of electrical disturbance. This condition may extend out half a mile on each side of the path. As the air particles go slowly back to their original condition, they give off this faint glow (phosphorescense) similar to that seen in many substances after being subjected to certain types of radiation. Bright meteors cause simultaneous radio static.

Somewhat like the aurora, it seems that certain air pressure is necessary for the production of these meteor trains. Where the air is too dense or too rare, they will not form. Meteor flights often leave no trains at first, mark one across the sky during the middle of their trip, then leave nothing over the last part. Careful calculations show that most of these trains are traced from the 60-mile down to the 50 mile limit. These would be entirely invisible in connection with daytime meteors.

The white, smoky trains left by daylight meteors are evidently entirely different phenomena. They appear much lower than the night trains, seldom being found above 40 miles. They extend down to about 20 miles. They are evidently real smoke left by the burning fireball. They often persist for a long time and are blown into fantastic shapes by the wind. Several years ago a huge fireball appeared in the Oregon heavens soon after sunset. The smoke train extended in a long line across the sky. After some time the upper air currents blew part of it almost exactly into the shape of a question mark. It was dubbed the "Question Mark" meteor by the newspapers.

## Figure 1




## Figure 2

The plane of this figure is to be thought of as being perpendicular to the earth's surface. This shows the slope at which the Yakima meteor descended toward the earth. This slope was only about 15°. The projected path on the ground is about 280 miles. Often meteors descend at a very steep slope. In such cases, the projected path is short.

Any unburned fragments would reach the ground beyond the disappearance point. To date, none has been found. Dr Culver, geologist of Wash. State College has conducted a searching party.

The Spokane meteor of June 1, 1938 left a smoke train which, through field glasses, was corkscrew-shaped over most of its path. Some reported a quivering of the meteor while in flight. It is well known that many irregular shaped meteors travel in fine spirals through the air.

Although the smaller "shooting stars" give no audible effects, yet some of the big fireballs produce quite frightful sounds. As sound travels only about 11 miles per minute in the cold upper air, a meteor 44 miles overhead will require 4 minutes for the sound to reach us. Many observers of both the sight and the sound do not think of connecting them to the same cause.

There is often a final explosion seen at the end of the visible flight of a big fireball. Most people assume that the sound soon heard is caused by this explosion. That this sound is often heard, there is no doubt. Three explosions were seen near the end of the flight of the Yakima meteor. The same number of snapping noises were heard later by those near the disappearance locality. But this sound was quite mild compared to the terrifying booms heard by those nearly under the last half of its flight. These violent sounds were caused by the highly compressed air ahead of (and the vacuum behind) the swiftly speeding fireball. These sound like a bang followed by a long echoing roll. Since the meteor is traveling faster than the speed of sound, the roll often seems to be going back in the direction from which the object came, rather than in the direction it is going. Those who observe the sound only, thus usually misjudge the direction the meteor was traveling. These meteoric compressional waves correspond to the shock waves, or ballistic waves, produced when an artillery projectile passes overhead. War veterans are familiar with these sounds.

One type of sound often reported by fireball observers is thought by practically all meteor experts to be entirely imaginary. A few such reports are met with whenever a fireball is being traced. This sound is explained as having a "swishing" quality, exactly like that produced by a Fourth of July rocket, and as being heard while the meteor is streaking across the sky. Most scientists think there is nothing to this as no astronomer or meteor student has ever heard it. They think the observer is so startled by the sudden appearance of the brilliant light and the resemblance of the path to that taken by the well-known rocket that it is quite natural, even shortly afterwards, for him to feel certain he heard the swishing sound. This is called the "psychological" sound.

Dr. Nininger, the Denver expert, thinks there may possibly be some electrical method of sound transmission, of which to date we are ignorant, whereby the sound may come to us as fast as does light. (The writer knowns of no one else who even suggests this). Dr. Nininger thinks he has evidence that certain observers heard the sound when indoors and upon stepping to a door or window saw the last of the meteor's flight. Others think that the sudden lighting of the room or the outside landscape may have attracted the attention and caused the observer to look outside to see what it was all about. Recalling it afterwards, he easily imagined he was attracted by a sound.

Although huge fireballs are extremely spectacular, yet meteor students derive most of their pleasure from the regular recurring showers of small, silent "shooting stars". The Perseids of mid-August seem to be the most consistent, every year coming in such numbers that on the night of maximum display one observer may count about 70 each hour. One person may watch only a small section of the sky. Dr. Wylie, of Iowa, states that 32 observers are needed to watch the entire sky. Discarding duplicate counts, a few hundred an hour are tabulated when such a force of skywatchers is employed.

Other showers that give good accounts of themselves are the Quadrantids around January 2 and 3, the Orionids about October 20, and the Geminids which are at maximum December 12.

Spectacular meteor showers occurred several times last century. The Leonids of 1833 and 1866 came in such numbers that one observer could see more than 10,000 an hour. The Andromedids, resulting from the entire disintegration of Biela's comet, provided splendid showers in 1872 and 1885. At the latter date, almost 10,000 an hour were seen.

The only brilliant display of this century was that seen from Europe shortly after dark October 9, 1933. By the time it was dark in America, practically every thing was over. Many European scientists observed the display and somecounts reached 400 per minute. They did not continue at this rate for an entire hour. These were the Draconid meteors and were from the disintegration products of Giocobini's comet. As this comet has a period of seven years, we may see more of these meteors in 1940. Records show that the Draconids have given minor displays several times in the past.

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The following excerpts from a recent letter written by Mr. Pruett to Mr. Treasher will be of interest to our members:

"I want to thank you very much for your offer to enlist the aid of the Geological Society in the work on meteors and meteorites. The members can be of great help in the following way:

"A huge fireball is never seen by most people, even in a life time. But the chances that some member of your society will see one at some time are not at all unlikely, considering the number making up the society. Any time that any member sees a really big one, especially if it is bright enough to light up the surface of the earth and produces a noise some time after its passage, I shall be delighted to have him send me his name and address. Instructions for making a detailed report will then be sent him. Or if he sees something rather insignificant near the horizon at the same time that a big one is reported as being seen high in the sky at some distant city, his report will be of value. But the greatest chance of help from all the members is the prompt report of any such object which has been seen from various localities. By this I mean that if anyone sees a newspaper account of a brilliant, noisy meteor seen from both (e.g.) Pendleton and Seattle, I shall appreciate it if he will send me the clipping at once. Then I shall ask the press to request readers who saw it to send data. Some times the smaller papers carry such accounts when they are entirely ignored by the larger ones. A few of the finest meteors I have traced were first brought to my attention by clippings from small papers. Then requests for data from readers of large papers showed these meteors had been widely observed.

"In regard to help on suspected meteorites; it will be appreciated if members will attempt to get small specimens of all suspected meteorites of which they learn sent to me. Only three real meteorites have been identified in Oregon. Many times people are exhibiting in public places pieces of rock which they claim are meteorites. I have persuaded many such people to send me specimens. None was meteoritic. The members do not need to remember my name. Address a letter to Meteors, University of Oregon, and I shall receive it promptly."

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A full account of all committee reports as given at the Annual Business meeting will appear in the News-Letter. All committee assignments will also be reported.

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VOL. 5 NO. PORTLAND, OREGON 1939

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Date ____________________

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

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I am particularly interested in the following branches of Geology: ____________________________
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Sponsored by: ____________________________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

__________________________________
Signature

## ANNOUNCEMENTS

### Lectures

Friday Mar.24 — This is a joint meeting with the Agate and Mineral Society. Mr. E. H. Rockwell, assisted by Mr. Thomas A. Carney, will present a very unusual group of colored slides of polished rock sections. There are about 150 slides in this collection. and to our knowledge have never been shown in this area.
In addition to this, Mr. Harold B. Say of the Oregon State Highway Department will show the film "The New Oregon Trail". This is one of the group of Oregon films being shown at San Francisco Fair. Remember the date - it looks like another fine program.

Friday Apr.14 — Lt. W. M.Scaife, who is in charge of the field work by the United States Coast and Geodetic Survey along the Columbia river, will lecture on "MAPS, AND WHAT UNDERLIES THEM". He will discuss the development of mapping and the planning of "controls", and will show a number of slides illustrating the nature of the field work required. Also he will tell us of his experiences, with explanation of the methods and principles involved, during his recent redetermination of the altitude of Mount Hood. A really worthwhile lecture of interest to all! Reserve the date!

Members of the Geological Society refer to maps continally. To afford them an understanding of the principles involved and to aid them in the effective use of maps, the program committee contemplates a series of lectures on the construction and interpretation of topographic and geologic maps. The lecture by Lt. Scaife is the first of the series; others will be interspersed in the year's program.

### Field trip by the Mazamas

Sunday Mar. 26 — A Mazama trip which will be of interest to members of the Geological Society, and to any of whom a cordial invitation to participate is extended, will be led by our own Franklin Davis, with past-president Hughes of the Mazamas as co-leader, on Sunday, March 26. The party will go to the Red Bluff slide area between Table Mountain and Greenleaf Park, north of Bonneville, where there have been recent further movements of a rather spectacular order. Departure from the Pacific Building at 7:30 a.m. Members of the Geological Society who intend to accompany the party are requested to communicate in advance with Mr. Davis, TR 7568.

## EXTENSION COURSE ANNOUNCEMENTS

Third Term Course in Geology, begins Thursday, March 23, 1939.

G.201p. General Geology - spring term - 2 hours. An introductory course dealing with the processes at work changing the face of the earth; the internal structure, composition, and activities of the earth; the economic geologic deposits; a survey of the main events in the history of prehistoric life including man and current events having geological backgrounds. Dr. Hodge, Thursday, 7:15 p.m. Room 110.

G340p. Elements of Paleontology - spring term - 2 hours. An introductory study of the more common types of invertebrate fossils, including forms occurring commonly at localities in the Northwest. Dr. Packard. Thursday 7:15. Room 202.

## WEDDING BELLS.

An interesting event of last week-end was the marriage Saturday noon, March 11, of Mrs. Lillian W. Neff, daughter of Mr. and Mrs. Conrad Wyss, and Mr. Frederick H. Strong. On their return to Portland the end of March, the couple will make their home at 2755 NE 51st Avenue. The best wishes of members of the Geological Society of the Oregon Country are extended to Mr. and Mrs. Strong.

## DUES

Dues are now payable. Make checks payable to the Geological Society of the Oregon Country.

# M E T E O R I T E S

By J.Hugh Pruett
Western Director, American Meteor Society.

"Rather than believe that stones fell from heaven, I would think those Yankee professors would lie". Such a statement is accredited to President Jefferson when told that the Yale investigators, Professors Silliman and Kingsley, reported that a shower of rocks actually peppered Weston, Conn., one morning in 1807. The President's disbelief in such penomena was at that time shared by many, including noted astronomers. Later, when serious attention was given the subject, the evidence that the earth actually receives visitors from space became overwhelmingly convincing.

A meteoritic "fall" may be a single meteorite or a shower of such bodies. Thus we may speak of the Willamette fall which, as far as is known, consists of only one piece; or the Holbrook, Arizona, fall from which 17,000 individual stones have been picked up since the shower took place about sunset, July 19, 1912.

Dr. Nininger's listed meteoric "finds" (recovered falls) had in 1933 reached about 1000 for the entire world during all recorded history. His new list in 1937 brought the total to 1,127. Of these 556 were from witnessed falls; 571, unwitnessed. Of the finds between 1933 and 1937, Dr.Nininger was responsible for slightly over one half of them. The writer knows of no one who has ever been so successful in running down these celestial visitors as is this Denver scientist, now the president for the Society for Research on Meteorites. By 1938, additional finds, principally those from foreign countries previously unreported, brought the listed number of 1204.

The rapidly increasing number of finds is evidently due to the wide publicity the general subject is receiving in the press the past several years. People everywhere are sending in "suspected" rock specimens for examination. Occasionally one proves to be the "real thing". During the past few years the writer has received real showers of stones through the mail - hundreds of them - from the Pacific Northwest. Unfortunately not one has been a meteorite. The most common material received is the humble "clinker" from the remains of a straw stack or a tree root where intense heat has fused the ashes. These are light in weight and full of holes, conditions not found in meteorites. Also in great numbers come pieces of sandstone, quartz, limestone, shale, garnet-schist, pyrite, granite, etc.

The Brezina system of classification lists 76 distinct types of meteorites. It is fortunate for most of us that these may all be included nicely in three general classes: iron, stony, and stony-iron.

The iron meteorites are composed principally of iron and nickel. There are usually very small amounts of a few other elements. The percentage of nickel runs from about 5 to 16 per cent but seldom reaches this upper limit.

Although etching with chemicals is a much-employed process in metallography, yet terrestrial alloys never give distinct type of patterns brought out in meteorites. The conditions of formations of these "celestial" alloys seem to have been different from anything that we know on the earth. The beautiful Widmanstatten figures (so called from Alois von Widmanstatten of Vienna, who first produced them in a meteorite in 1808) seem to be a sort of signature of the heavens, which identifies the bearer in no uncertain terms. These figures usually appear as straight bands running parallel to each other or crossing at various angles.

These figures may be produced by the application of chemicals or (at least in some cases) by heating. The latter process is the one originally employed by Widmanstatten on the Agram meteorite. The method so successfully used by Dr. Nininger is as follows:

A slab is cut from the meteorite and the plane face highly polished. All cracks, fissures, or sulphide inclusions are carefully filled or covered with shellac, and the face is again finished on a grit of 400 or finer. The specimen, polished-side up, is then brushed with dilute nitric acid - about 6% is usually found to be the best, although with some meteorites a slightly stronger solution is needed. The liquid is not allowed to remain unmoved on the meteorite but is constantly agitated and renewed by the brush.

Usually only a few seconds of brushing are needed to give the first intimation of the Widmanstatten figures, and seldom more than five minutes to complete the etching. Then the acid is completely washed off, and the specimen is well dried. Finally the etched face is given a thin protective coat of clear lacquer.

The figures produced by the etching are due to the fact the meteorite is composed of more than one nickel-iron alloy and these are not acted on with equal vigor by the acid. The most conspicuous figures are the long narrow plates. These sometimes vary abruptly in color in adjacent parts of a meteorite; in others, they appear uniform throughout.

The main body of the plate is kamacite and is usually given the chemical formula $Fe_{14}Ni$. Bordering the plates, there is usually a very thin line of taenite. Many meteoritic authorities do not believe taenite has a definite unvarying composition but that it is a mixture of orthotaenite ($Fe_2Ni$) and kamacite. Filling in the spaces between the plates, there are often fair-sized metallic blocks, sometimes of irregular shape. This has been assumed to be a third alloy, plessite. But some chemists believe plessite is a mixture of kamacite and taenite and that no third definite alloy exists. It is probable then that only $Fe_{14}Ni$ and $Fe_2Ni$ need be considered as definite. The kamacite makes up the main mass of an iron meteorite. If it should exist alone, the composition by weight would be about 93% iron and 7% nickel.

It is well known that the kamacite plates produced by etching are of varying widths. This leads to their classification as finest, fine, medium, coarse, and coarsest. The Carlton, Texas, meteorite shows the finest of Widmanstatten figures. The meteorites from the vicinity of the Arizona Meteor Crater give coarse figures. The fundamental cause of the width of these bands is well known. When the percentage of nickel in the meteorite is low, the figures are coarse. The higher the nickel content, the finer become the bands.

Although a great majority of the iron meteorites will show the Widmanstatten figures when etched, still there are two small classes which do not.

The large group just discussed is usually referred to as the octahedral class; the individual meteorites as octahedrites. In these, the kamacite bands are so arranged that they may be considered as parallel to the faces of a regular 8-sided figure, or octahedron. According to Farrington, whenever the nickel content is from 7% to 15% of the compsition, the crystallization takes place in this form.

Whenever the nickel content is 5% or 6%, the crystallization is in the hexahedral, or cubic, form. These meteorites are called hexahedrites. The regular etching materials produce in these only little furrows, known as Neumann lines.

The third class, ataxites, show neither the Widmanstatten figures nor the Neumann lines. These seem to have no definite arrangement or crystallization. Most of the ataxites have either very high nickel content, 15% to 20%, or very low.

A very few meteorites show varying types of Widmanstatten figures in different parts. The Willamette meteorite is an example. In some places the long kamacite bands appear; in otners, polygons something like quilt pieces. Some have assumed off hand that this is due to the way the crystals have been cut: when cut lengthwise, long bands are shown; when "across tho grain", the polygons.

Some real authorities on the subject do not think this is the explanation at all. Nininger believes the meteorite has crystallized differently in different places. Buddhuo of Pasadena feels the same way about it. In a letter to the writer he says that he is doubtful about the suggestion that the variations are due to the way the cutting is done. "If that were it, I would expect the same structure to appear in other meteorites. The only thing like it that I know of is the Murn Peowie meteorite from South Australia. Even this does not resemble the Willamette any too closely. I have often wondered about this peculiar structure, but have never come to any satisfactory conclusion regarding it. The bext explanation that I have so far is that part of the metal crystallized as ordinary iron does, in polyhedral crystals, and part as a meteorite does".

In the stony meteorites we have a widely different composition from that of the irons. The principal mass of these meteorites is not metallic but of a stony nature. Scattered in the stony material there are found grains of nickel-iron, which range in size from not much more than dust to quite sizable pieces. Although the nickel content of these metallic grains generally does not run higher than in the octahedrites, yet in some cases it may reach nearly 40%.

It is sometimes said that the absence of nickel in a specimen definitely removes it from the meteoritic class. However, it is true that there are about half a dozen known stony objects which are strongly suspected of being meteorites although chemical tests have failed to disclose nickel. But Farrington has said it is doubtful if any stony meteorite is ever entirely free of nickel. Budhue has made the statement that "no bona fide meteorite is known which does not contain some nickel."

While no elements unknown to the earth have ever been found in meteorites, yet many combinations of elements, or minerals, are found nowhere excepting in these celestial visitors. It is also true that many terrestrial minerals are unknown in meteorites. Common to both earth-rocks and stony meteorites are magnetite, chromite, enstatite, limonite, olivine, plagioclase and many others. It was once said that quartz was never found in meteorites, yet it is now thought that its presence has been definitely proven. Gold, platinum, and small diamonds have been found in these objects.

Found only in meteorites are schreibersite, oldhamite, moissanite, maskelynite, and several others. Never found in meteorites are the stratified rocks so common to the earth. Nor do meteorites contain material resembling granite, the more acid igneous rocks, gneiss, limestone, schist, sandstone, and metamorphic rocks.

The most interesting thing about stony meteorites is their structure. This is brought out to the best advantage by magnification, yet this is not always necessary. Fully 90% of all the stony meteorites known are conglomerate masses of various kinds of pellets cemented together. These pellets are usually called chondri. The chondri vary in size but most of them are about of the dimensions of millet seeds. They are often spheroidal, but many are very irregular in shape. According to Tschermak and others, these chondri may consist of chrysolite, bronzite, augite, plagioclase, glass, nickel-iron, chromite, enstatite, etc.

Any one stone is not made up of pellets of the same material. The amazing thing is that cemented together are broken fragments of various kinds of minerals. Examination through a microscope of low power will show various colors and shapes due to the heterogeneous mixture. A few stony meteorites are so fragile that when broken they separate into individual chondri very readily. Usually, however, the cementing is so tight that breaking is just as apt to occur right through the center of these pellets as along their borders.

Many are the conjectures as to the original formation of the chondri and their collection and cementation into the stony meteorites. Somewhere in the universe there have taken place most interesting processes, the nature of which is not clearly evident to us. Some have thought that the pellets are fragments of pre-existing rocks which by attrition were given the spheroidal shape so common to most of them. Masses of these - and of various kinds - were finally swept together and cemented in some cosmic furnace. Others suggest that minute drops of melted stony matter have cooled and produced the chondri. Others think they were formed somewhat as are volcanic tuffs; still others, that they are the result of crystallization from molten masses. It seems, however, that objections have been raised to all of these supposed processed.

We have discussed the iron meteorites and the stony meteorites. There is a third class which is rather intermediate, the stony-iron. Instead of nickel-iron making up practically the entire mass, as in the first class, or the stony material greatly predominating, as in the second class, we find in the stony-irons a sort of "sharing the honors" between stone and metal. These meteorites are by far the most rare and beautiful of any, and consequently bring the best prices.

The minerals in the stony-iron meteorites are usually silicates. In one type, the pallasites, we find principally olivine, a silicate of iron and magnesium. The olivine crystals are of various colors, depending upon traces of impurities in them, but usually of the same color throughout an individual meteorite. In various pallasites the colors found are brown, brownish red, yellow, yellowish green, and green.

The nickel-iron alloy in the pallasites is arranged in a sort of network like the framework of a sponge. When cut across so as to form a plane face, a sort of silvery honey-comb effect is produced. In these cells the olivine is held. The olivine grains are usually bordered by a thin layer of kamacite, thus showing that the nickel-iron solidified after the mineral. It is said that the metal in pallasites etches like the octahedrites among the irons. The famous Lost Port Orford is a pallasite.

In the other type of stony-irons, the metal does not form a well defined network but tends to collect in large grains. We may thus have a mixture of large metallic and silicate grains.

Freshly fallen meteorites show the characteristic fusion crust, the result of the re-solidifying of the surface which was melted by the terrific friction encountered during the passage through the air. The color of the crust is usually black or dark brown due to iron compounds, but at least one is known on which the crust is yellowish. Iron meteorites do not generally form as definite crusts as the stones. The iron crusts are of the same chemical composition magnetite, $Fe_3O_4$. The crustal appearance of the stony meteorites varies with the composition. Some minerals fuse easily and usually form a smooth crust which looks like varnish. The majority, however, carry crusts that are rough and scoriaceous.

The cause of much controversy are the tektites, those curious pieces of sculptured glass which are found in great abundance in certain localities in a great circle around the earth. They are found in Malaya, Australia, French Indo-China, the Philippines, Czechoslovakia, Lybia, and the African Ivory Coast. They are usually only a few grams in mass and vary greatly in color, although in any locality the color is uniform. Some scientists consider the tektites are meteoritic glass; others think them terrestrial. The nickel-iron josephinites of southwestern Oregon furnish another controversial topic.

It can be shown mathematically that a meteorite in the form of a rather flat slab will fall through the air flat side ahead rather than edgewise. The fused front edges will at once wash away and form an apex on the forward side. The Willamette is an example. If a meteorite has an apex when it enters the atmosphere, this end will turn forward providing the apex is not too long. Schlichter has shown that if the center of mass is less than 3/8 of the semi-diameter from the geometrical center of the body the apex goes ahead; if more than 3/8 of this distance, the apex will follow. A "tad-pole" shaped meteorite would travel with the large end ahead.

Only three authenticated meteorites have ever been found in Oregon: the Port Orford - likely over 20,000 pounds - in 1859; the Sam's Valley - 15 pounds - in 1894; and the Willamette - over 31,000 pounds - in 1902. The only known preserved specimens of the Port Orford are 4 grams in the Vienna Museum and 25 grams in the Smithsonian Institution in Washington, D.C. The main mass is still lost in the Oregon hills. The olivine crystals are greenish yellow according to a letter from the curator at our national capital. The principal mass of the Willamette is at the American Museum of Natural History in New York. This museum presented the University of Oregon with a beautifully etched slab of this meteorite in 1938. Other specimens are found in many museums. The Sam's Valley was distributed by the Foote Mineral Co. of Philadelphia. The museum where the Willamette resides has over 5 pounds of this meteorite, and has very recently told the writer that it is believed a piece may soon be returned to Oregon.

How does it happen that some meteorites are almost completely nickel-iron, others stony, and others intermediate between these? Of course no one knows, but many scientists have suggested that the pieces from space which are now and then reaching the surface of the earth are remnants from some disrupted planet, although not necessarily a member of our solar system. Wiechart suggested this in 1897, and Farrington in 1915. Recent advocates are Leonard of U.C.L.A., formerly president of the Society for Research on Meteorites, and Urry of Johns Hopkins. Jeans of England who holds that the asteroids are the result of a disrupted planet, should favor this.

It is generally agreed by geologists and astronomers that the central part of the earth is an alloy of nickel and iron. (There is not such general agreement as to whether it is solid or liquid). If a planet such as the earth should explode, it seems quite likely that any fragments reaching other planets as meteorites would fall into classes just as do meteorites known to us. Those from the center would be nickel-iron. Those from locations farther out would still contain large quantities of this metal but in addition might contain much stony material such as the pallasites. Those from near the surface would be predominately stony with only small inclusions of metal. If the exploded planet were just like our earth, we should find a fourth class of meteorites, sedimentary rocks.

In spite of our uncertainty, we are sure that the birth place of meteorites presented a scene of terrific heat and cataclysmic disruptions.

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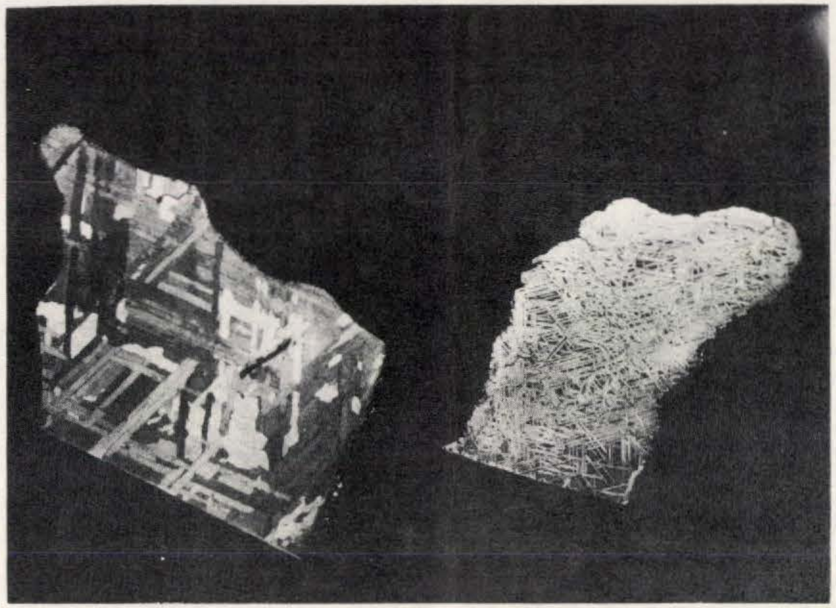

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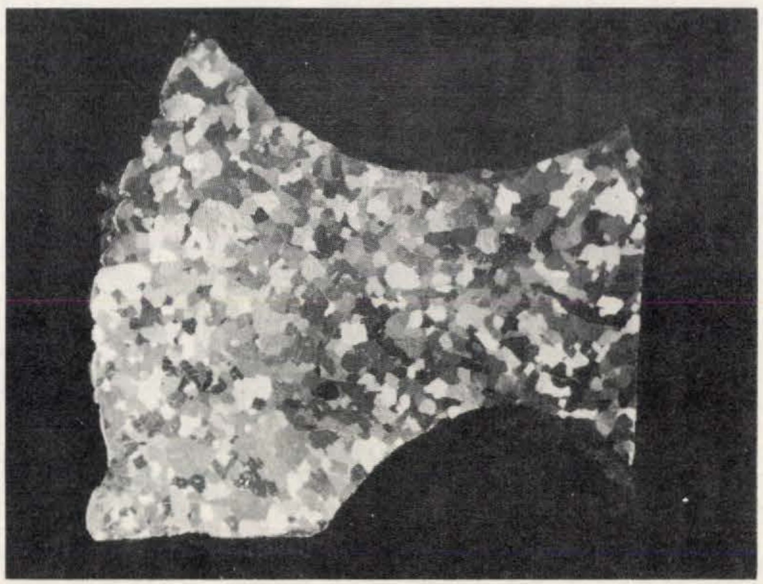
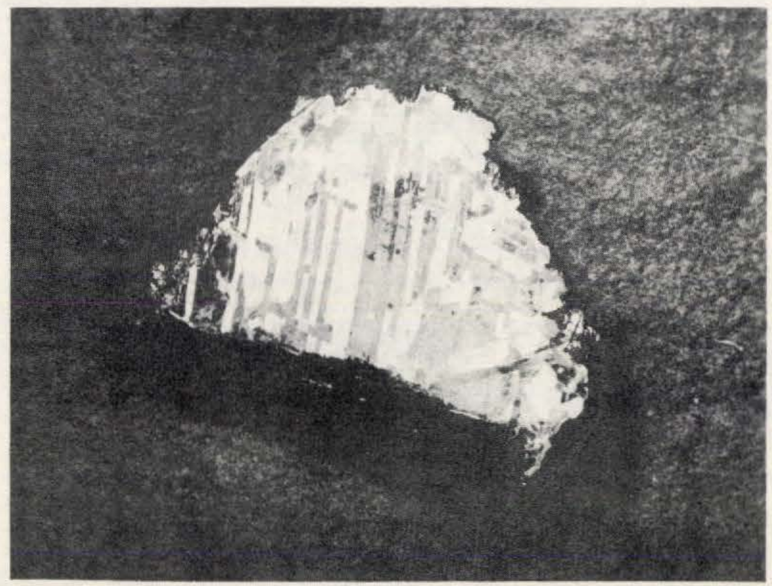


ETCHED SLAB OF WILLAMETTE METEORITE
"ACROSS THE CRYSTALS"



ETCHED SLAB OF WILLAMETTE METEORITE
"WITH THE GRAIN"

# GEOLOGICAL NEWS LETTER

VOL. 5 NO. 7 PORTLAND, OREGON APR 10 1939

OFFICIAL PUBLICATION OF THE GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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THE GEOLOGICAL NEWS-LETTER

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Editor-in-Chief and Business Manager

Raymond L. Baldwin
345 U. S. Court House
Portland, Oregon

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MEMBERSHIP APPLICATION

<u>GEOLOGICAL SOCIETY OF THE OREGON COUNTRY</u>

<u>Qualifications and Dues</u>

A <u>member</u> shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A <u>junior member</u> shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00

Date ________________

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

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I am particularly interested in the following branches of Geology: ____________________
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I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

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Signature

## ANNOUNCEMENTS

### Lectures

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Friday Apr.28 — Mr. J. C. Stevens will give us a lecture entitled "Silt and Civilization." It will consider the problems of silt movement in the southwestern United States in relation to the permanence of the existing and potential reservoirs in which water can be stored for irrigation and other essential uses. It will be adapted from the paper he gave recently before the American Geophysical Union at Los Angeles which made a deep impression on engineers and conservationists.

Mr. Stevens is one of our own members and a civil engineer of national repute. His subject on this occasion is one which brings out one conflict of geologic processes with problems of human existence; it is a thought-provoking, stimulating discourse.

### TRIPS

Sunday Apr.16 — The Geological Society of the Oregon Country will visit a new fossil leaf locality on Sunday, April 16th, under the leadership of Past President Ray Treasher. With reasonable care, excellent specimens of fossil ginkgo leaves can be secured.

The caravan will assemble in front of the Portland Public Market, S.W. Front Ave. and Yamhill St., at 9:00 a.m. This new starting place will cause less interference with traffic.

The route from Oregon City will follow the Molalla highway for two miles, then east on Highland road through Clark's and Messinger corners to Anderson's Park on Molalla river for lunch. Fossil beds will be visited in the afternoon. Interesting types of volcanic mud flows, tuffs and lavas will be studied.

Mrs. A. D. Vance had her tonsils out last week -- we agree with Mrs. Vance, it is no laughing matter.

******

The Executive Committee has received and with regret announces the resignation of Miss Ruth E. Hickman as secretary of the Society. Miss Hickman's action has been dictated by the very serious and likely prolonged illness of her mother, which makes heavy demands on her time. The sympathy and understanding of the Society are with Miss Hickman, with gratitude for the competent manner in which she had undertaken the duties of the office that circumstances now force her to relinquish.

******

Dr. Osgood spoke before the American College of Physicians at New Orleans March 27th. He told of a new and possibly a revolutionary method of treating cancer of the blood.

******

Mr. Earl K. Nixon spoke at the meeting of the Oregon Agate and Mineral Society. He discussed the various minerals and geological features of Oregon.

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THIS IS THE LAST ISSUE OF THE NEWS LETTER THAT YOU WILL RECEIVE IF YOUR ANNUAL DUES ARE UNPAID. THE COST OF PUBLICATION IS SUCH THAT THE SOCIETY CANNOT CONTINUE TO CARRY YOUR SUBSCRIPTION.

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Bulletin 896 U.S.G S. Lexicon of Geologic Names of the United States (including Alaska) by M. Grace Wilmarth. 1938. Part I, A.L., pp. 1-1244; part 2, M-Z, pp. 1245-2396. Price $2.50 set.

This bulletin is the work of the Committee on Geologic Names of the United States Geological Survey. The formal definitions of the formations state briefly the lithologic character, thickness, geologic age, stratigraphic relations to underlying and overlying formations and type locality. Citations to the publications in which the formations were first defined are listed. There are approximately 150 references and descriptions of Oregon formations and at least as many more for Washington listed. Due to a duplication of orders sent in there is one set available for immediate delivery. Anyone interested please call Tracy Wade, Trinity 6060, or Capitol 0523.

******

The School of Geology and Mining which is being held in Bend by Leslie Motz and John Eliot Allen, members of the State Department of Geology and Mineral Industries, we are informed is very popular. The school started March 21 and is held on Tuesday and Wednesday nights and is to run for six weeks.

******

Its fourth annual banquet was a gay and happy occasion for the members of the Geological Society of the Oregon Country, Friday evening, March 3, in Reed College Commons. The attendance was not quite as large as last year, but the entertainment features were equally as good, and perhaps enjoyed more because the business necessary to closing the past year's work had already been taken care of. The annual business meeting was held Friday evening, Feb. 24th, in the Public Service Building auditorium.

Spring flowers were used for table decorations. A large and beautiful centrepiece marked the speaker's table. The dinner was served soon after seven o'clock to an assemblage numbering about 150 members and their guests. Seated at the speakers' table were the guest speaker, Dr. Warren D. Smith, of the University of Oregon at Eugene, and Mrs. Smith, the toastmaster, Mr. Clarence D. Phillips, and Mrs. Phillips, the retiring president, Mr. Ray C. Treasher, and Mrs. Treasher, the newly elected president, Mr. Arthur M. Piper, and Mrs. Piper.

Immediately following the dinner, Toastmaster Phillips introduced some of the guests, among which were Dr. E. T. Hodge, founder and first president of this organization, Dr. E. G. Houseman, president of the Oregon Agate and Mineral Society, City Commissioner O. R. Bean, a grandson of Dr. Condon, who was one of Oregon's first geologists, H. A. Rand, of U. S. Engineers, and G. S. Paxson, of the Oregon State Highway Department at Salem, a member of the Geological Society.

Mr. Ray C. Treasher, retiring president, spoke briefly. He said this society is a unique organization. Nowhere else can there be found such a group of people, amateurs, interested in geology - rocks, minerals, etc., who will listen to a scientific lecture twice a month, and go on field trips twice a month for the study of geology.

In appreciation of his service as president during the past year, Mr. Treasher was presented with a copy of "The Lexicon of Geologic Names of the United States", in two bound volumes. Mr. Raymond L. Baldwin made the presentation for the Society.

Following introduction of the new officers, Dr. E. T. Hodge reviewed the early history of the organization, how it had its beginning in a University Extension class in geology in the spring of 1935.

Dr. Warren D. Smith, of the University of Oregon, was the principal speaker. His topic was "Crooked Trails", and his talk consisted of many interesting stories of experiences while doing field work in geology in various parts of Oregon. In closing he referred to his summer work at Crater Lake as geologist, and spoke with feeling of the Phantom Ship, saying that it really does sail each evening as the shadows fall.

Dr. Smith was presented with a desk pen having a base of polished black marble from the Wallowas. Imbedded in the rock was a gold geologist's hammer, the same as worn by members of the Geological Society. The presentation speech was made by A. D. Vance, a former president.

At intervals throughout the first part of the program a series of so-called telegrams were read by the toastmaster, and he assigned Dr. Hodge and Mr. Treasher to prepare replies. The "telegrams" were signed by fictitious persons, among them the famed Dr. Traprock of a previous banquet, and were questions on geological subjects. The witty answers to these telegrams had a prominent part in the merriment of the evening.

The second part of the program began with a song by the assembly to the tune of "The Old Gray Mare". The song was one from the Geological Society's song sheet, titled "The Oregon Country Ain't What She Used to Be."

Feminine Fossil Foolishness was presented by a group of women with singing and pantomime, using the tune "My Bonnie Lies over the Ocean" for their song, "Fossil Dreaming", also from the song sheet. Going through the motions of digging for fossils they picked up and waved large "fossil" bones. These bones, the property of Dr. and Mrs. W. C. Adams, were once used by Dr. Condon as comparative anatomy in his study of real fossil bones. Principals in this number were Mrs. May V. Walker, and Mrs. Leo Simon, who very creditably played the parts of cave dwellers, gesticulating wildly at each other.

Adam's Antics portrayed the rejuvenation of a dinosaur. While Dr. E. R. Abbett sang, Ferdinand, the dinosaur, was led in by a rope in the hands of Mr. Geary Kimbrell, and cavorted about. The song was a parody on a well known song of today. In introducing the number, Toastmaster Phillips explained that this strange creature was found in an eastern Oregon cave encased in ice, and when it was thawed out, it came to life. Dr. W. Claude Adams was the dinosaur, and looked the part, in a greenish colored model of this prehistoric animal. A fog horn in the background was used for the roar of the dinosaur. It was manipulated by Mr. Henry Abbett.

While the Wallowa Whiskered Warblers were costuming, Toastmaster Phillips read some Geologic Guess Whats or riddles sent in by various persons. If no solution was offered, the author was called upon to give the answer. The Warblers appeared as four male members of the G.S O.C. summer camp last year. They told in song the story of what happened as the result of a forgotten razor. Dr. Arthur C. Jones posed as J. Martin Weber, wearing a huge red beard and carrying a ukelele. Kenneth Phillips wore a thick white beard, representing Ray C. Treasher. Arthur M. Piper appeared as H. B. Schminky, with ~~a~~ long thin black whiskers, and E. N. Bates wore a black Vandyke in imitation of Dr. Francis Jones, who, as the only unmarried one continued to wear the adornment for some time after returning home.

The long and splendid program ended with the song "Good-bye, Rock Hunters, Good-bye", written for the tune "Good-bye, My Lover, Good-bye".

- E. M. Barr

******

As founder of our Society, Dr. Hodge was called on for a speech and in the following few remarks gave us some real food for thought.

Friends of the Geological Society of the Oregon Country: It is true I was active in the founding of the society - an act of which I shall always be proud. At every beginning there needs be someone upon whom to fasten the responsibility of an event. I just happened to be that passing man who was accidentally included in and charged with being responsible for the group. I had never helped in the founding of a society before and felt like the man who protested because he had never ridden a horse but was encouraged by the remark "Don't worry - the horse also has never been ridden before." The beginnings of this society met well the warning of Shakespeare "Meet the first beginnings; look to the budding mischief before it has time to ripen to maturity."

The society was the spontaneous result of the fact that "men know vast things but understand little that they know." The society was the result of those who wished to understand as well as simply know. There are others, not members of our society, for whom these words were intended, "Poor paltry slaves - yet born midst Nature's noblest scenes. Why - Nature, waste thy wonders on such men."

The greatest teacher is Nature. To those who have not been devitalized and mechanized by the froth that rides on the surface of civilization there is no need to call them to Nature, the great teacher. For to them "There are vistas in the sunset, there are murmurs in the winds, that are calling them to follow."

The true searcher after the realities, the basic facts and the joys of Nature, are the people who seek our society and the help it gives. They know that Nature does not capriciously scatter her gifts to lazy pets and luxurious darlings, but imposes tasks when she presents her opportunities and uplifts him whom she would inform. The apple that she dropped at the feet of Newton was her coy invitation to follow her to the stars.

Nature is a frugal mother and never gives without measure. When she has secrets to reveal she demands that the hearer be qualified. Our society exists to qualify men to know Nature.

For the average ignorant person he must travel far, pay his guide large fees and be capable of marveling only at the exceptional. For the wise members of our society we marvel at the commonplace things in our country and we pay no man a fee to tell us that it is marvellous. The greatest wonder of all is the regularity of Nature.

Some men seek riches, but nothing is rich except the inexhaustible wealth of Nature. To most seekers after wealth, Nature is invisible; to many she is only an upper surface; to us she is many fathoms deep.

To be a member of this society is like the art of conversion in Christianity. It is the first step towards the salvation of our truer selves. We approach that state and begin to know the earth that swings.

Between the silent stars, through endless space
We begin to share the majesty of infinite things.

******

We missed our good friend Phil Brogan at our Banquet. He sent a letter to Toastmaster Phillips saying he was taken sick the day before the banquet and did not think it advisable to make the trip this year.

******

From far-away Yale campus our fellow member C. Frazier Booth sent the following poem which was read at the banquet.

ODE TO FATHER.

Your crushing-rock course never fails,
But much too tough are dear old Yale's.
I wish they were as gneiss, as frail,
   As that old Oregonian shale.

My father's rocks I learned to haul;
No useful brain did it install;
Its only use is in a brawl,
   When "Doc of Entry" Booth is called.

******

U.S.G.S. BULLETIN 875 - NON METALLIC MINERAL RESOURCES OF EASTERN OREGON:
by BERNARD H. MOORE. 1937. 180 pages.

This bulletin covers the general geology and mineral resources of several areas which we have visited on our field trips and other areas with which we are individually familiar. Fourteen deposits of diatomite are described, several pages being given to the Terrebonne deposit. These deposits range in age from those in which deposition is now in progress to middle Miocene, among others are Klamath Lakes area, John Day valley, Malheur and Harney Counties. Eleven deposits of limestone are described including notes of Dr.Packard on the geology and fossils in the beds near Supplee, also several locations with general geology in the Wallowa Mountains. Several locations of marketable lump pumice are described including Crater Lake, Newberry Crater, and Northern Lake County. Asbestos deposits in Baker county are also described.

The bulletin is well illustrated, showing locations and microphotographs of diatomite species and is well supplied with geologic sketch maps with four separate maps in a pocket.

Considering our familiarity with the region and pertinent subject this bulletin should be of considerable interest to our members. The price is thirty cents.

- T. Wade.

******

Excerpts from Dr. Smith's letter to President Piper, March 8, 1939.

"Although I thanked the Society last Friday evening for the very much appreciated gift of the desk pen, I wish to put this in the form of a letter which might go into your files i you care to place it there. I cannot tell you how much this particular little gift means to me, but I can think of scarcely anything else that would be so acceptable, because it combines the associations with the Geological Society, and will remind me always of the

Wallowa country, where I have spent many weeks of pleasant and interesting work. I hope that the members of the Society enjoyed the occasion half as much as I did, and if they did, I know they had a very good time."

"I have endeavored in the past to get a local branch of the Society started in Eugene, and will continue to work to that end during the coming year".

"I hope we may have the pleasure of another visit from your Society to the Eugene territory, when we can have another interesting field trip".

"With kind regards to all the members and officers of the Society".

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GYPSUM & ANHYDRITE, and LITHIUM.

The U. S. Bureau of Mines announces, among their new publications, two which deal with minerals and the economics of their production. "Gypsum and Anhydrite", by Forrest T. Moyer, 1938, 45 pp., 3 figs., presents the various methods of producing and processing gypsum and anhydrite into their products and gives a general picture of the gypsum industry. Includes a bibliography. "Lithium", by Frank L. Hess, 14 pp., 4 figs., gives the history of lithium, its discovery, description, distribution in nature, and uses, together with a list of lithium minerals.

These publications are listed in the monthly list issued free by the Bureau, entitled "New Publications Bureau of Mines", and it will be sent to anyone requesting it. The two publications mentioned above may be requested as follows:

Address:
Section of Publications,
U. S. Bureau of Mines,
Washington, D.C.

| | | |
|---|---|---|
| Information Circular 7049 | Gypsum and Anhydrite | (free publication) |
| Information Circular 7054 | Lithium | (free publication) |

(RCT)

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LOG
PAST PRESIDENT'S TRIP NOTE NEW MEETING PLACE

Meet in front of PUBLIC MARKET, Front & Yamhill, 9:00 a.m. Proceed to Oregon City, and reassemble at left turn to Molalla road. Standard Oil service station, S.E.corner; Shell Oil station, N.E.corner.

MILEAGE:

o.o Oregon City, junction Pacific Hwy. and Molalla road.
0.7 Top of hill, turn right.
2.0 Left turn, on Highland road, signboard marked "Beaver Creek", "Golf Club".
4.8 Stop
5.6 Stop, explanation of boulders.
6.3 Beaver Creek store. Take road to left marked "Colton", "Clarks".
7.2 Turn right.
8.5 Road cut, weathered basalt, center of east line section 35.
9.0 Felsite outcrop, no stop. Elev. 810 feet.
9.9 Road cut, weathered vesicular basalt.
10.1 Messinger Corners, continue straight ahead.
10.5 Contact of tuff and felsite.
10.9 Bedded tuff.
13.2 Clarks - straight ahead.
15.6 View of Milk Creek valley.
16.4 Exfoliated felsite. Elev. 800 ft.
16.7 Bedded sediments. Elev. 700 ft.
17.2 Bedded sediments. Elev. 475 ft.
17.7 Cross Colton road, continue straight ahead.
18.6 Molalla river, turn left.
18.8 Turn right
19.2 Tuff.
20.4 Turn right
20.7 Agglomerate boulders on surface. Elev. 535 ft.
20.9 Agglomerate, elev. 425 ft. Turn right and cross bridge.
21.0 Enter Camp Ground, right. Arrangements for free parking provided by Mr. Vance.
LUNCH.
21.8 Turn left to fossil locality. This general locality is described in Bul. #6, Oregon State Dept. of Geol. & Mineral Industries as Molalla Reservoir locality. SE$\frac{1}{4}$ SE$\frac{1}{4}$ sec. 15 T. 5 S. R 2 E.

Quadrangle maps - Oregon City and Estacada maps cover area from Oregon City to stop at mile 15.6. There are no topographic maps for the remainder of the trip.

# GEOLOGICAL NEWS LETTER

VOL. 5 NO. 8 PORTLAND, OREGON APR 25 1939

OFFICIAL PUBLICATION OF THE GEOLOGICAL SOCIETY OREGON COUNTRY

PORTLAND OREG.

GEOLOGICAL NEWS-LETTER
Official Publication of the
Geological Society of the Oregon Country
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POSTMASTER: Return Postage Guaranteed

DR & MRS A C JONES
3300 S E HEATHER LANE
PORTLAND, OREGON

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY




THE GEOLOGICAL NEWS-LETTER

Official Publication of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Editor-in-Chief and Business Manager

Raymond L. Baldwin
345 U. S. Court House
Portland, Oregon

Associate Editors

| | |
|---|---|
| Edwin T. Hodge | A. D. Vance |
| Arthur M. Piper | C. D. Phillips |
| Ray C. Treasher | K. N. Phillips |

News-Letter issued semi-monthly on the 10th and 25th.

Yearly Subscription: $2.00. Single copies: $0.15

All communications and material for publication should be sent to the Editor-in-Chief. Change of address is required 30 days in advance of the date of proposed change.


MEMBERSHIP APPLICATION

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00

Date ____________________

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

________________________________________
Address

________________________________________
Business Address

____________________ ____________________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ____________________
________________________________________

Sponsored by: ______________________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________________
Signature

HIGHWAY RESEARCH ABSTRACTS - MARCH, 1939.

A HOME-MADE BRAKE TESTER

Many cities now have periodic safety inspections for automobiles and a large percentage of the cars tested fail to pass the brake test. In an effort to reduce the number of failures on this test, the Safety Council of Kansas City, Missouri, conducted tests to find a means by which motorists could check their brakes before appearing at the testing station. The most practical test developed required no more elaborate equipment than a quart milk bottle. To make the test, pour a pint of water into the quart bottle, cap it and set it upright on the floor of the car. Drive the car at 20 miles per hour and then apply the brakes. If the bottle does not upset, the brakes will not pass official inspection.

The American City Magazine, February, 1939, p. 18. Highway Research Abstracts, March 1939.

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Roadside Development Photographs which received awards at the 18th Annual Meeting of the Highway Research Board have been incorporated in an artistic display appropriate for highway conventions and available for exhibition by application to the Division of Information, U. S. Bureau of Public Roads, Washington, D.C. The display consists of four colored panels on double action hinges, adaptable to varying space area, the panel dimensions being 4 by 8 feet, excluding frames. Pictures, with printed descriptions, are shown on both sides of the panels.

The exhibition has been on display at the Annual Winter Meeting of State Garden Clubs, Indiana, and at the Iowa State College Annual Short Course.

Organizations using the exhibit are asked to pay freight or express charges. The weight of the exhibit, packed, is approximately 425 lbs. Advance applications for its use will assist in routing the exhibit, and probably save costs by making possible shipment by freight.

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NEW MEMBERS

| | | |
|---|---|---|
| Hugh Miller, Jr. | | 2691 S.W.Buckingham St. |
| Earl A. Marshall | TA 5953 | 1172 SE 55th Ave. |
| Mrs. Mildred P. James | TA 7106 | 135 SE 52nd Ave. |
| Miss Margaret Hughes | | 1524 SW 10th Ave. |

REPORT ON THE LIMONITE IRON ORES OF COLUMBIA COUNTY, OREGON
Williams & Parks
The Oregon Bureau of Mines and Geology, May, 1923.

SNOWS OF YESTERDAY
Kenneth N. Phillips

SOIL SURVEY OF CLACKAMAS COUNTY, OREGON
Kocher, Carpenter & Taylor Bureau of Soils 1921

SOIL SURVEY OF MULTNOMAH COUNTY, OREGON
Ruzek and Carpenter Bureau of Soils 1919

SMALL SCALE PLACER MINES AS A SOURCE OF GOLD, EMPLOYMENT, AND LIVELIHOOD IN 1935
Works Progress Administration.

ROAD MATERIALS IN THE WILLAMETTE VALLEY
Oregon State Bureau of Mines, January, 1911.

SOUR SOILS AND LIMING
Dr.William Frear, Dept. of Agriculture, Commonwealth of Pennsylvania.

THE COLUMBIA RIVER GORGE-ITS GEOLOGIC HISTORY INTERPRETED FROM THE COLUMBIA RIVER HIGHWAY
Ira A. Williams, The Oregon Bureau of Mines & Geology, May, 1923.

THE ANALYSIS OF SILICATE AND CARBONATE ROCKS
W. F. Hillebrand, U.S.Geological Survey Bulletin no. 422.

THE CAMBRIAN-ORDOVICIAN STRATIGRAPHIC COLUMN IN SOUTHEASTERN NEWFOUNDLAND.
B. F. Howell

THE DATA OF GEOCHEMISTRY
Frank Wigglesworth Clarke, U.S.Geological Survey Bulletin no. 616

THE ECONOMIC GEOLOGICAL RESOURCES OF OREGON
Oregon Bureau of Mines 1912.

THE GEOLOGY OF PART OF THE WALLOWA MOUNTAINS
C.P.Ross, Oregon Dept.of Geology & Mineral Industries Bulletin no. 3

THE GUARDIANS OF THE COLUMBIA
John H. Williams

THE MECHANICAL AND CHEMICAL COMPOSITION OF THE SOILS OF THE SUSSEX AREA OF NEW JERSEY
Geological Survey of New Jersey bulletin no. 10

TWO ISLANDS
Thomas Condon

- Librarian Report
Raymond L. Baldwin

REPORT ON BOOKS AND BULLETINS IN LIBRARY
OF GEOLOGICAL SOCIETY OF OREGON COUNTRY

GEOLOGY OF CATAHOULA AND CONCORDIA PARISHES
STATE OF LOUISIANA, GEOLOGICAL BULLETIN no. 9

GEOLOGICAL NEWS LETTERS
GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

| | |
|---|---|
| Vol. 1 - 1935 | 2 copies |
| Vol. 2 - 1936 | 2 copies |
| Vol. 3 - 1937 | 2 copies |
| Vol. 4 - 1938 | 2 copies |

METALLURGY AND WHEELS
GENERAL MOTORS RESEARCH LABORATORIES

PHYSICAL AND ECONOMIC GEOGRAPHY OF OREGON
Chapter XIII The Wallowa Mountains and Country
Warren DuPre Smith

DISTRIBUTION OF LIFE IN THE PHILIPPINES
Roy E. Dickerson

GEOLOGIC LITERATURE OF NORTH AMERICA 1785 - 1918.
John N. Nickles
U.S.Geological Survey Bulletin no. 746.

MINERALOGIST - Vol. V - 1937

NORTHWEST SCIENCE
Vol. 1 to 12
1926 - 1938 incl.

PRELIMINARY REPORT OF SOME OF THE REFRACTORY CLAYS OF WESTERN OREGON
Wilson & Treasher
Oregon Department of Geology & Mineral Industries, Bulletin no. 6

QUICKSILVER IN OREGON
C.N.SCHUETTE
Oregon Department of Geology & Mineral Industries, Bulletin no. 4

ORE DEPOSITS OF NORTHEASTERN OREGON
A. M. Swartley
The Oregon Bureau of Mines and Geology, December, 1914.

OUR VANISHING GLACIERS
Kenneth N. Phillips

REPORT ON OIL & GAS POSSIBILITIES OF EASTERN OREGON
John P. Buwalda
The Oregon Bureau of Mines & Geology, July, 1921

REPORT ON INVESTIGATION OF OIL AND GAS POSSIBILITIES OF WESTERN OREGON
Harrison and Eaton
The Oregon Bureau of Mines and Geology, March, 1920.

REPORT OF SERVICE COMMITTEE

Activities during the past year:

| | |
|---|---|
| Publications delivered to members | $157.80 |
| On hand and so far unable to deliver | 4.55 |
| On order for future delivery | 8.75 |
| Total at list price | 171.10 |
| Charge to members | 156.69 |
| Saving to members | 14.41 |
| Average discount, percent | 8.42 |

Distribution of Orders:

| Organization: | List Price | Net Price |
|---|---|---|
| Geological Society of America | $68.45 | $68.45 |
| U.S Geological Survey | 24.95 | 24.95 |
| University of Oregon | 37.00 | 29.60 |
| University of California | 17.35 | 13.88 |
| University of Washington | 7.50 | 6.75 |
| Oregon Department of Geology | 6.45 | 5.16 |
| McMillan's | 7.50 | 6.00 |
| Other | 1.90 | 1.90 |
| Total | 171.10 | 156.69 |

Miscellaneous highlights on the year's business:

45 members used the service during the year.
Two members bought 30% of the publications handled.
One author write 43% of the publications.
56% of the sales were from the GSA and USGS who give no discounts, due to prices close to cost of publication.
The smallest individual order was for $0.15 and the largest for $8.25.

In general all transactions have been very satisfactory and collections have been 100% with the exception of the second item above which will be all right as these few can be sold to other members after a reasonable interval.

The greatest disappointment during the year is that no copies of Camp and Hanna's Elements in Paleontology were sold which lists at $2.50 with a good discount and one of the best purchases in the lists offered to the group.

Expenses for the year have been: postage $1.14; loose leaf sheets for my detailed accounting system $0.40; a total of $1.54. To these expenses is credited $0.10 from Rose Jennings, a donation for postage, and from W.A.Reeves for the same purpose $0.03. This leaves a net expense for the year of $1.41. I mention these donations as a record for income tax deductions.

Respectfully submitted:
Tracy Wade.

## REPORT OF THE TRIP COMMITTEE

Mar.27, '38.- Sandy Bull Run Area - Leader, Mrs. Wheeler. - 54 persons attended
Apr. 9, '38 - Special trip,Eugene - Leader, Dr.Warren D.Smith
Apr.24, '38 - Estacada - Leader, Prof. Orr of Sandy High School - 56 people
May 15, '38 - Wolf Creek - Leader, Franklin Davis, 85 persons attended.
May 28,29,30, '38 - Clarno Fossil Beds - Leader, Hancock.
June 12, '38 - Bull Run Dam - Leader, Mr. Ben Morrow.
Jul.2,3,4, '38 - Coos Head,Charleston,Oregon - Leader, Dr. Packard
Jul. 10, '38 - Angel's Rest, Columbia Gorge - Leader, Franklin Davis.
Jul. 24, '38 - Hancock's Summer Home and Mirror Lake - Leader, Hancock.
Aug.13-14, '38 - Coe Glacier - Leader, Russell Collins .
Aug. 28, '38 - Fossil locality near Wildwood Golf Course - Leader, H.Jennison
Sept.3-4-5, '38 - Olallie Lake and Breitenbush Lake - Leader, Russell Collins
Sept. 25, '38 - Klickitat Dry Ice Wells - Leader, J.C.Stevens.
Oct.16, '38 - Tualatin-Nehalem, North Plains, Banks,Buxton, Pittsburg Bluff - Leader, A. D. Vance
Oct.30, '38 - Fossil Beds in vicinity of Salem - Leader, Prof. Clark
Nov.13, '38 - Invitation by Mazamas to accompany them on a tour of new Capitol Building.
Nov.20, '38 - Buck Creek - Leader, Franklin Davis.
Dec.11, '38 - Dallas Quarries - Leader, Leo Simon.
Jan.15, '39 - Columbia County Iron Deposits - Leader, Earl K. Nixon
Feb.26, '39 - Tualatin Valley - Leaders, Dr.Francis Jones and Prof. Watson
Mar.12, '39 - Clackamas River, Paul Bunyon Railroad Grade Leaders, A. D. Vance and Raymond L. Baldwin

One trip postponed - Larch Mountain, SNOW
Coldest trip - Olallie Lake, SLEET and RAIN.

- Chester A. Wheeler

## REPORT OF PUBLICITY COMMITTEE

Meeting notices appeared in the papers 29 times, with space as follows:

| | |
|---|---|
| Oregonian | 62.0 inches |
| Journal | 59.5 inches |
| News-Telegram | 88.0 inches |
| | 209.5 inches |

Trip notices appeared 18 times, with space as follows:

| | |
|---|---|
| Oregonian | 31.0 inches |
| Journal | 31.0 inches |
| News-Telegram | 44.5 inches |
| | 106.5 inches |
| Grand total | 316.0 inches |

- H. B. Schminky

## REPORT OF THE CURATOR OF MAPS

The society has no maps on file at this time.

- H. B. Schminky

## REPORT OF THE MUSEUM COMMITTEE

After contacting representatives from about twenty organizations interested in seeing a museum established, it seemed best to organize a corporation that could deal effectively with matters pertaining to the establishment of a museum.

The Portland Museum of Natural History was incorporated in 1930 for the purpose of securing a museum for the city of Portland. It had a very splendid list of trustees some of whom have passed on and others who have moved away. Among the deceased are W. B. Raker, president, Rodney L. Glisan, vice-president, Lawrence A. McNary, trustee. Ira N. Gabrielson, the secretary, has been transferred to Washington, D.C.

Owing to the depression which shortly followed its incorporation, this organization has of necessity lain dormant although it had not ceased to exist. It seemed best, therefore, to revive this organization, elect a new board of trustees, and carry on where it had left off. Accordingly, a meeting of the old board of trustees was called. A luncheon meeting was held at the Congress Hotel Friday, February 3, 1939, at which about 27 were present including trustees of the old organization and representatives from a number of outdoor societies that had been invited. A new board of trustees was chosen and these trustees immediately selected officers. Following is the list:

J. C. Stevens, President
Earl K. Nixon, Vice-president
Frederick Greenwood, Treasurer
Burt Brown Barker
Ormond R. Bean
J. C. Braly
W. N. Crowell
Ralph E. Dugdale
W. L. Finley
M. D. Wells
Harold S. Gilbert
Stanley G. Jewett
Dr. A. A. Knowlton
Ben Hur Lampman
Mrs. A. E. Rockey
E. H. Rockwell
Robert W. Sawyer
William Joy Smith
Lawrence R. Teeple

Ex officio Trustees

Hon. Charles A. Sprague, Governor of Oregon
Hon. Joseph K. Carson, Mayor of Portland

It will take time to secure results. The plan now under way is to secure members who will make annual contributions. It is planned to start a museum in temporary quarters as soon as suitable arrangements can be made. We believe that the best way to get the citizens of this community museum minded is to have an actual museum in operation that is a going concern. We expect to charge an admission fee which will defray the cost of operation. Funds from memberships will only be used for capital expenditures.

Those having attractive exhibits which they are willing to loan to the museum even for a few months should get in touch with me or any of the other officers of the corporation.

J. C. Stevens, Chairman,
Museum Committee,
Geological Society of the Oregon Country

TREASURER'S REPORT as of February 28,1939.

| | | | |
|---|---|---|---|
| BALANCE on hand as of March 1. 1938 | | | $260.47 |
| RECEIPTS: | | | |
| Memberships | | $512.00 | |
| Subscriptions & Sales News Letter | | 10.80 | |
| Stationery Sales (credited to Exp.News Letter) | | 6.10 | |
| Annual Banquet 1939 | | 113.75 | |
| Total Receipts | | | 642.65 |
| | | | 903.12 |
| DISBURSEMENTS: | | | |
| News Letter | | | |
| Postage | | $ 46.75 | |
| Printing and Mailing | | 14.00 | |
| Plates and Negatives | | 75.90 | |
| Paper | | 52.80 | |
| Ink | | 18.71 | |
| Depreciation on multigraph | | 47.13 | |
| Total Expense News Letter | | 255.29 | |
| Miscellaneous Expense | | 33.19 | |
| Stationery Expense | | 2.50 | |
| Lecture and Entertainment | | 20.52 | |
| Total Expense | | 311.50 | |
| Paid on Multigraph | $256.25 | | |
| Less Depreciation and carrying charge charged to expense | 58.17 | 198.08 | |
| Total Disbursements | | | 509.58 |
| BALANCE on hand | | | $393.54 |

******

Recapitulation

| | | | | |
|---|---|---|---|---|
| Cash | $393.54 | Surplus as of Mar.1,1938 | | $329.47 |
| Equity in Multigraph | 267.08 | Receipts | 642.65 | |
| | | Less Expenses | 311.50 | 331.15 |
| | | | | $660.62 |

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Outstanding Bills

| | |
|---|---|
| Addressograph & Multigraph Corp. | $23.92 |
| 1939 Annual Banquet Committee | 113.75 |

- Mabel E. Smith,
Treasurer.

## SECRETARY'S ANNUAL REPORT.

For the period from March 1, 1938 to February 24, 1939, the Society had 117 members, one being an honorary membership, and three junior memberships. Of these twenty-three were new members for the full year, and nine were short term members. This is a decrease of six members from the preceding period. To date thirty-nine members have renewed for the year 1939, and there are six new members, a total of forty-five.

During the past year the Society held twenty-one meetings, one being the annual picnic at Mt.Tabor Park, and one held jointly with the Oregon Agate and Mineral Society. Nineteen trips were sponsored, four of these being week-end trips. The first summer camp for Society members was a two-weeks trip to the Wallowas. Members were also invited to attend Dr.Packard's summer camp at Coos Bay.

Twenty-four bulletins and one supplement were published. Four subscriptions to the bulletin were obtained, and four copies were sold. Nine copies of the supplement were sold.

The executive board held four meetings.

Total receipts for the year including a balance of $260.47 on hand March 1, 1938, were $853.27. Disbursements were $505.83, leaving a balance of $347.44 on this date, February 24, 1939. - E. M. Barr

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## COMMITTEE CHAIRMEN, 1939.

| | |
|---|---|
| Auditing: | Ed Boyrie |
| Exhibits: | Thomas A. Carney |
| Field trips: | A.D.Vance (A member of this committee will be historian) |
| Membership: | Leo F. Simon |
| Museum: | J. C. Stevens |
| News Letter and Library: | Raymond L. Baldwin |
| Program: | Carl P. Richards |
| Public Relations: | Clarence D. Phillips |
| (This committee will coordinate public relations, publicity and contacts with related organizations). | |
| Service: | Tracy Wade |
| Social: | |

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## REPORT OF SUMMER CAMP COMMITTEE

The detailed report of the summer camp appears in the Geological News Letter for December 1938. Everyone attending the camp were committee members, and each one did his part to make the camp a success.

- H. B. Schminky.

## LUNCHEON NOTES

The Thursday noon luncheons at the L'Abbe Coffee Shop, 9th and Salmon, have been well attended of late. The luncheon on April 13th did not scare many, on account of the "unlucky" date, about 26 being present. Carl Richards introduced Lt.Scaife, of the Coast & Geodetic Survey, who is to address the Society Friday evening. Lt. Scaife responded with a few words, indicating his pleasure with the luncheon.

Franklin Davis presented an article from a recent issue of LIFE, telling about the live prehistoric fish dredged from the ocean depths. Dr.Osgood told of many interesting things which occurred during his recent trip to New Orleans, where he presented a paper on his cancer researches. Leo Simon passed around a number of specimens. Bruce Schminky called attention to a newspaper article advertising the summer meeting of the Geological Society of America at San Francisco. Ray Treasher stated that Dr. Tom Thayer is now at Deming, New Mexico, and that the Thayer family are the proud parents of a baby girl.

The Thursday noon luncheons are always interesting and anyone who would care to lunch with the group are welcome at attend. Any time between 12 noon and 1 p.m.

Miss Eva Catlin has been appointed Secretary to fill the vacancy caused by resignation of Miss Hickman.

Tom Carney will show a group of moving pictures at Mazama meeting Wednesday, April 26th. These are some pictures in color which Mr. and Mrs. Carney took on a trip to the National Parks last summer. They were shown at a Geological meeting a short time ago and were much enjoyed by members of our Society and their friends.

Dr. Adolph Weinzirl lectured before the United States Department of Agriculture Club at a noon luncheon April 18th. The subject of his talk was "The Public Health Problem".

We want to thank J. C. Stevens and Ray MacKenzie for the back numbers of Geological Bulletins which they recently turned over to us. From time to time members turn over their back numbers to the Society and we find we can make good use of these back copies so we would urge our members who are not keeping files of the bulletins to turn them in to the Society.

## READ THERMOMETER ATOP MOUNT HOOD.

Kenneth Phillips, chairman of the Mazama Research Committee, and Harry Clark of Newberg climbed Mount Hood again Sunday to read the maximum and minimum recording thermometer left at the lookout cabin last summer. The maximum temperature since the last reading, early in the winter, was 35 degrees, and the minimum was 16 degrees below zero. The latter mark is believed to have been established in February while the maximum probably was set in the warm weather this month, Phillips believes. Despite the high east winds blowing at lower levels Sunday, there was almost no breeze on the summit, the climbers reported.

- Oregon Journal, April 18, 1939.

## ANNOUNCEMENTS

### Lectures

Friday Apr.28 — Mr. J. C. Stevens will give a lecture entitled "Silt and Civilization". It will consider the problems of silt movement in the southwestern United States in relation to the permanence of the existing and potential reservoirs in which water can be stored for irrigation and other essential uses. It will be adapted from the paper he gave recently before the American Geophysical Union at Los Angeles which made a deep impression on engineers and conservationists.

Mr. Stevens is one of our own members and a civil engineer of national repute. His subject on this occasion is one which brings out one conflict of geologic processes with problems of human existence; it is a thought-provoking, stimulating discourse.

Friday May 26 — Captain B.B.Talley of the 29th Engineers, U.S.Army, will present an illustrated lecture on the subject of

"MAPPING WITH AERIAL PHOTOGRAPHS".

This is the second of a series of lectures on the construction and interpretation of topographic and geologic maps. The application of aerial photography to map making has shortened greatly the required time in the field, and involves many details and principles of a highly interesting nature. An explanation of these, with the aid of slides and an exhibit of typical examples, by one who has had extensive experience in the work, will make this a most informative lecture.

Friday June 23 — This is to be a joint meeting with the MAZAMAS, and will be held in our usual meeting place - the auditorium of the Public Service Building.

Dr. Laurence McKinley Gould will lecture on

ICE - "the most interesting thing in the world".

Dr. Gould will be remembered by his splendid lecture to us last summer, when he told of his experiences in Antarctica with the Byrd Expedition of 1929-1930, of which he was second in command. In 1927 he was a member of the Putnam Baffin Island Expedition, exploring Hudson Strait and Foxe Basin. With such extensive experiences in both Arctic and Antarctic regions, as well as on various mountain glaciers, there are few men as eminently qualified to discuss the gelogical aspects of ice, so a real treat is in store for those who hear him. Our Society is honored to have this fine scientist with us again. Reserve the date now and assure him a real welcome by a large and appreciative audience.

# GEOLOGICAL NEWS LETTER

VOL. 5 NO. 9 PORTLAND, OREGON MAY 10 1939

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POSTMASTER: Return Postage Guaranteed

PORTLAND OREG.

DR & MRS A C JONES
3300 S E HEATHER LANE
PORTLAND, OREGON

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Executive Board




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Editor-in-Chief and Business Manager

Raymond L. Baldwin
345 U. S. Court House
Portland, Oregon

Associate Editors

Edwin T. Hodge — A. D. Vance
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______________________________
Address

______________________________
Business Address

______________________ ______________________
Telephone Number — Occupation

I am particularly interested in the following branches of Geology: ______________________
______________________________

Sponsored by: ______________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________
Signature

## ANNOUNCEMENTS

### Lectures

Friday May 12 — This meeting will be devoted to the showing of the Union Oil Company's motion picture entitled

PETROLEUM GEOLOGY

It is a pictorial review of the chief phases of geologic history. Changes in physiography which have taken place on the North American continent since the deposition of the earliest fossil-bearing sediments, more than 550 million years ago, are shown by animated paleographic maps and diagrammatic cross-sections. A vivid concept of life in the Mesozoic era is presented in realistic scenes showing dinosaurs and other prehistoric animals in their native environment. Entertaining as well as instructive!

Friday May 26 — Captain B. B. Talley of the 29th Engineers, U.S.Army, will present an illustrated lecture on the subject of

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This is the second of a series of lectures on the construction and interpretation of topographic and geologic maps. The application of aerial photography to map making has shortened greatly the required time in the field, and involves many details and principles of a highly interesting nature. An explanation of these, with the aid of slides and an exhibit of typical examples, by one who has had extensive experience in the work, will make this a most informative lecture.

Friday June 2 — On account of our regular meeting date (the second Friday in the month) coming at the time of the Rose Festival, our first meeting in June will be on Friday, June 2nd. The program committee is endeavoring to have for that occasion a lecturer of prominence who will speak on a subject of unusual interest. Particulars will appear in the next issue of the News Letter. Meanwhile, note the date - June 2 - and save it!

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## TRIPS

Dr. E. L. Packard will lead the Geological Society of the Oregon Country on its field trip on May 14th to a new fossil locality. The caravan will leave the new meeting place at S.W.Front Ave. and Yamhill St. promptly at 8:00 a.m. and proceed down the Columbia River Highway, turning west into the hills about one mile north of Scappoose on the Spitzbergen road. This is the same road which the Society followed on Mr. Nixon's Columbia county iron ore trip. The party will leave the old route at the "Y" marked "Pisgah Home Winter Road" and continue along the new road which leads over the divide into the Nehalem river drainage. Several interesting stops will be made to discuss the formation and the new fossil bed will be reached about noon. The fossil locality is 30½ miles from the west approach to the St.Johns Bridge. The route from this point has not been logged, but the party will continue on to Pittsburgh Bluffs to compare the fossils with those of the type locality. If time will permit the return will be made by way of Buxton.

******

## CHANGE OF ADDRESS.

President Piper has moved his office from 516 Couch Building to 307 Old Postoffice Building.

Mr. and Mrs. Ray E. Mackenzie have moved from 2402 N.E. 15th Avenue to 2737 N. E. Mason Street.

******

## NEW MEMBER.

| | | |
|---|---|---|
| Mr. Andrew Rapp | AT 5281 | 2181 N.W. Nicolai St. |

******

Mr. Tom Carney showed moving pictures and gave a geological talk at White Temple on evening of April 27th. Mr. Carney also lectured on crystals and displayed his collection at the Oregon Agate and Mineral Society meeting Friday night, May 5th, at the Chamber of Commerce.

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Tracy Wade and Franklin Davis are vacationing in the Fossil Lake region.

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## LUNCHEON NOTES
Thursday, April 27, 1939.

Mr. Lawrence A. TenEyck was introduced by Carl Richards. Mr. Ten Eyck expressed his interest in the Geological Society and it is hoped that Mr. Richards can induce him to join our ranks.

Mrs. M. P. James, one of the newer members of the Society, was introduced by Mr. Piper. This was Mrs. James' first luncheon meeting. Mr. Richards called attention to fact Mr. Piper also had a guest whom he was asked to introduce. Mrs. Piper acknowledged the introduction.

Mr. Davis and Mr. Simon recounted some of their experiences on a recent field trip to the Wallula Gateway and the discussion centered around Indian petroglyphs and artifacts. Aside from the fact that Mr. Davis was lost most of the time, the party had an exceedingly fine time. Mr. Weigand drove the car, and Mr. Geary Kimbrell was the fourth passenger.

Mr. Calef presented a piece of Florida coquina rock that he collected in that area. With it he had some of the Florida beach sand which is composed of shell fragments instead of the usual quartz.

LUNCHEON NOTES
Thursday, May 4, 1939.

A. D. Vance presented some interesting fossils from locality to be visited on our May 14 field trip.

Mr. Calef displayed garnets and crinoid stems collected in vicinity of Grand Canyon.

Mr. Rockwell announced that Dr. Booth had been forwarding specimens collected on his trip to Mexico City. One shipment of 840 pounds had been received and another of 1120 pounds is on the way.

Mr. Schminky announced summer Field Camp will be held at Coos Bay beginning July 23rd. Don't forget the date!

Mr. Bates just returned from a trip to Denver and points in California, read a story of a large meteorite found this week in northern California. This meteorite, weighing 1500 pounds, pronounced the finest specimen ever found on the Pacific Coast, is being taken to Oakland for an indefinite period, but will eventually be taken to the Smithsonian Institute in Washington.

Mr. Richards extended an invitation to attend the Professional Engineers' meeting, Friday May 6th.

Mr. Rockwell announced the Agate & Mineral Society meeting Friday, May 6. Mr. Carney will display his part of his beautiful collection of crystals and explain them.

## MOLALLA TRIP.

The recent visit by members of the Geological Society of the Oregon Country to the newly found fossil leaf beds near Molalla was an event of more than ordinary interest and importance. On Sunday, April 16th, the visit was made as a part of the regular field trip schedule of the organization.

A number of different kinds of leaves were found in abundance, including the gingko. Mr. A. W. Hancock, probably the best informed student of fossil leaves in our membership, identified the oak, chestnut, elm, sweet gum, willow and magnolia, and there may have been others. Splendid specimens of all were secured. Perhaps more thrilling were the finding of nuts and seedpods of the gingko and magnolia. One nut ~~was~~ found seemed to be a walnut. Another rare find was a cone, apparently from an evergreen tree.

Leaves of the gingko have been found singly but rarely in several localities in Oregon. At the Molalla locality they are found in abundance, not only the impressions, but actual carbonated leaves. The same is true of the other kinds of leaves found.

Credit for the find is due Mr. Ray C. Treasher, who "discovered" it several months ago and very graciously kept the secret until such time as it would be practical to take a Geological Society caravan into the region. The formation in which the fossils are imbedded is Oligocene or Miocene tuffaceous material, and the indications are that the leaves have been carried along in a mud flow, as many of them are bent or in a curved position. However, they are in the usual layers.

While the leaf beds were the goal and highlight of this particular field trip, only the period after lunch was spent there. Geological features along the route were studied during the morning, principally in the Milk Creek district. Stops were made in a number of places, and the last one before lunch was beside a field containing residuels from a Rhododendronlike formation. Gravels in a tiny dry stream bed or gully attracted so much attention from several agate enthusiasts that they could hardly be persuaded to leave. No valuable finds were reported.

Lunch was enjoyed on the banks of the Molalla river, in the Molalla riverside park. Free use of the park was granted by the owner. Identification of wild flowers by Leo Simon was again a feature of the lunch hour. The weather was perfect and a large group turned out for the trip. Mr. A. D. Vance, chairman of the Trips committee, registered 64 persons.

- E. M. Barr

THE FLOTATION OF MOUNTAINS

A Theory of Orogenesis.

Digest of an article by A. C. Lawson, Scientific Monthly, vol. 47, no. 5, pp. 429-438, November 1938.

Professor Lawson formulates a rational explanation for the construction and ultimate destruction of the great mountain ranges that consist of folded sedimentary strata, and tests that hypothesis by comparison with known features of the Sierra Nevada. Briefly his hypothesis supposes: (1) Such ranges exist only where sedimentary rocks have been accumulated to excessive thickness, as in a delta built out into deep water. (2) Under the depositional load, the sea floor subsides and so permits accumulation to a maximum thickness of about 8 miles. (3) With a load so great, the Earth's crust beneath the trough of subsidence begins to collapse with compressive stress: a "geosyncline" is initiated. (4) The compression throws the sedimentary rocks of the trough into steep folds whose crests rise high into the zone of erosion; conversely, the keel of the geosyncline is depressed several times the height of the newly created range and so reaches down into the lower part of the crust (into the sima). (5) In the high temperature of the sima, the keel is fused to a granitic magma, which tends to expand and so to force dikes, sills, and other apophyses into the walls of the magma chamber. (6) As erosion reduces the new mountain range the whole trough rises by relief of load, and ultimately the magma can solidify as a granitic batholith. (7) The rise is less than the mean thickness of the layer removed by erosion so that the range may eventually be reduced to a peneplain.

As a basis for the discussion, Professor Lawson reviews the history of the development of the principle of isostacy. Thus, during a trigonometric survey in India it was observed that the deflection of the plumb line at the base of the Himalaya Range (due to the mass of the mountains) was about one third of the amount to be expected if the range was underlain by crustal material of normal density. To explain this phenomenon Sir G. B. Airy suggested low density in the roots of the range. About three decades later Major C.E. Dutton proposed the principle that mountain ranges are masses of density balanced by depressed masses of high density, this principle he called isostacy.

As a most striking example of isostatic balance, there is mentioned the well known downwarping of the crust of the earth by the accumulation of the north polar ice-cap to a thickness of several thousand feet during the Pleisto cene and the crustal recovery after the ice front had retreated as evidenced by ancient shore line about the Great Lakes.

The most common cause of shifting load in geological processes is that of erosion. An instance is the delta of the Mississippi, 1,000 miles by 600 miles in extent, 8 miles in maximum thickness, and containing about 1,500,000 cubic miles of sediment or 1,000,000 cubic miles of dry rock. In order to compensate for this accumulated load at the surface in accordance with the theory of isostatic balance, an outward viscous flow of equivalent mass must take place at depth in the crust.

Another example of shifting load is that due to compressive stresses in the earth's crust causing rupture and faulting in a plane inclined at a low angle to the horizon. A part of the upper crust may be shoved under the adjoining part and so cause local thickening and a consequent increase of load. If the movement is large, isostatic balance will be established by the depression of the faulted belt into the heavy rock of the depths, and the uplift of the surface will be only a fraction of that depression. The thickened belt will float in denser rock. Finally, when the thickened sima flattens out, the eroded land surface subsides to form a structural valley such as the Great Valley of California.

Great mountain ranges appear to have originated by the operation of compressive stresses in the earth's crust in regions of excessive sedimentation. These sediments were deposited in shallow water. The dissection of the loftiest mountain areas has exposed an original sedimentary deposition of as much as 8 miles in thickness. The only places where such great thicknesses of sediment could have accumulated as the deltas of large rivers. A load of 8 miles of sedimentary deposit over a large area seems to mark a limit beyond which the crust of the earth can not be depressed without collapse under horizontal stress. Yielding under this great stress causes the deformation which converts the sediment-laden area into a lofty mountain range.

Here Prof. Lawson considers the construction of the earth's crust in continental and oceanic regions. From surface exposures supplemented by seismologic data, the earth's crust appears to have two main parts, an upper or sial and a deeper layer or sima. The sial comprises an upper layer of granite (density 2.6) about 12.4 km. thick and a lower layer of diorite (density 2.8) about 18.6 km. thick. The sima comprises a basalt layer (density 3.05) of limited thickness and a dunite layer (density 3.3) of indefinite thickness. There is no sial under the Pacific Ocean, and the bottom of the basalt there is at a depth of 46.4 km. below sea level.

Upon the assumption of this depth to the bottom of the basalt and a mean depth of the ocean of 5 km. a computation is made on the basis of isostatic balance which shows that for a mountain mass (density 2.83) 3 km. above sea level the depth of its immersion into the dunite would be 18.1 km. (64.5 - 46.4 equals 18.1). At this great depth of 64.5 km. the light crushed rocks are brought into a zone of high temperature where they are melted into a magma. In fusing, the mass of the rock is not changed but its volume is increased. This expansion causes a bursting of the walls of the magma chamber and an intrusion upward, forming dikes, sills, lacoliths, etc. found in every great mountain range.

When the compression is relieved and the consequent upbuilding ceases, the process of degredation dominates and the land surface is reduced. However, this reduction of altitude is not a measure of the removal by erosion since the load removed by erosion is compensated by recovery from deformation. On the assumption of a specific gravity of 2.67 for the sedimentary rocks and of 3.3 for the depths, the loss of altitude of the surface would be one fifth of the thickness of the layer removed ( 1-2.67/3.3 equals 0.2).

The process of erosion in the course of time exposes the granitic rocks which are found in the central part of great mountain ranges. It continues until what was once a mountain range becomes a peneplain at a small elevation above sea level.

As a specific illustration, geological history of the Sierra Nevada is reviewed. In that area sedimentation in an extensive sea continued until late Jurassic time. Then followed successively collapse, the various steps of mountain building, and erosion to an approximate peneplain. Then another cycle of mountain building processes became operative. A mountain range was initiated by folding of the weaker rocks, but the greater part of the uplift is said to be due to compressive stresses applied to the great buttress of granite which could not fold but yielded by breaking and shearing along an inclined plane so that the lower part of the granite mass was thrust westward under the upper part, resulting in a great increase in thickness of the granite batholith. Thus the bold eastern front of the range which is the degraded scarp of a zone of normal faulting, is the surface expression of a minor step in the mountain building process -- marginal collapse of the upper thrust block.

-- Geary Kimbrell.

******

## STREAM TIN IN OREGON

Cassiterite is tin oxide ($SnO_2$), and is more commonly known as "stream tin" from its occurrence in placer deposits. A nodular variety, known as "wood tin" is found in some localities.

The United States lacks deposits of cassiterite, or stream tin, and most of the supply has to be imported. There are few occurrences, and these supply a certain amount of museum specimens but little, if any, commercial ore.

A group of placer miners operating on Pine creek, south of Baker, Oregon, have been bothered with brown pebbles in their sluices. Unable to decide what the brown material was, they sent samples to the Baker Assay Laboratory of the State Department of Geology & Mineral Industries, and Mr. Leslie Motz, analyst, determined the samples to be cassiterite.

Mr. Earl K. Nixon visited the placer property, and collected a few pieces of the stream tin. These represent the first authentic occurrence of cassiterite in Oregon. Mr. Nixon states that the miners are working an old Tertiary stream channel that may have headed in the Greenhorn mountains, and that the stream tin represents the accumulations of many, many centuries of time. There is an insufficient amount to justify commercial development of the tin, at present, but further search may open new possibilities.

There have been many reports, from time to time, of cassiterite occurrences in Oregon. Some of these have originated in the Wallowa mountains and the Department's field survey parties made particular search for cassiterite pebbles last summer. None came to their attention. The occurrence on Pine creek may give new incentive to a search for this important, strategic war mineral.

-RCT.

The Oregon State Department of Geology & Mineral Industries has added the magazine "Pan-American Geologist", to their library of magazines purchased.

## THE 1939 SUMMER CAMP.

Enough members have signified their intention of attending the summer camp to justify setting the dates and locality. The Coos Bay region has been selected for the scene of activities, with the opening day of the camp set for July 23rd. The camp will last to July 31st or to Aug. 6th, depending on the wishes of those attending.

At this time the camping place has not been chosen.

A. D. Vance will be the trip leader, and it is hoped that Dr. Packard will be with the group much of the time.

The important thing at this time is to know how many of the members can attend the camp. Please send a postcard to the committee chairman giving the following information:

1. The probable number in your party.
2. Would you attend the full two weeks, or would you come for the first or the second week only.
3. Your telephone number and mailing address.
4. Your name.

There are so many details to be worked out by the trip leader and the summer camp committee, that they ask the members who know that they can attend the camp to supply the above information at once. Mail cards to

H. B. Schminky
1030 S. E. 54th Ave.
Portland Oregon

All information pertaining to the camp will be released in the News-Letter as soon as the details are completed.

******

The summer camp committee desires to make some suggestions to society members who are going on vacation trips this year. As you know, many of our members visited the same localities on their vacations last year, although they did not all go at the same time or by the same routes. We know that it is not possible to make caravans of vacation trips, but those going to the same localities could get a lot of pleasure out of working up their itineraries together. Let each one look up a different subject, like geology, history, wild life, etc., pertaining to the areas to be visited. Then all get together and work up a log of the trip listing the highlights of each subject studied for all important stops. Then when the trip is made each one can fill in the details of their own activities, showing mileages, side trips and additional information learned along the way. After they are all home, they can again get together, compare experiences and work up a composite log of all their findings. This finished log could be typed, illustrated with the best photos of each locality, and a copy turned over to the society's librarian.

If you are planning a trip this year, why not come to the next lecture meeting a half hour early and see if you can contact kindred souls and see if the above plan could be worked out for your mutual enjoyment.

******

In the meantime all others who have not made plans for their own vacations are advised to give the society's summer camp serious consideration. You will have a good time if you attend.

- H. B. Schminky, chairman
Summer camp committee..

LIST OF PUBLICATIONS AND MAPS OF INTEREST TO THOSE ATTENDING THE SOCIETY SUMMER CAMP.

PUBLICATIONS:

Stratigraphy and Mollusca of the Eocene of Western Oregon, by F. E. Turner, Geological Society of American Special Paper #10.

Faunal and Stratigraphic Relationships of the Empire Formation, Coos Bay, Oregon, by Henry V. Howe, University of California Publication vol. 14 no. 3, pp. 85-114.

Progress Report on Coos Bay Coal Field by F. W. Libbey, State Department of Geology and Mineral Industries, bulletin no. 2.

MAPS:

U. S. G. S. Topographic maps.
- Port Orford (and Geological folio for those fortunate enough to possess it)
- Coos Bay (folio as above)
- Reedsport, Siltcoos Lake, Heceta Head, and Waldport.

Forest Service Maps covering the following National Forests:
- Siskiyou, Umpqua and Siuslaw
- Umpqua

This list will probably be increased by the addition of other publications later. Contact Tracy Wade, of the Service Committee, for the purchase of the above publications.

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Report of the Research Committee
for the year ending February 28, 1939.

For the year ending February 28, 1939, it was contemplated that the Research Committee would have no fixed membership but would include all members of the Society who wished to participate in a joint research activity. A problem in the stratigraphy of the Nehalem-Tualatin area near Portland was selected for the first activity of a research group. With the assistance of A. D. Vance, the chairman made a preliminary reconnaissance of the area and, so far as possible, recovered all the fossil localities that are described in the recent literature on the area. Thus, the necessary ground work was laid for systematic collection of fossils and for working out a stratigraphic section.

No joint activity in this research problem has followed but the foundation remains as the basis for any future work that the Society may wish to undertake.

- Arthur M. Piper
Chairman

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MEDFORD GEOLOGIC MAP OUT

The new geologic maps of the Medford quadrangle, representing work completed last November by field parties of the U. S. Geological Survey under Francis G. Wells, geologist, are ready for mailing by the Oregon State Department of Geology & Mineral Industries. The maps are in several colors, show the various geological formations in the Medford-Ashland district, as well as the location of the mines in the district. On the back of the map appears a rather thorough description of the geology and notes on the occurrences of chromium, gold, quicksilver, coal, clays, etc.

The preparation of this map by the U. S. Geological Survey so soon after the completion of field work represents a concession requested by the Department and very kindly made by the director of the U. S. Geological Survey. The Department is carrying the cost of the color lithostating and is issuing the maps. Copies may be obtained by writing to the head office of the Department, 329 S. W. Oak Street, Portland, enclosing 40 cents to cover printing and mailing.

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# GEOLOGICAL NEWS LETTER

VOL. 5 NO. 10 PORTLAND, OREGON MAY 25 1939

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do hereby apply for membership in the Geological Society of the Oregon Country, subject to the provisions of the By-Laws.

______________________________
Address

______________________________
Business Address

______________ ______________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ______________
______________________________

Sponsored by: ______________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________
Signature

ANNOUNCEMENTS

Lectures

Friday May 26 — Captain B. B. Talley of the 29th Engineers, U.S.Army, will present an illustrated lecture on the subject of

"MAPPING WITH AERIAL PHOTOGRAPHS"

This is the second of a series of lectures on the construction and interpretation of topographic and geologic maps. The application of aerial photography to map making has shortened greatly the required time in the field, and involves many details and principles of a highly interesting nature. An explanation of these, with the aid of slides and an exhibit of typical examples, by one who has had extensive experience in the work, will make this a most informative lecture.

Friday June 2 — On account of our regular meeting date (the second Friday in the month) coming at the time of the Rose Festival, our first meeting in June will be on Friday, June 2nd.

Mr. Harry G. Johnson, director of the Brown Astronomy Foundation of Walla Walla, Wash., will give an illustrated lecture entitled

THE WORLD OF THE MOON.

It will form a fitting sequel to Dr. Pruett's lecture on meteors last February which afforded us so much interest. A study of the happenings in the heavens often throws much light on geological processes and events on earth and a review of the various features of the moon, including a discussion of the meteoric theory of the origin of its craters, is an appropriate subject from that viewpoint. Mr. Johnson has just returned from a lecture tour in the eastern states and is scheduled to speak to the students at Reed College at the end of May.

(Note the date - the 2nd of June - one week earlier than our usual meeting time).

Friday June 23 — This is to be a joint meeting with the MAZAMAS, and will be held in our usual meeting place - the auditorium of the Public Service Building.

Dr. Laurence McKinley Gould will lecture on

ICE - "the most interesting thing in the world."

Dr. Gould will be remembered by his splendid lecture to us last summer, when he told of his experiences in Antarctica with the Byrd Expedition of 1929-1930, of which he was second in command. In 1927 he was a member of the Putnam Baffin Island Expedition, exploring Hudson Strait and Foxe Basin. With such extensive experiences in both Arctic and Antarctic regions, as well as on various mountain glaciers, there are few men as eminently qualified to discuss the geological aspects of ice, so a real treat is in store for those who hear him. Our society is honored to have this fine scientist with us again. Reserve the date now and assure him a real welcome by a large and appreciative audience.

## TRIPS

**FOUNDERS DAY TRIP**

Sunday May 28 — Dr. Edwin T. Hodge will lead members of the Geological Society of the Oregon Country and their friends on a trip up the North Bank of the Columbia. Stops will be made along the way at points of geological interest. Beacon Rock will be climbed, and from this vantage point the geology of Columbia Gorge will be explained as only Dr. Hodge can explain it.
Starting time 9:00 a.m. from Front and Yamhill Streets, in front of Public Market.

Sunday June 11 — Franklin Davis will lead a trip to Angels Rest.

Sunday June 25 — Dr. Warren D. Smith will lead society on a trip to Cape Lookout, near Camp Merryweather, south of Tillamook. There are many interesting geological features in this area.

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## NEWS OF OUR MEMBERS.

Mrs. A. D. Vance is visiting her mother near Council Bluffs, Iowa.

Sunday, May 21st, under leadership of Leo Simon and Ronald Burnett, the Mazamas made a trip in the vicinity of their lodge on Mount Hood, with particular attention to identifying species of trees and plants in that area.

Mr. Lee Rapp, one of the newest members of the Geological Society, is a graduate geologist. Mr. Rapp attended the University of Oregon and secured his degree there. We hope that he enjoys the activities of our Society and we know that we are always glad to have technically trained geologists added to the fold. Incidently, he and Mr. Treasher were in school at the same time. Perhaps you had better meet Mr. Rapp, and see if there is some "low-down" that can be secured. (Mr. Davis please note).

Dr. H. C. Dake has "done it again". He has already co-authored one book, "The Quartz Family of Minerals". A recent announcement by McGraw-Hill states that "Jewelry, Gem Cutting, and Metalcraft", by William T. Baxter has a section on the identification of gem stones by Henry C. Dake, editor of the Mineralogist. Congratulations, Dr. Dake.

******

PUDDING RIVER - SALEM TRIP.

Members of the Geological Society of the Oregon Country who followed the leadership of Prof. Clark of Willamette University and Mr. Reeves on October 30th, 1938, enjoyed a most interesting trip, through that portion of the Willamette Valley north and east of Salem. Prof. Clark and Mr. Reeves met the society caravan about 9:15 a.m. at Checker Board Service Station, just past Mile Post 39 on East Side Highway. By 9:30 a.m. the caravan was under way and immediately turned east off the Highway to visit Lake Labish Bottoms.

Our first caravan stop was on the bridge crossing the Little Pudding River, where the sluggish "Little Pudding" flows along the edge of what was once Lake Labish. Lake Labish has been drained and in its place one finds a level stretch of rich black peat soil upon which are grown large crops of onions and other vegetables. Before Lake Labish was drained it had reached the swamp stage which all lakes reach sooner or later in their ephemeral existence.

At this stop Prof. Clark introduced us to the problem we were to study that day - namely, the drainage basin of the Pudding River. At several points near Salem, the divide is but a very short distance from the Willamette River. Prof. Clark pointed out that the Willamette River would only have to rise a few feet above its flood stage to cross the low divide and flow down through the Lake Labish farm lands into the Pudding River.

The Pudding River roughly parallels the Willamette River along the east side of the Willamette Valley from a few miles south of Salem to a point north of Canby. It refuses to flow westerly to the larger Willamette, so the Willamette after reaching Newberg, makes a right angle turn to the east picking up the waters of the Pudding River a short distance below the junction of the Pudding and the Molalla.

After crossing the Labish bottoms for some distance the caravan drove southeast through the Waldo Hills, still in the drainage basin of the Little Pudding River. The next stop was made after crossing the Mill creek divide not far from the town of Shaw. We were now in the Willamette River drainage system as this area is drained by Mill Creek which flows into the Willamette at Salem. Prof. Clark pointed out the wide valley lying before us with Mill Creek hugging the slopes of the Waldo hills on the north side of the valley while six or seven miles to the south the north Santiam River lays its course to the southwest along the foothills of the opposite side of the valley. Between the two streams the valley floor, apparently as level as a table, has an even westerly slope of about twenty feet to the mile. Against the hill at the west end of the basin Mill Creek makes a right turn through the town of Turner and passes through a narrow gap to reach the Willamette.

Was this an old lake bed and did the north Santiam once pass through the Turner gap? These questions were given due consideration but not settled.

About one mile east of Turner there is an excellent exposure of supposedly Eocene material. We hurried through Aumsville to this exposure. Cars were left by highway and the group prepared for a three-quarter mile walk to the Turner sandstone quarry and its fossils. Gravels were noticed almost completely covering the surface of the field to the left of the road. The hike through the pasture and along the hillside to the quarry was enjoyed - the rain which had been intermittently falling since we left Portland seemed to have definitely ceased. The sun came out and our picks rang on the rocks and the caravan members interested in fossils added many interesting specimens to their collections. We even noted our president, Ray Treasher (it's well known that he isn't a fossil man) picked and whacked away with great care and precision and obtained some nice specimens.

Prof. Clark said that he had sent some specimens from this quarry to the Smithsonian Institute and had received the report that they were apparently of Eocene Age. This came as a surprise to some members of our Society, as they had expected to find an Oligocene fauna in this section. The shells of the mollusks found were all weathered away but some well preserved casts and moulds were found. One member found a mould which closely resembles Acrilla aragoenis of the Coos Bay Coaledo Eocene, lending some support to the Eocene Age determination.

Leo Simon found a specimen case of a pelecypod which he later sent to Dr. Packard. This was new to the doctor, or possibly his scientific caution prevented him from naming it. There are coarse sandstones containing an abundant fauna in certain strata. Solon and a great many varieties of clams, many genera of gastropoda and some dentalia are found there.

Some true shells were found in such a state of preservation that they could be identified as to specie but most of the fossils were casts. Many of these, however, were clearly marked and probably can be identified.

It was necessary for our leaders to hint several times that it was getting on towards two o'clock before they could pry us away from such treasures. Every one voted that the place chosen for lunch justified the delay for Prof.Clark had arranged to have Chresto Cottage at Willamette University open for us. This cottage on the campus is for social gatherings of the students. It being a little damp and cool for lunching on the open road, we surely appreciated their open house to us.

After lunch Prof. Clark hung on the wall an enlarged map of the area over which we had just come. This was an exceedingly interesting way to present and study our problem. There was the larger stream, the Willamette, meandering northward and then finally eastward to Oregon City. The Pudding River, smaller with its much more deeply entrenched meander, flowing north into the Molalla River near Oregon City. The Little Pudding River, a tirbutary of the Pudding, lies to the east of the Willamette and west of the Pudding River. Prof.Clark had marked off the drainage divide between the two basins. There, skirting the eastern border of the Salem hills, flowed the Willamette with a very narrow drainage basin, while to the east lay this low flat basin of the Pudding River. In some places near Salem, if the Willamette in flood stage were to rise ten or fifteen feet, its waters would overflow into the Pudding River drainage basin. Why does the Willamette skirt the Salem hills, and flow in a long roundabout way to Oregon City, when it already has a valley cut with an established drainage system through which it could flow in a much more direct (nearly diagonal) course?

This problem developed some interesting discussion.

By the time this discussion ended it was after three o'clock, and all voted it was too late to visit the second fossil locality, Prof.Clark had planned to show us. Prof. Clark brought out their museum's choicest specimens and we could readily see why they are eagerly awaiting the development of the building to house their collection.

President Treasher expressed the thanks of the Society to Prof.Clark and Mr. Reeves for the interesting and enjoyable day which they carefully planned trip had provided. The caravan broke up here; a few of the cars returned by the way of the West Side highway and stopped at a quarry between Hopewell and Amity, where an interesting basalt dike had forced its way up through a fossil bearing tuff.

- Eva Catlin.

******

"PRETTY PEBBLE"

Down where the grinding granites groan
Under the weight of a mile of stone;
Down where the seething magmas boil
Deep under rock and sand and soil;
Where gases reach and snatch and clutch,
And change is wrought by their lightest touch;
A crystal was forged and spread and grew,
Eons ago, when the world was new.

Cradled in incandescent glass,
Fed upon heaving bubbling gas,
Adding by atom and molecule,
Greatening more as the melt grew cool;
Till thin sharp edges, clean and new,
Bounded the facets straight and true;
But this was an infinite age ago,
And reckonless distance deep below.

Then, in the throes of procreant pain
Mother Earth shuddered and heaved amain;
Shattered the crystal through and through
That penetrant vapours might weld anew;
Dulled the faces once so bright,
Crushed and smothered in Plutean night.
As it lay gripped in that awful stress
Diuturnity passed and the load grew less.

Rivers and raindrops, wind and air,
Had eased the weight that bound it there;
Patiently moving the hills away,
Grain by grain and day by day;
Carving the valleys and piling the sands,
Crumbling the mountains and rearing the lands;
While the cycles passed as seconds fly,
Till the crystal at last lay under the sky.

Now the rays of the hot new sun
Starred and burned till the day was done.
Now the chill of the midnight air
Cooled and checked and cracked it there.
Now the rasp of the wind-born sand,
Now the wash of a rain-drop band,
Turn and turn about again
The elements played that slow refrain.

Then flooding torrents, sweeping the brim,
Snatched the stone from its rocky rim.
Roaring, whirled and rolled it away,
Tossed and caught in its monstrous play,
Beat and battered and bruised again,
Carried it on through the level plain,
On to the ocean, there at last
It lay in Protean caverns vast.

Many a frigid fathom below
Eyeless monsters angle slow,
Where phosphorescent horrors glide,
Or over the slippery oozes slide;
And steadily drops an awful rain
Of countless multitudes of slain,
Falling to gaping maws of fright;
Gruesome shapes in an endless night.

Wrapped and buried in bathybic slime
The crystal knew no lapse of time,
Till the end of an era disturbed its bed
As new land lifted and wide plains spread
Out from the ancient shore of the sea
Where waves had washed an eternity.

We walked on the beach, and I heard you say,
"What a pretty pebble!" and toss it away.

- John Eliot Allen
Field Geologist, Oregon
State Department of Geol-
ogy and Mineral Industries.

## SNOW USE.

For the last three years, records have been kept by the U. S. Geological Survey and Bureau of Agricultural Engineering on depth and water content of snow at Phlox Point snow course, elevation 5,600 feet, half a mile southwest of Timberline Lodge on Mount Hood. The water content is determined by weighing cores of snow cut out with a sampler tube of known diameter. The monthly readings have been used (with data from many other courses) to obtain an idea as to the approximate run-off to be expected during the following low-water seasons.

At Phlox Point, observations made as nearly as practicable on the first of each month gave the following results:

| Date | Snow depth, inches | Water equivalent, inches | Density percent |
|---|---|---|---|
| 1937 | | | |
| April 5 | 152.9 | 67.4 | 44.1 |
| April 30 | 158.3 | 80.1 | 50.6 |
| June 4 | 71.5 | 43.1 | 60.3 |
| July 4 | Bare except drifts in timber | | |
| 1938 | | | |
| Jan. 3 | 56.5 | 19.4 | 34.3 |
| Feb. 1 | 83.4 | 31.7 | 38.0 |
| Mar. 1 | 101.5 | 42.8 | 42.2 |
| Apr. 4 | 152.5 | 65.7 | 43.1 |
| May 3 | 115.8 | 53.6 | 46.3 |
| June 3 | 45.2 | 23.8 | 52.7 |
| 1939 | | | |
| Jan. 4 | 70.5 | 22.0 | 31.2 |
| Feb. 2 | 101.1 | 33.0 | 32.6 |
| Mar. 2 | 151.8 | 54.7 | 36.0 |
| Mar. 30 | 140.5 | 65.7 | 46.8 |
| May 4 | 94.2 | 47.6 | 50.5 |

The spring snow depth and water equivalent at Phlox Point are generally greater than at any other station in the Northwest, although some stations are situated at higher elevations up to 9,600 feet.

The latest observation, May 4, was taken in a blinding snowstorm, while the Portland weatherman reported "party cloudy". In spite of the warm dry weather prevailing since March 15th, the water equivalent was found to be only 6 inches less than a year ago.

- Kenneth N. Phillips

## A REVIEW

"Preliminary Geologic Map of the Medford Quadrangle, Oregon" by Francis G. Wells, issued by Oreg. State Dept. Geology & Mineral Industries, 329 S.W. Oak Street, Portland, Oregon; 1 geol. map with text, 1939. Price 40¢.

The Medford quadrangle lies in southwestern Oregon in Jackson County. Field work was done during the summer of 1938 by Mr. Wells and seven assistants. The broad Bear creek valley separates the quadrangle into a S.W.Portion of older metamorphics and a N.E.portion of younger volcanics. Pre-upper Cretaceous rocks are Old Schists, that are highly foliated and probably derived from volcanic tuffs or highly ferromagnesian sediments; Younger Metamorphics consisting principally of quartzites, quartz-mica schists, and quartz-amphibole schists whose exact extent is unknown; Metavolcanic and Metasedimentary rocks that contain lenses of limestone that are too small to map. The meta-rocks dip steeply, strike east of north, and are strongly fractured.

Pre-upper Cretaceous intrusives are serpentine, which contains massive to granular chromite and large, irregular masses of siliceous intrusives. Dikes and veins range from gabbroid to aplitic types. Earliest activity was probably basic, becoming more acidic toward the close of the activity.

Upper Cretaceous Chico sediments, consisting of sandstone and some conglomerate, with some gold, have a maximum thickness of 600 feet, lie in Bear Cr. valley. The overlying Umpqua (Eocene) is disconformable on Chico, and consists of medium-grained sandstone with shaly and conglomeratic layers. Later rocks are principally water-laid volcanics, lava of Western Cascades type with interbedded sediments and white tuff, Rogue River valley lava flows of High Cascades type, and some intrusive dikes. Alluvium in the stream valleys is an important source of gold.

Structure of the Pre-upper Cretaceous rocks is complex, schistocity having destroyed bedding. A synclinal axis trends N.W. from Siskiyou Gap to Donamore Peak. The meta-rocks have a general N.E. strike, steep to vertical dip. Younger rocks strike N.W., and dip N.E. at low angles. Faults are prominent in the older rocks and poorly defined in the younger rocks.

Mineral deposits include clay, chromium, coal, gold, manganese, quicksilver, and mineral springs. Of these, chromite occurs in serpentine as massive to granular mineral. Prospecting should be confined to serpentine areas. Manganese oxides occur principally in the Lake Creek region, deposited in tuffs and breccias by leaching solutions that carried the manganese and iron. The breccia member is the most favorable prospecting locality. Gold is recovered from various placers, and future production will probably come largely from lode mines. Quicksilver is found in the N.E. portion of the quadrangle; it is characteristically spotty in occurrence, and usually associated with volcanic rocks. Coal, clay and mineral water are of minor importance. No oil shows are known.

The geologic map is printed in 4 colors, the scale is 1½ mi. to 1 in. Legend includes a tabulation of mines and prospects located on the map by numbers. The map and text were released by the U.S. Geological Survey at the request of the Oregon Department that these pertinent data be made available to the public prior to the release of the final bulletin. The Director of the Federal Survey graciously granted the request, the master copy was prepared by the Survey, and the cost of publication was supplied by the Oregon Dept. The map and text are strictly preliminary and are subject to later modification. - RCT.

## MORE ABOUT THE COOS BAY SUMMER CAMP

From July 23rd to August 6th, those members of this society that attend the Coos Bay camp are going to have one grand time studying the geology back of our coast scenic spots in southwestern Oregon. This area contains Oregon's most ancient rocks. Through the ages these rocks have been subjected to nature's most complicated contortions, and impregnated with the minerals that are being mined today. The plants of the past supply the fuel of today in the Coos Bay coal beds. Elevated sea beaches, sea cliffs, submerged valleys, dune formed lakes, and other structural features may be studied at their best. Everyone should return with a collection of typical rocks, minerals, and fossils common to the region.

Time will be allowed for play, for after all, this is a vacation trip.

Please send in a postcard at once, stating the number in your party, your address and phone number, and the length of time you will stay at the camp. If you are alone state if you would share a cabin.

We are waiting for a reply from the operators of Long's Barview Cabins at Charleston, Oregon, regarding rates and other facts about their camp. This information will be submitted as soon as it arrives to those sending cards, and will appear in later News-Letters.

Mail your cards to:

H. B. Schminky
1030 S.E.54th Avenue

## A VACATION TIP -

If any members of the society, or their friends, are intending to spend their vacation in the Wallowa mountains this summer, I would suggest that they write to:

Mrs. T. H. Williamson
Edelweiss Camp
Joseph, Oregon.

for accommodations. Mrs. Williamson did much to make the summer camp a success last year. Let her know that you belong to this society in your l tter.

## LUNCHEON NOTES
May 11, 1939.

Guests at the noon luncheon on Thursday, May 11, 1939: Franklin Davis introduced Nola Schaffarzick who is in town temporarily. She used to be a member of the society. Mr. Baldwin introduced Eva Catlin as the new secretary of the society. Mr. Treasher introduced Hiram Wood, who has been employed recently by the Oregon State Dept. of Geol. & Mineral Industries. Mr. Wood has his master's degree in geology and is Oregon trained.

Davis and Wade gave a brief account of their two-man field trip to Fossil Lake and displayed specimens. Mr. Wade secured an excellent rodent skull and Mr. Davis completed his horse-hoof collection to the knee pad joint. Dr. Adams submitted specimens from Death Valley for inspection by the members. Mr. Vance introduced the coming field trip by showing some of the material that he collected. Mr. Phillips (K.N.) had pictures, taken on the Columbia County iron ore trip. Treasher presented the O.S.D.G. & M.I.'s new map of the Medford quadrangle. Mr. (Dr.) Stevens gave some impressions of the San Francisco Fair with particular reference to museums.

These Thursday noon luncheons are attracting a lot of attention. Members of the society, their guests, or anyone interested in rocks, minerals, and fossils, meet at the L'Abbe Coffee Shop, 9th and Salmon, between the hours of 12 noon and 1:15 p.m. There is no formality; people come in when they can get there and leave whenever necessary. Almost any topic under the sun is discussed and everyone has an equal chance to be heard. If it is possible for you to be there, and you have not yet attended, you are missing a real treat.

***********

## MIDGET SAMSON

The most powerful magnet in the world for its size - one that will lift nearly 1500 times its own weight - has been developed in the G.E.Research Laboratory. It weights 1.85 grams (1/15 oz.) and has lifted 2750 grams (6 lbs.) in tests. About half the size of an eraser on the end of a lead pencil, it will lift a 5 lb. flatiron with ease. The new magnet is several times as strong as those previously made.

The magnet is of Alnico, an alloy of aluminum, nickel, cobalt and iron. The material was first developed in the G.E.Research Laboratory as a heat-resisting alloy withstanding scaling and deterioration at high temperatures. Research on the magnetic properties of alloys of this type was later carried on by Professor T. Mishima of the Imperial University, Tokyo, and General Electric perfected a process of heat treating by which the magnetic properties were more fully developed.

Alnico has been used in radios, motors, generators and other electrical equipment for some time, replacing electromagnets. The more powerful new magnet employs the same alloy as previously used, but utilizes a steel sheath around the Alnico pelet to direct the magnetic flux against the keeper or object being attracted. The steel jacket also protects the magnet against demagnetization when not in use. - General Electric Review, vol.42 no.4 (April 1939)

# GEOLOGICAL NEWS LETTER

VOL. 5 NO. 11 PORTLAND, OREGON JUNE 10 1939

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DR F T JONES
FOREST GROVE, OREGON

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY




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Editor-in-Chief and Business Manager

Raymond L. Baldwin
345 U. S. Court House
Portland, Oregon

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| Arthur M. Piper | C. D. Phillips |
| Ray C. Treasher | K. N. Phillips |

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MEMBERSHIP APPLICATION

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ____________

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

______________________________
Address

______________________________
Business Address

______________________________ ______________________________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ____________
______________________________

Sponsored by: ______________________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________________
Signature

ANNOUNCEMENTS

Lectures

Friday June 23 — This is to be a joint meeting with the MAZAMAS, and will be held in our usual meeting place - the auditorium of the Public Service Building.

Dr. Laurence McKinley Gould will lecture on

ICE - "the most interesting thing in the world".

Dr. Gould will be remembered by his splendid lecture to us last summer, when he told of his experiences in Antarctica with the Byrd Expedition of 1929-1930, of which he was second in command. In 1927 he was a member of the Putnam Baffin Island Expedition, exploring Hudson Strait and Foxe Basin. With such extensive experiences in both Arctic and Antarctic regions, as well as on various mountain glaciers, there are few men as eminently qualified to discuss the geological aspects of ice, so a real treat is in store for those who hear him. Our society is honored to have this fine scientist with us again. Reserve the date now and assure him a real welcome by a large and appreciative audience.

Friday July 14 — Dr. Donald B. Lawrence, Professor of Botany, University of Minnesota, will speak to us on the subject of

MOUNT ST. HELENS.

His lecture will be illustrated and will review the recent geology of this, our youngest local volcano.

Dr. Lawrence is well known to our members and his talk to us on a former occasion about the submerged forests of the Columbia will be recalled as one of outstanding interest. Changes in growth of plant life tell an important geologic story and the romance of that story concerning Mt. St.Helens is as fascinating as that of the Columbia River drowned forests.

TRIPS

Sunday June 11 — Franklin Davis will lead a trip to Angels Rest in the Columbia Gorge a short distance west of Wahkeenah Falls, and about 28 miles from Portland. The spot is also known as Fort Rock - is about 1500 feet above the river and is reached by a good trail on a fair grade. The sign post says it is a two-mile hike. The return trip will be by way of Wahkeenah Springs, Mist Falls, to Wahkeenah Falls on the Highway. The return trip is approximately 4 miles, all down-grade. The start will be made from the Public Market Building at 8:00 a.m. It is planned to eat at Angels Rest, where no water is available. Lunches should be carried in packs or paper bags, as it will be inconvenient to carry baskets on the trail. Besides the geological interests, the view point will be one of the finest in the gorge and will be of particular interest to the photographers. Mr. Leo Simon will attend to the identification of the flowers which will be found in profusion along the trail.

Sunday June 25 — Dr. Warren D. Smith will lead the society on a trip to Cape Lookout near Camp Merryweather, south of Tillamook. There are many interesting geological features in this area.

**********

THE SUMMER CAMP ON COOS BAY will open on July 23rd and close Aug.6th. Long's Barview Cabin Camp has two cabins with two beds each at $1.25 per day, and three cabins with one bed each at $1.00 per day. They do not furnish bedding or cooking utensils. Reservations may be sent to Long's Barview Cabin Camp, Marshfield, Oregon, Route 2. Dr. Packard has not had confirmation on our using the school camp, but there is still hope.
THIS WILL BE THE LAST REMINDER ABOUT THE CAMP unless those desiring to attend send in their cards.

**********

The following FREE circulars will be of much interest to those attending the camp:

Circular 2 - Copper Deposits in the Squaw Creek and Silver Peak Districts and at the Almeda Mine, southwestern Oregon, with notes on the Pennell & Farmer and Banfield Prospects by Philip J. Shenon.

Circular 8 - Beach Placers of the Oregon Coast, by J. T. Pardee.

Mail a postcard to The Director, United States Geological Survey, Washington, D.C.

We also refer you to the following publications by the old Oregon Bureau of Mines and Geology:

Mineral Resources of Oregon, vol. 1 no. 5, Aug.1914 - Petrology and Mineral Resources of Jackson and Josephine Counties, Oregon, by A. N. Winchell, and,

Mineral Resources of Oregon,vol. 2 no. 2, Oct.1916 - Preliminary Survey of the Geology and Mineral Resources of Curry County, Oregon, by G. M. Butler and G. J. Mitchell

Both of these are out of print, but they are worth study at the Library.

**********

The author of "Silt and Civilization" is well qualified to write such a paper. Mr. Stevens is a member of the firm of consulting engineers, Stevens & Koons, of Portland, Oregon. He has served with the surface water division of the United States Geological Survey, and as consultant on many irrigation projects. His paper on the silting of reservoirs won the national award of the American Society of Civil Engineers, of which organization he has served as Director. In addition to his many duties and interests, Mr.Stevens finds time to follow his hobby of geology and has contributed materially to the Geological Society of the Oregon Country.

His statement that "every civilization seems to contain the germ of its own disintegration" fits in with his subject. Our civilization must eat-therefore more land must come under cultivation; -therefore irrigation and storage reservoirs are necessary; -cultivation destroys Nature's protective cover and erosion brings silt to fill the reservoirs built to make the farming possible. The processes concerned are geologic, and as students of this science, we are interested in any such process that may change man's way of living.

## SILT AND CIVILIZATION

by J. C. Stevens

We are at the beginning of a rapidly expanding program of reservoir construction for multiple purposes of irrigation, power, flood control, domestic water supply, and silt abatement. We may safely anticipate that this program will continue to expand until virtually all reservoirs for which there is a need and an economic justification will be created and placed in operation. We may speculate that the peak in this program will be reached in about 100 years.

By that time irrigation development in the west will have reached its optimum. Practically all available areas that are suitable and for which irrigation is economically justified, and many that are not, will be under irrigation. This increase in irrigated areas over that existent today will be by waters conserved in storage reservoirs. Under this optimum condition populations will have trebled or quadrupled. Cities will exist where deserts now abound. Transportation, communication and power systems will join urban and rural areas with closely woven networks, and western civilization will have found its place in the sun.

By that time many of the reservoirs now in use will have become useless by siltation and the program of supplanting them by other sites or by increasing storage capacities by increasing the height of dams will have been well begun. This program of supplanting useless reservoirs will run parallel with that of constructing new ones and we may speculate that this dual program of construction and supplantation will continue for a period of 200 years. During this period practically all feasible reservoirs will have been constructed and western civilization will be faced with the problem of maintaining their usefulness by all means that ingenuity can devise.

We may visualize all sloping lands terraced, all bottom lands adequately drained, drainage basins intensively managed to reduce erosion to a minimum, and economies practiced in the use of water that today are little dreamed of, Western civilization will be on the defensive with many casualties in its wake.

We may speculate that 500 years of this brave defense cannot end otherwise than in ultimate defeat; that ultimately all reservoir sites will have been utilized and ultimately filled with the sediments from their drainage basins; that ultimately western civilization must decline to a state the unconserved waters of the west will maintain.

It is a rather dark picture, but is it not the way of all flesh? Civilizations have been founded, have grown to an optimum of prestige and influence, and have gradually declined and faded to exhaustion. Of such were ancient Sumaria, Chaldea, Mesopotamia, the Incan and Aztec civilizations in our own hemisphere. In many places of the west are found remains of irrigation institutions once vigorous but now extinct.

The causes of these declines have been varied - foes from without and foes from within. Every civilization seems to contain the germs of its own disintegration. Exhaustion of natural resources must be recognized as a most potent cause, and if western civilization in the United States is not greatly curtailed beforehand by other causes it is most likely to become so by sedimentation of reservoirs before 40 generations have passed on.

The construction of storage reservoirs in the west began scarcely 50 years ago, and already a goodly number have either become useless or have had their usefulness greatly impaired by siltation. Following are those in the United States, on which actual silt surveys have been made, that have lost 50% or more of their original capacity. Channel reservoirs created by diversion dams are not included.

| Reservoir | Stream | Original capacity (1) 1000 af | Year Constructed | Year of last survey | Siltation period years | Capacity lost % |
|---|---|---|---|---|---|---|
| McMillan | Pecos | 90 | 1894 | 1932 | 39.0 | 56 |
| Old Lake Austin (2) | Colo.R. of Texas | 49 | 1893 | 1900 | 6.75 | 48 |
| New Lake Austin | do | 32 | 1913 | 1926 | 13.0 | 96 |
| Boysen | Big Horn | 16 | 1911 | 1924 | 13.0 | 80 |
| Zuni | Zuni | 15 | 1906 | 1932 | 26.2 | 77 |
| Furnish | Umatilla | 5.5 | 1909 | 1931 | 22 | 82 |
| LaGrange | Tuolumne | 2.3 | 1895 | 1931 | 36 | 83 |

Can we do anything about it? Ultimately, no. But we can postpone the evil day. If, instead of waiting until we are on the defensive we begin now to adopt those measures we know must eventually be adopted, we might hold this civilization intact for several hundred years longer than would otherwise be the case. Every decade that can be added to the useful life of a storage reservoir is abundantly worthy of accomplishment, because there is so much at stake.

The measures now being taken by the Soil Conservation Service, the Forest Service, and other federal and state agencies are pointing the way. We have however, just begun. Many practices now followed will be found futile, and others more effective will be substituted. Only by experience can we prove or disprove theories. Progress will only be made by patient endeavor, and many backward slips must be expected.

Two types of erosion must be recognized: that type that has gone on since the foundations of the earth were laid; the type that has moulded hills, mountains and plateaus to their present configuration, and has built up valleys

(1) To Spillway level or level controlled by flashboards or crest gates.
(2) Dam failed in 1900. Reconstructed in 1913.

and bottom land; the type that levels upland to plains and renders them fit for human occupancy we may style geologic erosion. We need not concern ourselves much with this type of erosion for there is little we can do about it. We must not even wish to halt the normal phases of this process.

The other type of erosion is largely man-induced. We may call it cultural erosion. It results from man's improvident use of land and water resources. Every highway, every irrigation canal, every railroad, the grazing of livestock, the cultivation of fields, in short, every scar made by man on the earth's surface is a source of incipient erosion that in critical areas may reach serious proportions, and greatly aggravate the normal geologic erosional processes. It is to this type of erosion that preventive and remedial measures must be applied to lessen its expansion and to heal the scars that have already been made. We cannot expect to eliminate entirely this type of erosion any more than we can hope to do away with cultural activities. Nevertheless nature will work wonders in healing scars if given a chance. The maintenance of an adequate vegetal cover is the most important single consideration. Correct methods of tillage and farm management, the control of grazing, the protection of forests from fire and improvident cutting, the searching out of plant types that will thrive in critical areas, and the revegetation and protection of those areas are factors essential to a well-balanced and orderly program to reduce cultural erosion to a minimum.

The efficacy of these measures, however, must not be unduly exaggerated for the claims as to their value can only be proven by catastrophic trials such as that visited upon southern California during the downpours of last March. One of the dangers to be reckoned with is that such cloudbursts may bring down not only the silts and debris normal to such a storm, but those accumulated over many preceding years and held in reserve by inadequate and improperly maintained detention works and measures. That has actually happened in many instances in the west where unproven detention works were hastily built.

I have asked many of my friends in the Soil Conservation and Forest services this question: "If you could put into immediate service all the soil retention measures that have proven effective and can be economically justified throughout the entire drainage area of the Colorado river, how much of the 200 million tons of silt now carried annually to the gulf or stored in reservoirs, could be held on the basin area?" The answers have varied all the way from 40 to 95 percent. My own feeling is that 15 or 20 percent would be more in accordance with the truth. Even that much would be abundantly worth while, as it would add between 100 and 200 years to the useful life of the Colorado's reservoir system. I challenge anyone to adequately evaluate a reprieve of 200 years to western civilization.

What is silt and where does it come from? Silt is rock ravelings, and comes from the disintegration of rocks. Rain water dissolves certain rock constituents. It enters crevices, freezes, spalls off particles and blocks, chemical agents in air and water react with those in the rocks causing them to break down and crumble to dust. Rocks in stream beds are ground to sand and the chemical constituents dissolved and carried away. Sedimentation is that phase of the geologic cycle involving water transportation and deposition. Lakes and valleys are filled, great deltas extend fan-like into oceans, creating alluvial plains. Of such are the valleys of the Nile, the Ganges, the Mississippi, the Yellow river, and lower Colorado and Rio Grande.

In areas of abundant precipitation, the streams carry off the detritus from rock disintegration almost as fast as it accumulates. Such streams run clear except during floods. On the arid areas such detritus accumulates to great depth and may remain in place for many years, until an unusual rainfall or cloudburst occurs, when great quantities of silt are carried into stream channels. If the drainage area is large enough, such downpours occur in some portion of the drainage area at sufficiently short intervals to keep the main stream surcharged with sediments. This characteristic is observed on the basins of the Colorado, Rio Grande, Missouri, and most streams of southern Texas.

The geologic formations of which the basin is composed are also a most important factor. On the Yellow river the yellowish wind-borne loess keeps the river supplied. On the Rio Grande, Colorado and Texas streams, exposed sedimentary rocks are rapidly disintegrated, providing enormous quantities of fines for transportation by both wind and water.

Stream degradation. A most fruitful source of silt in streams is bank caving, by which sediments are reworked or carried entirely off to the sea. An alluvial valley is built up during centuries of sedimentation and then degraded under a new set of cultural or climatic conditions. Valley building appears to be an endless succession of alluviation and degradation. Abundant evidences of these recurring cycles have been found.

No complete explanation for these cycles of alluviation and degrading has as yet been found. The potent factors are deep seated and are quite certainly beyond man's power to alleviate to any great extent, except in certain favored situations. During a period of alluviation the slope of the valley is flattened. In time, it becomes too flat for the stream to carry its normal flood waters. A period of channel cutting ensues. This process of degradation is carried beyond the balance point, and a period of alluviation sets in.

In conclusion, I want to point out that the one great silt problem of the irrigated west is that of preserving the integrity of our storage reservoirs. All others are of local or temporary import and are quite capable of ultimate solution.

For the major problem, however, there now appears to be no final solution. Is the technical skill of humanity able to cope with it? How long can the day of exhaustion of our storage facilities be postponed? Are the measures of soil conservation, forestry, grazing control now in effect accomplishing their expected purpose? Can man be brought to a realization of the importance of remedial measures, and will he, under some inconvenience and expense to himself, adopt them for the benefit of future generations? The answers to these questions are of tremendous importance to western civilization.

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## COON CREEK TRIP

A company of about fifty braved the heat of the very warm summer day on Sunday, May 14, to visit the fossil localities on the new road linking Scappoose with Vernonia. The trip was led by Dr. E. L. Packard of Oregon State College, and A. D. Vance, chairman of the trips committee. The fossil exposures in this district are all Oligocene in age, and the principal fauna are Pelecypods and Gastropods, commonly known as clams and snails.

The most important beds visited are adjacent to a little stream known as Coon creek, and after lunch in the shade of the highway bridge, the afternoon was spent at this place. The best find here was a large shark's tooth, by H. B. Schminky. Dr. Packard stated that this tooth, about an inch long, is a fairly long tooth, a pretty good sized one for Oligocene, and represents a shark probably eight feet long. After the fossil hunters had spent some time breaking rocks, they rested and listened to Dr. Packard tell something of the geological history of western Oregon during the Oligocene age, and of the faunal sea life during that period. He described some of the clams and snails that are now found fossil. Some notes on this talk are given below.

Stops were made at some other localities during the morning on the way to Coon creek, and at one of these a small shark's tooth was found by Miss Ellen James.

The geology of the district was noted, and some stops were made to study this. At one road cut there was a fairly good example of an anticline. The structure was discussed briefly by Dr. Packard. An eastward dipping series of Oligocene sediments is indicated. It appears to be quite thick, apparently having flexures which have been faulted in that area. There seems to be two or three townships covered with lava sheets. The lava may have come up in vents or cones, as it does not cover the whole district.

From the Coon creek fossil beds, some of the group went to the Pittsburg Bluff locality, where Leo Simon found the shell of a large limpet, a species of snail. Very few limpets are described in the Tertiary of the west coast, according to Dr. Packard. He pronounced this one a very fine large specimen.

Dr. Packard's talk was in part as follows:

The Oligocene sea, as far as we are able to discover, probably struck the Oregon coast a little south of Yachats. Then it looks as though there was a peninsula jutting out into that sea and across the region of the Coast Range, and probably not far south of Newport, somewhere in there. Then I imagine there was a southeast bend of the shore line that extended to the present foothills of the present Coast Range, down to Eugene, and over to the Cascades at Coburg. At Coburg, the rocks with Oligocene fossils in them dip under the lavas of the Cascade range. The shore line couldn't have been very far east of Coburg, not more than five miles, and probably less, because the sediments there are coarse. Such sediments cannot be very far from a shore line, not more than two or three miles.

Then near Brownsville, which is north, there is a locality of Oligocene fossils, the same sort of Pelecypods and Gastropods that we find at Eugene, first called the Eugene formation by Schenck. The fauna at Brownsville is probably at the very top of the Eugene formation. A few years ago Wayne Felts, now at Cincinnati, then working within the Peterson Butte area, did some fair collection of the Eugene fauna, Oligocene, so that the short line is that far over, almost at the middle of the Santiam district. (Wayne Felts, a member of the Geological Society of the Oregon Country during its first year of existence, was leader of the society's first caravan trip, May 25-26, 1935, when ancient Indian settlements were explored in the Columbia river gorge).

Northward, those same beds occur at Turner, and extend eastward as far as Silver Creek falls. So we may say that the shore line extended from Brownsville, a little east of Peterson Butte, to somewhere near Silver Creek falls. It would swing to somewhere in the vicinity of Portland and cut across into Washington, where it occupied a considerable embayment in southwestern Washington, and reached up into the Puget Sound country. This is only a guess, and the beds we may see may not be the farthest extent of the Oligocene shore line. So we can't be too sure where this shore line actually was, and probably never will. But we can approximate it.

Let us think of this Oligocene sea occupying this portion of western Oregon for a very long period of time, representing a million or two years duration. Let us think of this thing as being a sea which was shifting. This shore line shifted from time to time. Being unstable, you can think of the sea as gradually advancing on the land at that particular time. The land was western sloping, probably. There were no Cascades then, and it was before the Columbia river lavas. We don't know where the shores were, but we do know that during this Oligocene time, when this sea occupied this region, there was a great deal of volcanic activity, and the winds blew ashes into eastern Oregon. We know there was a great deal of this volcanic ash because we find it in the John Day beds. We know there was semi-tropical vegetation there, and forests, and it was inhabited by large numbers of mammals and turtles. That ash was being washed down by these westward flowing streams toward the Pacific, and into this embayment in northwestern Oregon.

There may have been volcanoes along the margin of this sea, which may have been throwing their ashes into the embayment from time to time. Streams bringing in this ash in large quantities, and they mingled with the sands and muds in this embayment. The streams may have been working on the Eocene rocks, and you have massive sand beds. Those beds where the currents were strong, were cross-bedded. The sea advanced, and perhaps shifted back, and came in in a different way, and left thicker deposits in one place than in another. In this Oligocene sea of ours there may have been water continually, and there may possibly have been eruptive interruption when there was no water, especially in some places.

Near this Oligocene sea there were living semi-tropical flora. The vegetation was not as tropical as in the Eocene, but nevertheless was mor tropical than at the present time. Perhaps similar to the Mexican, probably warmer than southern California.

In that sea there were living, sharks. They have been found in a number of places. Sharks are difficult to determine. They have a variety of teeth in the same jaw, depending on the position in the jaw. Teeth drop out and others come in, so the teeth show different sizes in the same jaw. That makes determination rather difficult. Sharks are cartilaginous vertebrates, having a cartilaginous backbone. In some places this back bone is changed by calcification, but usually we get nothing but the teeth, and it is pretty hard to say much about an isolated tooth of a shark.

Oligocene seas were shallow seas. At no time were these embayments in Oregon excessively deep, so that submergence of this basin affected very materially the variety and quantity of sediments. There were no masses of limestone.

In addition to sharks, the life of this sea probably included some mammals. The reason I say probably is, that in the area near Newport a number of years ago, almost at Yaquina Point, in the mud flats at extreme low tide, there were found vertebrae that looked like an animal about the size of a seal. It seemed at the time those were Oligocene. It is possible that this block that contained the seal, although it was in place, may represent a portion of the Astoria-Miocene. If that is the case, than that small bone is not Oligocene, and we will have to say that the only vertebrae we have from those Oligocene beds are the shark. We have found them at Eugene.

Then besides those things, the fauna which we have in these Oligocene beds is usually the fauna of Pelecypods and Gastropods. There have been found a few specimens of sea urchins, and possibly a coral, but they would be relatively rare, and not an important element of the fauna. So with the exception of Aturia, which are Cephalopods, and which appear in some of these beds, and an occasional crab, that is about the list we may expect to find.

The clams and snails are quite modern. There is a long list of Pelecypods from the Oligocene. The best source for this material is that by Hubert Schenck. A very conspicuous Oligocene clam is the Acila, having taxodont dentition. That genera goes farther back into the past than the Oligocene. We do not find Acila at the present time unless we dredge five to one hundred fathoms.

Tellina is a genus which occurs very commonly in the Oligocene. A modern thing, it goes back into the Cretaceous, and from there clear through to the present time. There are quite a number of Tellinas. The genus is represented by several species at the present time. Some of them are of pretty good size, being two inches long. Almost always the Tellina is rather sharp pointed at the posterior end. Quite frequently the shell is bent up at the posterior end.

Then we have the genus Solen, a small razor back. There are several different species in this fauna. Solens are still living. They are the true razor clam that is found scattered over the world at the present time. The one we call razor clam is not a solen. This particular species is very narrowly confined to this northwest coast.

Another genera which is a modern thing is the Spisula. It also runs back into the Cretaceous, which represents its maximum development. It is abundant in the Miocene time. The modern fauna is not as extensive as in the Miocene. In fact, in the Oligocene that group was in a plastic condition, so there are many different species that are hard to distinguish. Extremely variable types. The Spisula is a very common modern genus. It is probably the most abundant single genus of clams that will be found in this portion of the Tertiary. It is a very highly specialized clam. It has the teleodont type of teeth.

The Macoma is a sharp pointed little fellow which is called Leda. Ledas are also normally considered to be outside the breaker line, like the Acila. Some have smooth shells and some are ornamented. The leda belongs to a family which is next door neighbor to the Acila, so has a similar type of teeth, tax-odont.

The Cardium is a modern genera, with heavy ribs, a nearly symmetrical shell, and is equivalvular. Several Cardiums are described in this Oligocene fauna.

The Gastropods represent probably not quite as large a proportion of the fauna of the Oligocene as the Pelecypods. Some of them are highly ornamented, and when a Gastropod is ornamented, it is fairly easy to check it over. The Natica belongs to this class. There are several different species of Natica, egg shaped, rounded smooth types, with small spires and large body whorl. These types differ somewhat in proportion as the body whorl, or the space in it coils around a space called the umbilicus. So the general shape of the Natica and its umbilical region are the two most important diagnostic characters of a particular form.

One rather rare genus today is the Turritella, one of those long, many coiled types, quite abundant in the Tertiary. Not so important in the Oligocene as in the Eocene, where they serve as a zonal fossil.

There is a series of genera here that belongs to a group which is represented by four or five different genera having much the same appearance. Agasoma is one of these types. Bruclarkia is another. That group was quite highly ornamented, and represents the middle Tertiary. A group of considerable importance. The ornamentation consists of ribs which are longitudinal, which tend to develop nodes on the shoulders, rows of nodes which are distributed along lines which we think of as longitudinal ribs.

- E. M. Barr

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MEMBERSHIP APPLICATION

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ____________

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

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Address

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Business Address

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Telephone Number    Occupation

I am particularly interested in the following branches of Geology: ____________
________________________________

Sponsored by: ____________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

____________________
Signature

## ANNOUNCEMENTS

### Lectures

Friday June 23 — This is to be a joint meeting with the MAZAMAS, and will be held in our usual meeting place - the auditorium of the Public Service Building.
Dr. Laurence McKinley Gould will lecture on
ICE - "the most interesting thing in the world".
Dr. Gould will be remembered by his splendid lecture to us last summer, when he told of his experiences in Antarctica with the Byrd Expedition of 1929-1930, of which he was second in command. In 1927 he was a member of the Putnam Baffin Island Expedition, exploring Hudson Strait and Foxe Basin. With such extensive experiences in both Arctic and Antarctic regions, as well as on various mountain glaciers, there are few men as eminently qualified to discuss the geological aspects of ice, so a real treat is in store for those who hear him. Our society is honored to have this fine scientist with us again. Reserve the date now and assure him a real welcome by a large and appreciative audience.

Friday July 14 — Dr. Donald B. Lawrence, Professor of Botany, University of Minnesota, will speak to us on the subject of
VEGETATION AS A CLUE TO RECENT GEOLOGICAL EVENTS ON MOUNT ST.HELENS.
His lecture, which will be illustrated with lantern slides, is based on the research work he has conducted on the slopes of our youngest volcano during the past year or two.
Dr.Lawrence is well known to our members and his talk to us on a former occasion about the submerged forests of the Columbia will be recalled as one of outstanding interest. Changes in growth of plant life tell an important geologic story; the romance of that story concerning Mt.St.Helens is as fascinating as that of the Columbia River drowned forests.

Friday July 28 — Our president, Mr. Arthur M. Piper, will be our speaker and will present the third lecture in our series of maps, their principles and their significance and relation to geologic work. The particular phase of the subject with which he will deal he entitles
INTERPRETATION OF TOPOGRAPHICAL MAPS,WITH SPECIAL REFERENCE TO LAND FORMS.
This is the branch which deals more with the use of maps, rather than with the principles and processes governing their making, so it is of particular value to the geologic enthusiasts in our Society. Mr.Piper has spoken to us on former occasions, always with much acceptance; his training renders him well qualified to deal with this subject.

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### THE COOS BAY SUMMER CAMP.

Everyone who is interested in attending the camp at Coos Bay is requested to remain after the meeting on June 23rd. Those who cannot be at the meeting should send in cards signifying their intention of attending the camp.

## TRIPS

Sunday June 25 — Dr.Warren D. Smith, Professor of Geology at the University of Oregon, will lead the Geological Society of the Oregon Country to study the geology of the Cape Lookout region near Tillamook Sunday June 25th. Members of the Society will assemble at Hemlock on the Tillamook highway about 8 miles north of Hebo at 9 a.m. where Dr.Smith and his geology class from the University will join us. The caravan will then proceed to "Allen's" where the cars will be parked and the hike across dune sand and up the beach will begin. The interesting geology to be seen on this trip will be explained by Dr.Smith at the various stops. Dr.Smith will work north along the beach from Florence with his geology class on Saturday and spend the night probably at Depoe Bay. Some members of the Society plan to leave Portland Saturday noon and study the geology at Roads End Saturday afternoon and evening.

## NEW MEMBER.

| | | |
|---|---|---|
| H. B. Wood | Tr 6174 | 4222 N. Commercial Ave. |

## CHANGES IN ADDRESS

Mr. and Mrs. M.F.Sandoz, Box 76, Davenport, Washington.
Mr. and Mrs. E.E.Williams have moved to 2338 NE 17th Ave. MU 1270
Mrs. Hazel Haaser has moved to 5916 NE Broadway.
Mrs.Elizabeth Griswold, Ketchikan, Alaska, c/o Montgomery-Ward Co.
J. M. Weber, Route 2. Box 370, Troutdale, Oregon.
Mr. H. F. Travis is at Cannon Beach for the summer.

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Ormond R. Bean, recently named State Utilities Commissioner, figured the City of Portland could get along better without our fellow member Franklin L. Davis than hd could and so decided to take Franklin with him. Mr.Davis left Portland June 13 to assume his new duties at Salem, where as assistant commissioner he will have charge of all matters pertaining to personnel and reorganization of the Department.

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Commissioner William A. Bowes, Saturday, June 10th, announced the appointment of our fellow member A. D. Vance as his assistant and to be Chief of Operations of the Public Works Department.

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Mr. Thomas A. Carney showed colored moving pictures on June 12th, with talk on photography, to the Montavilla Camera Club.

Friday night, June 16th, at a meeting of Oregon Agate and Mineral Society, Dr. Booth gave a talk and displayed specimens collected on his recent trip to Mexico.

Mr. O. E. Stanley has returned from a trip to San Francisco Fair, Bryce Canyon, and Zion National Park. When asked about his trip he remakred he had some pictures but that Mr. W. A. Reeves, who was making the same trip, was bringing back some rock specimens.

Two of the musketeers, Miss Helen Iverson and Miss Constance Endres, are on a trip to the Olympic Peninsula and Vancouver Island.

Who left a black zipper jacket in Mr. Vance's car on the Angels Rest trip? Will the owner please get in touch with Mr. Vance?

How many members of the Society can use a typewriter? We would appreciate having a number of our members offer to do some typing for the bulletin. Most of the typing of master copy for bulletin has fallen on a few members of the society. Summer is here and these members may want a vacation. You on the other hand want your bulletin, and you want it out on time, so that you may always have notice of next meeting or trip. Why not volunteer to serve on "Bulletin on Time Committee?"

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## REVIEWS.

"Northwest Mineral Supplies": Edwin T. Hodge; Northwest Science, vol.13, no.2, pp.38-44, May 1939.

The author discusses the status of investigations of mineral resources of the Pacific Northwest, particularly Oregon, Washington, Idaho, Montana and Alaska. He states that no inventory of Northwest mineral resources ever has been made, - that Northwest power can service electrometallurgical industries - that various raw materials either are, or are reported to be, present, and that a survey should be made in the near future for economic and strategic reasons.

Iron & Steel. Large supplies of iron ore adaptable to electric furnace reduction are available. Ferroy-alloys are considered. Manganese: imports into the U.S. are heavy, - necessity of stock piles - importance of Olympic Peninsula manganese ores. Alumina can be produced from high grade kaolins of which there are plentiful resources, to ultimately manufacture aluminum metal, and the kaolins may be used also in ceramics. Phosphorus and Fertilizer: Idaho and Montana contain a large proportion of the world's reserves. This fertilizer could be supplied to western farms at low cost. Magnesium metal has wonderful properties. The Northwest has the largest supply of high-grade low-cost magnesia ores in the U.S., and the metal should be produced using Northwest power. Coal in the Northwest is not attractive as a fuel but as a source of chemicals it has unlimited possibilities. Limestone resources are large and of high quality but no thorough study has been made of the deposits. Other metals that should be investigated are Chromite, Molybdenum, Tungsten, Antimony, Quicksilver, Nickel and Cobalt. Many of these are known to occur in commercial quantities. No systematic attempt has ever been made to evaluate Silica supplies. Zinc and Lead could be important if treated electrolytically.

(RCT)

## REVIEWS

Lawrence, Donald B. - "Some Features of the Vegetation of the Columbia River Gorge with Special Reference to Asymmetry in Forest Trees." (Ecological Monographs 9:217-257, April 1939)

Members of the Geological Society of the Oregon Country will be interested in this noteworthy contribution by a fellow member to the literature dealing with the Columbia River Gorge. The paper is the result of work in four field seasons, coupled with research into literature on the geology, climatology, and ecology of the region, for which a bibliography is included. (The only notable reference that seems to have been omitted is the classical statement by Believe-it-or-not Ripley that "Shellrock Mountain rests upon a bed of solid ice!")

The author's summary follows: "Some of the main physical features of the Columbia Gorge are discussed, including geology, topography, soils, flood history, and tributary drainage systems. Notable vegetational features are described, with special reference to habitat conditions as these differ from west to east and from north to south. The gorge appears to have acted as an east-west corridor for and as a north-south barrier to plant migration.

"A number of observations concerning flood tolerance of firs and pines are presented, from which it is concluded that Douglas fir is very intolerant, and that ponderosa pine is considerably more tolerant.

"The peculiar and conspicuous one-sided tree crowns of the western and eastern regions of the gorge, especially those of Douglas fir, are described in detail, with photographic illustrations, and the weather conditions to which these two very different types of crown asymmetry are apparently due are described and discussed.

"In the western part, the firs are prevailingly and drastically pruned through mechanical breakage due to the action of occasional easterly winter gales that are accompanied by heavy deposition of ice. These crowns characteristically extend only in a westerly direction from the trunks. The firs of the western part are also characteristically subject to parch blight in many instances, a form of injury in which the foliage and branchlets on many unbroken branches are winter-killed. The killed needles gradually become brown as spring comes on but they generally remain in position for several months, giving rise to discolored patches that are conspicuous in spring and early summer.

"In the eastern part, the firs show little or no signs of storm breakage or parch blight, but they are characteristically wind-trained, through the action of persistent strong westerly winds of summer; their crowns generally extend only in an easterly direction from their trunks, branches arising on the west being bent around the trunks so as to extend toward the east.

"In the middle region of the gorge, in the vicinity of the Cascade Rapids, both forms of fir crown may be seen, and some crowns exhibit the combined effects of both storm-pruning in winter and wind-training in summer.

"The western, storm-pruned type of tree asymmetry resulting chiefly from glaze injury has apparently not been described for any other part of the world; but the eastern, wind-trained type is not uncommon in localities where strong winds of persistent direction and velocity occur in the growing season."

K.N.P.

RECENT ADDITIONS TO OUR LIBRARY.

Dr. Donald B. Lawrence presented our library with his bulletin "Some Features of the Vegetation of the Columbia River Gorge with Special Reference to Asymmetry in Forest Trees".

Kenneth N. Phillips presented the following bulletins to the Library, "Geology and Ground Water Resources of the Island of Oahu, Hawaii", by H.T. Stearns and K.N.Vaksvik.

A complete report in eight bulletins of transactions of the American Geophysical Union, Fifteenth Annual Meeting (1934). These reports are divided as follows:

Part I in 7 bulletins:
1. General Assembly.
2. Section on Geodesy.
3. Section on Seismology.
4. Section of Meteorology.
5. Section of Terrestrial Magnetism and Electricity.
6. Section of Oceanography.
7. Section of Volcanology.

Part II in 1 volume:
Sections on Hydrology and
The Western Interstate Snow-Survey Conference.

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NEW BULLETIN ON MINING FOR BEGINNERS.

Amateur miners will be interested in a new forty-page bulletin titled "Elements of Mining for the Beginners", written by Guy E. Ingersoll, associate professor of mining and metallurgy at the Washington State College. The bulletin covers all phases of mining except placer and is written in simple language designed to help the beginner in prospecting and mining. It describes the simple elements of mining and does not take up modern power methods. The price of this bulletin is 25¢ and it may be obtained by writing Professor Guy E. Ingersoll, School of Mines and Geology, Washington State College, Pullman, Washington.

-Pacific Rural Press, May 20, 1939.

## SMITHSONIAN RECEIVES ANOTHER METEORITE.

A 2000-pound meteorite, probably a fragment of one of the largest shooting stars which have struck the earth, has just been added to the meteorite collection of the Smithsonian Institution. This specimen was found in 1903 near the town of Pearcedale, not far from Melbourne, Australia - the general area of the Cranbourne meteorite which was discovered in 1854.

The largest piece of the Cranbourne meteorite, weighing over three tons, is now in the British Museum; the second largest piece, weighing about one and a half tons, is in the Melbourne Museum. Smaller fragments are displayed in museums all over the world.

It is not definitely known yet whether this large mass just received at the U.S. National Museum is actually an individual of the Cranbourne fall, but it will probably prove to be so, says E.P.Henderson, of the Smithsonian Institution. That two separate meteoric falls of such huge size would occur within such a limited area is quite improbable. Mr. Henderson says that this meteorite probably exploded in midair and hence fragments may be found some distance apart. This is the way meteorites frequently behave.

This Australian meteorite will shortly be placed on exhibition at the U.S. National Museum. A study will be made to determine its composition and relationships to the Cranbourne. While the Cranbourne meteorite must be considered as one of the major collisions between the earth and a body from space, Mr. Henderson believes it is by no means the largest known meteorite.

Stony meteorites are more numerous than the iron variety, but it is interesting to note that all of the largest falls, both as to size and weight, are iron meteorites. There are many scars upon the surface of our earth where meteorites have struck, notable among which is the great Meteor Crater in Arizona. The celebrated fall of 1908 which struck in northern Siberia produced a shock observed on seismographs far distant from the point of impact.

The Smithsonian has added 30 different falls to its collection so far this year. Most of these have been found in the United States. The Australian iron is by far the largest received this year, but several good-sized ones have come in from Chile and Mexico.

- Smithsonian Institute, April 7, 1939.

# THE WORLD OF THE MOON

Some thoughts on "the meteoric theory" prompted by the lecture of Mr. Harry G. Johnson before the G. S. O. C. on June 2, 1939.

by Carl Price Richards.

The splendid lecture which Mr. Harry G. Johnson, director of the Brown Astronomy Foundation at Walla Walla, Wash., presented to our members recently, was on a subject which, strictly speaking, is not geology. Geology, by its very definition, treats of the earth; but the moon, though intimately related, is certainly not "of the earth". In a word, the subject of the lecture was "selenology", the science which treats of the moon. However, it is a most appropriate one to come before a geological society, since much can be learned about the earth by studying the moon, and other heavenly bodies too.

Mr. Johnson handled the subject in a scholarly manner throughout and presented it in such a way that those least familiar with the facts concerning our satellite would gain a good mental picture of its nature. His lecture was illustrated with about a hundred excellent lantern slides, many being reproductions of photographs taken at Mt. Wilson and Yerkes observatories. He also brought his public address system, with which, before the lecture, the assembling audience was regaled with fine renditions of classical music - a fitting prelude to a discourse which dealt with heavenly realms.

Although possessing a beautiful, resonant voice, Mr. Johnson used the microphone and loud speakers for his address, as it entailed less physical effort on his part, while allowing his audience to catch every syllable. Mention should be made of his spot-light pointer, enabling him to stand some twenty feet to one side of the screen and yet, by the small disc of light, point to any feature he desired. Operating the lantern was a very efficient individual in the person of Mrs. Johnson. The uncanny promptness with which slide after slide came on the screen was indicative of some splendid teamwork, which was manifest, even though it was noted that they had rigged up a signal system, whereby the lecturer could flash a small bulb at the lantern. This simple device obviated the distracting click or tap, or the call for "next slide, please" (or simply "next") which is usually the unpleasant accompaniment of a lantern lecture. All these little adjuncts that contributed so much to the smoothness with which the lecture proceeded, bespoke a consideration for the audience by the speaker and, audiences (even those at a geological lecture) being human, like to be "considered!"

Moreover, our speaker won the approbation of his listeners by his engaging frankness; although, without question, exceedingly well informed regarding the latest scientific research on lunar problems, his response to some of the questions which arose was a candid "I don't know". Indeed, there are many features on the moon's surface which have puzzled the scientific world from the time Galileo first beheld the character of that surface. Many of them, of course, have been solved and satisfactorily explained, but many still remain inscrutable enigmas.

One such is the great Alpine Valley, the only thing of its kind on the moon. Eighty miles long, six to eight miles wide, a mile and a half deep and as straight as an arrow, it has, up to the present, defied any satisfactory explanation as to its origin. Mr. Johnson stated some of the theories which had been put forth to explain it, but showed the untenable nature of each of them.

The most prominent characteristic of the lunar landscape is the vast number of craters, those saucer-like formations which completely cover certain areas to the exclusion of all other features. These were ascribed by Mr. Johnson to meteoric origin, and clear explanations, supported by descriptions of laboratory experiments, were given in substantiation of that theory. All of which was most convincing and satisfactory as far as it went, but, in spite of it all, there are certain difficulties which cannot be ignored.

Let us briefly review a few of the facts: - The Moon, a spherical orb of rock, 2163 miles in diameter; specific gravity, 3.4; mass, 1/81.5 that of the earth; surface gravity, 1/6th that of the earth. It revolves about the earth in 27 1/3rd days (siderial time) at a mean distance of 237,500 miles. It rotates on its axis in exactly the same time, hence it always presents the same side to the earth. There is no atmosphere of any kind on the moon, nor any water. The temperature of its surface varies from about 200 degrees Fahrenheit above zero to about 400 degrees below zero.

There being no atmosphere and no water, there is no erosion. The erosive agents of wind, water and ice, so familiar to us on earth, are entirely absent on the moon. As a result, the surface features of the moon are, in a very true sense, permanent. During the three hundred years in which the surface of the moon has been studied by the aid of telescopes, no change in the form of any of its surface features has been detected. But three hundred years is a mere "twinkling of an eye" compared with the age of the earth-moon system. One must delve back millions of years for the origin of those vast craters and mountains. Mr. Johnson mentioned eight or ten million years ago as the time some of the craters were formed. Even that would take us back only into the late Tertiary, or Pliocene times. If it be true that the last major craters were formed about that time, and the meteoric process of forming the others had been in progress for several hundred million years, then the moon, during the period, must have been passing through regions of space strewn with boulders, many of them of immense proportions.

It should be noted that, relative to the dimensions of space, the earth and moon are a negligible distance apart, hence, what the moon encounters in its travels, the earth will, in a general way, also encounter. It is also reasonable to expect that the earth would have been hit by more of these space-roaming boulders than would the moon. Firstly, because it is a larger object, being nearly four times the diameter of the moon, and, secondly, because of its six-times greater gravitational attraction, causing objects to be drawn to it from a greater distance than could be reached by the pull exerted by the moon - or, in other words, it would sweep a bigger field. Thus, if the moon was bombarded by projectiles large enough to create those enormous craters, the earth also would have been subjected to a similar, or even greater bombardment. And, if it was so treated, it must have been similarly bruised and scarred - yet, the only instances of meteoric craters on the earth are negligible in size compared with those on the moon. The largest one known being the famous crater in Arizona, which is less than a mile in diameter, and would therefore be visible only through the largest telescopes, were it on the moon.

That is the problem which baffles. With evidence of such abundant meteoric impact - if such it be - on the surface of the moon, some very satisfactory explanation is required to substantiate that theory of the origin of the thirty or forty thousand craters one sees on the moon.

Mr. Johnson stated that experiments indicated the size of a projectile to be about one tenth the diameter of the crater it caused, the velocity being in the order of 20 to 50 miles per second. Thus, a crater such as Plato, 60 miles across, would have been caused by the impact of a mass about 6 miles in diameter, or some 113 cubic miles in volume. To appreciate this mass, it may be noted that the volume of Mt.Hood above the 5,000 foot level is approximately 10 cubic miles. Then picture, if one can, a mass of solid rock, a dozen times the size of Mt. Hood, hurtling in from space and striking the earth at a velocity of 50 miles per second, which is 1,000 times the speed of an airliner - or, Portland to New York in 50 seconds! The cataclysm resulting from the sudden dissipation of so much energy would certainly result in considerable structural deformation of the earth's surface within a great distance of the point of impact. Imagine many thousands of such impacts, each forming a structure of distinctive character on a scale commensurate with that of our greater mountains and then visualize erosive agents eradicating every last trace of all those vast formations.

Such is a brief description of one of these events as it would appear to an observer on the earth, located about 50 miles or so from where one of these meteorites fell, supposing he were able to survive the effects of the tremendous forces which would prevail, even at that distance. But let us review the same event from a really safe distance, located, for instance, many thousands of miles away in space. The 6-mile diameter projectile then assumes insignificant proportions. as it would be seen in its true relation to the earth, the volumetric comparison being as one is to 2,300 million. Hence, great as the damage caused by its impact would appear at close quarters, the effect on the world as a whole would be trivial - comparable to the effect of driving a golf ball against the perisphere! But, to continue our analogy, let that golf ball be substituted by a similar sized piece of rock, and shoot that rock out of a gun, and repeat the operation several thousand times. With such a battering, New York's perisphere would have a considerably damaged surface and the exhibition management would have to organize some very drastic erosive operations to obliterate all the scars!

Explanations of the absence of any evidence of such treatment have been sought in the presence on the earth of atmosphere and water, with their resultant erosive action, and the entire absence of such agents of change on the moon. But, even when one contemplates the advance and recession of oceans, the building and wearing away of mountains, the displacement and replacement, the folding, faulting and working over which has occurred on the surface of the earth in geologic times, it is hard to believe that those changes could have wrought so complete an eradication of all evidence of gigantic formations, such as are seen on the moon, as to defy every effort of geologists to discover even the slightest trace of them.

It has been a matter of observation that big meteorites invariably spatter fragments of their mass over a considerable area close to the point where they fall. These fragments are easily detected on account of their distinctive characteristics from stones of terrestrial origin, as well as because of their magnetic properties. Hence, if the earth has received a share of these celestial visitors in proportion to the number of them which, it is claimed, hit the moon, then one would expect to find an abundance of meteoric substance appearing in various formations, in a similar manner to that in which fossils of the various geologic ages are found. But such does not appear to have been the case.

A further difficulty in the acceptance of this theory is the partiality of the crater markings on the moon. Large areas are practically devoid of them, yet, adjacent to those areas, the wall-ringed craters are so crowded that they literally overlap one another. Why one area should be subject to so liberal a bombardment and an adjacent one immune, is hard to explain. One might as well expect to find during a rainstorm, certain patches in the street remaining dry, while other portions were wet.

To explain this inconsistency it has been contended that the so-called "seas" are lava outflows which inundated the meteoric craters. Such a theory however, necessarily assumes considerable volcanic action and at once suggests the probability of such action manifesting itself in craters. That these craters are not similar in form to the volcanic craters on the earth, so it is claimed, may possibly be explained by the weakness of lunar gravity, combined with the lack of water and atmosphere. One theory claims that the cup shaped pits, of which there are countless examples, result from a single explosion, like the bursting of a big bubble of gas in a field of viscous lava. Also that the larger diameter craters, or ringed plains, such as Gassendi, Tycho, Clavius and many others, are simply colossal walls of slag pushed back from the volcanic vent.

The generally accepted explanation of the light colored rays radiating from the craters Tycho and Copernicus, as Mr. Johnson stated, is that they are deposits of pumice or dust, ejected and spread by volcanic forces. If then, these two craters are the centers of volcanic activity so great as to spread their ejecta many hundreds of miles, it is reasonable to maintain that the same activity was responsible for building the structural forms at their vents. And, if these two craters were built by volcanic process, it is quite likely that many others came into existence by the same cause. The theory of volcanic origin does escape two of the objections to the impact theory - the absence of similar surface forms on the earth and the partiality of those forms on the moon.

On the other hand, a study of the forms of individual craters does suggest their formation by impact. Laboratory experiments, it is claimed, show that forms of that character are caused by projectiles striking certain materials with sufficient force. Also, aerial photographs of craters caused by the explosion of bombs bear much resemblance to pictures of many of the inner craters. Then there is the star example of them all, the Arizona meteorite crater, which also has many features in common with the craters seen on the moon.

So it would seem to resolve itself into a situation where the contenders for the meteoric theory have some weight of evidence in their support, but not quite sufficient to clinch the verdict in their favor. It is in such cases, is it not, that the Scotch courts return a verdict of "Guilty, but not proven"!

* * * * * *

One purpose of the News-Letter is to serve as a medium for the presentation of information concerning geological matters and the setting forth of theories, pro and con, in the endeavor to arrive at the true solution of geologic problems. In that spirit the above has been written and it is hoped it will bring out further comment. The problem is one of considerable interest, if not of very real significance, regarding the geology of the earth's surface. In what has been stated above, important points may have been overlooked, or the premises may be in error, or the reasoning at fault. If any one of these is the case, no one more than the present writer will welcome the pointing out of any omissions or inaccuracies. "Veritas vincit"!

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# GEOLOGICAL NEWS LETTER

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MEMBERSHIP APPLICATION

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ____________

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

______________________________
Address

______________________________
Business Address

______________ ______________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ______________
______________________________

Sponsored by: ______________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________________
Signature

## ANNOUNCEMENTS

### Lectures

### S P E C I A L   N O T I C E

Motion pictures taken in Antarctica by Dr. Laurence McKinley Gould will be shown and described by him in the Lincoln High School Auditorium on Thursday, July 13, at 8 p.m. These are the pictures of which he spoke during his lecture on June 23. They have not been shown in public before.

Friday July 14 — Dr. Donald B. Lawrence, Professor of Botany, University of Minnesota, will speak to us on the subject of
VEGETATION AS A CUE TO RECENT GEOLOGICAL EVENTS ON MOUNT ST. HELENS.
His lecture, which will be illustrated with lantern slides, is based on the research work he has conducted on the slopes of our youngest volcano during the past year or two.
Dr. Lawrence is well known to our members and his talk to us on a former occasion about the submerged forests of the Columbia will be recalled as one of outstanding interest. Changes in growth of plant life tell an important geologic story; the romance of that story concerning Mt.St.Helens is as fascinating as that of the Columbia River drowned forests.

Friday July 28 — Our president, Mr. Arthur M. Piper, will be our speaker and will present the third lecture in our series of maps, their principles and their significance and relation to geologic work. The particular phase of the subject with which he will deal he entitles
INTERPRETATION OF TOPOGRAPHICAL MAPS WITH SPECIAL REFERENCE TO LAND FORMS.
This is the branch which deals more with the use of maps, rather than with the principles and processes governing their making, so it is of particular value to the geologic enthusiasts in our Society. Mr.Piper has spoken to us on former occasions, always with much acceptance; his training renders him well qualified to deal with this subject.

## TRIPS

Sunday July 15 — SKYLINE TRIP - LEADER, A. D. VANCE.
Meeting place, S.W.Front and Yamhill Sts. at 9:00 a.m.
Caravan will proceed up Broadway Drive and Talbot Road to Fairmount Blvd., circling Council Crest. Good views of Willamette and Tualatain valleys. At viewpoints stops will be made and topography discussed. Follow Humphrey Blvd. and cross Canyon Road into 58th Avenue which is old Skyline Blvd. Detour through Mt.Calvary Cemetery onto New Skyline Blvd. At viewpoints discussion on what appears to be old land surface. Cross Cornell, Thompson and Germantown roads. Short side trip to Hoyt Quarry. Note weathered feldsite. Cross Cornelius Pass road. View Point Tualatin and Columbia valleys. Fossils on road to North Plains. Follow Pumpkin Ridge road to a new fossil locality. A highway down a Wolfe Creek (believe it or not) leads to Columbia River Highway. Total length of trip approximately 80 miles.

## COOS BAY SUMMER CAMP

Camp will start July 23rd. Those intending to attend the camp should send for their reservations at once to

LONG'S BARVIEW CABIN CAMP
Route 2 - Marshfield, Oregon.

Arrangements are being made with Mr. Long for him to make reservations at nearest camp grounds, for those of our group who write in too late to be taken care of at his Barview Cabin Camp.

At the present writing there will be only one week of the camp. If there are any that wish to remain longer, we can suggest many things for them to study for as long as they care to remain in the district. This information is also open to any who wish to visit the district after the camp is over.

Every person attending the camp will be a committee member to see that a good time is had by all and that the trips run smoothly. The group will be responsible for a good write-up of the camp activities in the Geological News-Letter.

Be sure to state that you are members of the Geological Society when writing for your reservation.

## VACATIONS.

Misses Fowler and Rosa are on the way to Mexico City, taking in Bryce Canyon and Zion National Park on the way.

J. Martin Weber is on the way to Yellowstone National Park, Bryce Canyon and Zion National Park. with a strong hint of a stop at San Francisco to see the Fair.

Clarence Phillips and family are on the way to Los Angeles and will spend some time at San Francisco Fair.

The Jones family is at Manhattan Beach.

Tracy Wade spent last week at his Rockaway Beach house.

Mr. and Mrs. Tom Carney are at the New York Fair. On their return to Portland Mr. Carney will assume his new position as curator of our new Museum.

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## DOINGS OF OUR MEMBERS.

An extensive exhibition of ceramics opened Monday June 26, and will continue to July 23 at the Oregon Ceramics studio, 3934 S.W.Corbett Street. Known as the California ceramics exhibition, the pieces are all by California ceramists and are being shown in the larger cities on the Coast. Last year a similar exhibition was held at the Art Museum. Mrs. Edwin T. Hodge is in charge for the directors of the local studio, assisted by Mrs. C. F. Adams and Mrs. L.B.Macnab. Hours for the exhibition are 10 a.m. to 5 p.m. daily and 2 to 5 p.m. Sundays.

Mr. Earl K. Nixon presided at a meeting of the American Institute of Mining Engineers which was held at Baker on the evening of July 2nd.

# HOW OLD ARE OUR GLACIERS?

by Francois E. Matthes
Senior Geologist, U.S.Geological Survey.

(Editor's Note:- At the annual meeting of the American Geophysical Union held in Washington, D.C., last April, Dr. Matthes, who is chairman of the Committee on Glaciers, presented a report in which he pointed out that most of the glaciers in western United States are "modern", not relics of the ice age. For the use of the National Park Service, and at their request, he prepared an explanatory article, of which the following is a copy.)

**

It is generally taken for granted that the glaciers now existing on the higher mountains of the earth are, like the ice caps of Greenland, Iceland, and Antarctica, relics of the ice age, but it now appears that we shall have to revise our ideas on that subject. Recent studies in the Sierra Nevada and adjacent Owens Valley, California, leave no doubt that of all the glaciers and ice fields that glitter on our western mountain ranges only a few of the largest are likely to be remnants of the much vaster ice masses that existed there during the ice age. All the others are of a new generation that came into being less than 4,000 years ago - that is, fully 6,000 years after the ice age came to an end.

The evidence is indirect yet convincing. It is found in the post-glacial history of Owens Lake, a briny pool without outlet that is situated at the eastern base of the Sierra Nevada and is fed almost wholly by the melt water that comes down from the snow fields and glaciers on the range. From its salt content and the known quantities of salt that are brought into it annually by Owens River its age has been computed as being, in round numbers, 4,000 years.

Now Owens Lake is not, as was formerly supposed, a remnant of the much larger and deeper lake that occupied Owens Valley during the ice age. During the warm and dry period that immediately followed the ice age that ancient lake dried up completely, the same as a number of other lakes of the same type in the "land of little rain" to the east of the Sierra Nevada. The present Owens Lake came into existence later when the climate again turned cooler and moister, about as it is at present, and that change took place, according to Dr. Ernst Antevs, who is an authority on the climatic fluctuations that have taken place since the ice age, about 2,000 B.C. By that time the salt crust left from the earlier lake had become buried under mud and gravel washed in by spring floods. The new lake consequently found the basin "freshened", and its present salt content therefore is a fairly reliable index of its age.

The drying up of the earlier lake no doubt was caused primarily by a deficiency of snow on the Sierra Nevada, and secondarily by higher temperatures that promoted evaporation. However, from measurements and observations on the glaciers of Yosemite National Park that have been made for several years by Park Naturalist C. A. Harwell and his staff, it is evident that those small glaciers are very delicately adjusted to the present climatic conditions. Even a moderate decrease in snowfall and slightly higher summer temperatures, if continued for a century, would suffice to destroy them all. There can be no doubt, then, that when ancient Owens Lake dried up the Sierra Nevada was stripped of all its ice, and conversely, than when the new shallow lake came into existence new small glaciers were being formed on the range - the same glaciers which, with sundry fluctuations, have remained until the present day.

What has happened in the Sierra Nevada doubtless has happened also on many other mountain ranges in the western United States; for all of the smaller glaciers on those ranges are fronted, like those of the Sierra Nevada, by very fresh-looking moraines arranged in compact concentric series. These ridges of ice-borne rock fragments are like new-made dumps as compared with the youngest moraines that date from the ice age. It has long been suspected that they might be products of recently formed glaciers rather than of dwindling remnants of ice-age glaciers, but there was no conclusive proof until the story of Owens Lake had been spelled out.

It follows that all the glaciers in Yosemite National Park, all those in Rocky Mountain National Park, and all but the largest in Glacier, Mount Rainier, and Olympic National Parks are "modern" glaciers and not relics of the ice age at all. It likewise follows that all those glaciers that have persisted since the ice age, such as the main ice streams on Mount Rainier and Mount Olympus, in Glacier Bay National Monument, Mount McKinley National Park, and other parts of Alaska, are now much larger than they were 4,000 years ago. And so it may be said, though it seems an exaggeration, that we are now living in a "little ice age" of our own.

- From National Park Service Bull. June 1939.

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CORRIGENDUM.

On page 114 of vol.5 no.12 an important clause in a sentence was omitted. Lines 4 and 5 should read: - " . . . some very satisfactory explanation of the obliteration of all such evidence on the surface of the earth is required to substantiate that theory of the origin of the thirty or forty thousand craters one sees on the moon."

**********

On May 26th our Society enjoyed a real treat when we had another lecture on mapping. Capt. B. B. Talley, who was to have given the lecture, caught a severe cold and did not think it advisable to venture out that evening. Lt.Lancefield substituted for Capt. Talley, and in a very capable manner presented the subject of "Mapping with Aerial Photography".

**********

FOUNDER'S DAY TRIP.

The first so-called Founder's Day trip of the Geological Society of the Oregon Country attracted a large number of members and other interested persons on Sunday, May 28, 1939. The trip was led by Dr. Edwin T. Hodge, founder of the society, and it is hoped to make the event an annual one. A study of the topography of the Columbia river gorge was made, beginning at the Fisher quarry and ending at Beacon Rock.

The caravan traveled along the Washington side of the river. The first stop was at Fisher's quarry, which has been open for many years. It is unique in that the rock is suitable for jetty construction, the only place in this part of the country that such is the case. This rock, which is andesite, has jointing planes in it of such character that when the rock is blasted, it breaks down into numerous pieces that weigh five to fifty tons. These big pieces are best for constructing jetties. The Columbia River basalt breaks into small fragments, and it is almost impossible to get large pieces. Rock has been taken from Fisher's quarry to build the south jetty of the Columbia river on several occasions, and is used exclusively for jetty work. This quarry has had a monopoly on that business.

Dr. Hodge stated that from the standpoint of general geology of Oregon the quarry is a very significant location. Two rocks make up a very large portion of Oregon. One is the Columbia river basalt, a rock very high in calcium, magnesium and iron, very low in silica. The rock at this location is andesite. It very often weathers so as to produce a pale green color. There are some iron minerals in this rock, and when it oxidizes, it produces a pinkish stain. Or, if it is unweathered, as seen at this quarry, it is a light grey color, so that this is a very good illustration of an andesite. The volcano from which this andesite came is some distance away because the flow does not have slope. This makes it possible to cut and develop a working face, and one of the valuable features of this quarry is that it has a very large face development, as well as large trackage space.

Attention was called to the soil that lies on top of the quarry rim, an interesting thing which is a characteristic feature to be seen all over the Cascade country. This soil is to be found universally all over the surface. It has been churned into a light, fine dust, having originally come from ashes that were blown out. Those ashes, in large part, have been wind drifted, and then have slowly decayed, but not greatly so, and at the very top of this quarry rim you find a little thin, organic soil. They lie directly on top of the lava, presumably from a volcano north of Vancouver. Dr. Hodge expressed the opinion that this soil is possibly the same as soil which has been wind drifted as dunes in the Willamette valley and became fixed as climatic change came over the country. Referring to Mt. Pleasant, he stated that it is one of the outstanding volcanoes of the Cascades. Instead of erupting, it broke out at the side, as did Mt.Tabor. This quarry is a good illustration of lava coming out, one flow after another, from vents that pile up the flows on top of each other. In such a manner was the formation built up which we call the Cascade mountains. They are not a range made by deformation and folding, but are a typical mountain range formed by the simple accumulation of lava,

Some platy andesite was noted. The formation of this "sheeting" structure by the manner in which the lava cooled, was explained.

The Oregon topography to the south was viewed from the bluff along the river bank. The volcano, Rocky Butte, has a long slope to the right, which is the face of a lava flow where the river once cut against it. It has cinders and scoria on top. The lava flowed out to the westward from it. Dr. Hodge stated that Mt. Tabor is another volcano from which the lava flow extended northwesterly, apparently flowing on the surface. There is a series of hills to the east of Rocky Butte, most of which, it has been found, are made of andesite. It may be possible, despite the soil, to discover some scoria and prove that they too are volcanic mounds. That lava comes to the surface and flows out from a vent with very little ash, tuff and cinders. The mound, thus built, is wholly of lava, and such a volcano is usually called a shield volcano. These hills are not in the immediate foreground, but are some distance back.

Those volcanoes stand on a uniformly level surface. At Portland this surface breaks into a series of giant steps, leading down to the Columbia river. They are not high, but long, and parallel the Willamette. They show their best development on the east side of the Willamette, due to the down cutting of the Willamette on that surface. Swinging back and forth across the surface, the river cut those steps. This surface rises on a very gentle grade upward to the east, and has been named by Dr. Hodge the "Saco" surface, a term for "Sandy-Columbia".

The Saco surface is underlaid by the Troutdale, and it represents material that was washed westward from the Cascade mountains to form an enormous Piedmont fan. Dr. Hodge has traced that fan half-way up into the state of Washington, and as far south as Salem in Oregon. The top of that surface is the Saco surface. It has been so little dissected that we can see it still today, rising gently upward to the east, and sinking to the west. However, streams cutting across that surface have cut deep canyons in it, which are the only irregularities in the Saco surface. Since then the Columbia has cut down into it, in a series of steps. At one time those cuts were very much deeper than they are now. The Columbia cut to the bedrock. If we were able to go down to the old bedrock into which the Columbia cut at that time, we would find that bedrock probably 300 to 500 feet deep, at least. And there was a time that the country became submerged when the ocean moved in as a great estuary, 500 or 600 feet deep. Then the silts which were brought down were deposited in the river and have been building it up ever since until that old valley is now filled to a tremendous depth with material which has been brought down by the Columbia since that submergence. We know the bedrock at Portland is 1,100 feet. At Cape Horn holes were drilled down 120 feet and were in river gravel all the way. In fact the only place where bedrock was found was at Bonneville. Bonneville was really built on the side of the river. The true bedrock that lies under Bonneville, to the north, is more than 125 feet below sea level.

Before leaving the quarry, Leo Simon named the wild flowers found growing in that vicinity.

The group then drove to Prune hill, where, standing on top of the Saco surface, the surrounding country was studied. This same surface was seen on top of Chamberlain hill, to the east. In the distance, to the right of Mt.Hood, on the Oregon side, a continuation of this surface was seen. The same thing can be traced north and south for 60 miles each way, disproving any argument that it might be an old delta of the Columbia river. A curious feature seen from here was a valley swinging off to the east which must have been the channel of a stream that was flowing on the Saco surface when it was in existence. Later the Columbia cut across here and ignored that channel, taking a shorter route.

Looking across the Columbia, near where the Sandy comes in, is a steep cliff, a very dark brown, made of andesite. The whole hill is rimmed with andesite, which lies on top of water worn Troutdale gravels. This shows that the andesite, at least this at Chamberlain hill, flowed out on top of the Troutdale after the Troutdale was laid down. At other places is evidence, as at Mt.Zion and Mt.Pleasant, where the andesites have obviously cut through the Troutdale and erected their volcanoes on top of the Saco surface. The andesite is therefore post Troutdale. Referring again to the great Piedmont fan, Dr. Hodge said it must been washed out of the Cascade mountains before the andesite was poured out. It is all volcanic, and he is of the opinion that it represents pyroclastics blown out of volcanoes, either falling upon a surface or it washed over that surface westward, and perhaps eastward in such vast volume it formed a continuous surface over the whole country, including the hills of west Portland. Since that time these volcanoes continued to be active, and from them lava flowed and buried that material that had been washed westward. In some places the volcanoes did not completely bury it. In certain cuts in the Cascades one can see these lavas lying in old valleys, actually filling in old valleys. Lava flowed from Chamberlain hill in all directions on top of the Troutdale formation.

That lava must have flowed towards the Columbia river, and the question arises as to whether it stopped at the river's edge. On the Washington side is seen this same surface, and at the edge of the river. There was no river then. The surface on top of Prune hill, the Saco, is older than the Columbia river, very much older. This surface was formed of those lavas that made the Cascade mountains, that flowed out and covered it. And it was only after that, that the Columbia river flowed over this surface and cut a gorge.

To the west is a valley 50 miles wide and 225 miles long, that existed before the Columbia river. In it are the Willamette, Cowlitz and Chehalis rivers. This valley had a broad cut in its surface before the Columbia river crosses the Cascade mountains. There is a tremendous amount of evidence in support of this theory. It takes a long time to cut such a valley. The Columbia river canyon has cut into this valley, carrying very much more water than the Willamette. The Washougal and Sandy rivers were pointed out, and the fact that both have changed their outlets into the Columbia several times. They carry lots of sand and gravel and, entering the Columbia at sluggish points, have dropped their loads and formed dams, so they swung farther westward to find new outlets.

Across the Columbia from Prune hill is Larch mountain, a volcano, and in that district lots of other volcanoes are seen. Lava flows, apparently just as they came out, are found, many of them still bearing the scoria on their surface and hard to walk across. Volcanoes so young, they look as though they could have erupted just a few years ago. When you have volcanoes erupting, there are sags between them, and if a river gets dammed it would find its way between these sags. There must have been some streams in those sags that had already begun down cutting. Rising above the flat surface, and built on top, are still higher volcanoes, Mt.Hood, Jefferson and the rest, still younger.

Eastward from Prune Hill is Mt. Zion, then Cape Horn, then Prindle valley, and beyond that is a flat surface called Fletcher flat, capped by Columbia river basalt (Coriba). The basalt drops down here and forms Cape Horn.

In some places the Troutdale has been deeply weathered into a very red soil, which sometimes contains boulders, perfectly preserved as to shape but changed into clay. A series of water-worn boulders changed completely by chemical methods into kaolin.

The caravan moved on to Mt.Zion, also called Biddle Butte, having an elevation of 1,458 feet, and with a far-reaching view in all directions. A leisurely enjoyed lunch hour was spent here. Then Dr. Hodge gave another interesting talk on the geology of the region. Scoria was found on top of Mt.Zion, indicating that the group was standing right on the very tip-top of the volcano. Looking south from this point, again was noted the descending skyline, some of which surface is due to lava flows on the Saco surface. The surface on the Washington side slopes the same. There has been some erosion, but the surface is remarkably preserved. This Saco surface is made of sand and gravel,and is easily dissected, so that it doesn't take very long for streams to cut into it. Angels Rest on the Oregon skyline is andesite which flowed out of Larch mountain probably, although it has been dissected to little slabs of rock. The lava from Larch mountain flowed in all directions, forming a surface almost perfectly preserved.

Looking along the same elevation one can see some red volcanic ash. Below that is Columbia river basalt. That upland surface on top, in the Cascade mountains is flat. Rising above it is a whole series of little volcanoes. One can walk across that surface hundreds of square miles where there are not even canyons, perfectly level. The only hills are occasional volcanoes, all made of andesite. Some of these lavas flowed out toward the Columbia river. They come to the edge of the river and show evidence of having been eroded. If the river had been there before that volcanic eruption this lava would have flowed down into the gorge where it would be found in some places. Dr. Hodge stated that he and some of his students examined the south wall of the gorge very carefully from the bottom to the top and were unable to find any place where that lava poured down into the gorge. The same evidence can be found at some places on the north side of the river, proving that the Columbia river cut through this surface after those volcanoes were built. The reason why the lava surface on the Oregon side of the river is undissected is because the amount of local rainfall that comes directly down upon that lava to do that erosion, has not been sufficient. The erosion on the north side must have been done by some other method, from some other place.

Looking eastward from Mt. Zion is seen a big valley, a high valley carved. Whatever started it, within a stone's throw of the river, is this old high valley, from which the present valley has been cut down. That valley comes out to the Columbia and stops. On the south side of the river, just across, heads an upland valley of the same sort. There was once a stream on this upland surface, these latest lavas, that went across this country. Then came the Columbia river spilling across, and cut that valley in two. It is not the only one that has been cut in two. The Hood river valley is one. It goes right across the Columbia. There is definite proof in the case of the Hood river valley because there is lava on the floor of that valley that can be traced across to the other side.

The first elevation east from Mt.Zion is Fletcher flat, then Archer mountain, and beyond that, Hamilton Mountain. This high elevation is Columbia river basalt. But across the river the Coriba is at a lower elevation, the lava descending in that direction.

Returning to the highway, a stop was made at Cape Horn, where the Columbia river basalt was seen. Dr. Hodge explained that this spot is just on top of the flow. A bit of the upper scoria can be seen. The cliff is made of another flow, fairly massive below, and changing into a brickbat type above, due to the type of cooling. Above is an old surface, not perfectly regular, but nearly so, and on that surface is Troutdale. Examination of the yellow material in the cliff would show that it is made up of tiny crystals, such as are blown out in the lava when it is ejected. Some of the boulders are probably blown out and rounded by transportation. All the lava flows on top of it are andesitic rocks. Columbia river basalt is below, on top is Troutdale, and one of the early flows of the Cascan on the Troutdale. The layers of Columbia river basalt, Coriba, may be seen on Fletcher flat, Archer mountain and Hamilton mountain, and it is underneath the Troutdale gravels. Beneath the Columbia river basalt is the Warrendale formation, made of sedimentary material, some of it bentonitic.

The rocks dip from north to south, and where the Warrendale is exposed, the river can cut into it easily. When this river was drowned not so long ago, the water was raised to a high elevation, went over a steep cliff, cut into the Warrendale that had long been rotting, had that dip to the south, and had ground water coming out through it, and after the drowning, precipitated land slides. Looking up the river, the south side is steep. The north side, from the base of the Columbia river basalt is a slope out into the river. That slope is all land slide. As far as one can see out into the river is land slide slope, a great big land slide here. In the middle of the river at Cape Horn is a large basalt rock,one of several in the river, carried there on the top of the landslide. All the rest of it has been washed away. There have been a series of landslides, extending up to and beyond Bonneville. At some places this landslide crossed the river, at Bonneville, and up the river, and created the Bridge of the Gods.

Volcanoes that made great volcanic fields to the south, seem to disappear in the country north of the Columbia river until beyond Mt. Adams, and then they begin again. Beacon Rock rises right out in the middle of the river, the neck of a volcano. And if it is a neck, then there must have been a great volcano here, and if the river was here at the time, the river has cut it all away. Dr.Hodge said it would be a strange thing for a volcano to be built in the middle of the river and not touch this landslide. This volcano is a type of rock like the Cascan and Beacon Rock looks like a neck which we see ordinarily, which the river cut down into in selecting its course. One other point about this landslide, brought out by Dr. Hodge, was, that if the Columbia was an antecedent stream and maintained its course as those mountains were lifted up, where there were soft rocks there should be wide valleys, and at this point it should be eroded away back. But the gorge is so young that its north wall is still sliding, a point which is significant.

Beacon Rock was the last place visited and most of the group made the climb to the top. Here the discussion on landslide was continued. The party had traveled on landslide all the way from Cape Horn to the foot of Beacon Rock. Attention was called to the Columbia river basalt, horizontal beds of black rock on Hamilton Mountain, which show that this lava flowed out horizontally across the land surface. The conical peak beyond, with its wide horizontal beds, is a part of the same structure as Hamilton mountain, although much of it has been eroded. On top of Archer Mountain and on top of Fletcher Flat is that same Columbia river basalt. Streams have cut down through the surface so that only remnants are left. Those remnants cap the beds. Underneath is Warrendale.

The big, long spur that almost crosses the river is landslide, Warrendale formation. The islands are toes of old landslides, Columbia river basalt. And on the other side of the river, the lower elevation is Columbia river basalt 500 feet high. A great landslide, coming from the scarp that lies behind Hamilton mountain and goes across the river, formed a dam. Back of this dam was the lake, called Lake of the Gods, and in it were drowned trees that had grown in the valley. That lake rose until it spilled over the landslide and cut down into it. On this landslide were found trees that had grown to be 500 years old, proving that this particular slide has reached stability.

Referring to Beacon Rock, Dr. Hodge said that there came from the interior of the earth, blowpiping their way up, some gases. The hole they cut by melting a hydrogen flame, was the diameter of this vent, which is now Beacon Rock. After the hole had been cut through the surface there was built a great volcano on top of the land surface that was here. The pipe through which that lava came was not exactly circular but had some variations. That volcano was andesite, and there were probably lava flows, and if so, they flowed out across this surface and probably downhill. Then, at a later date, the Columbia river cut across this country, and it cut on both sides of this rock, cutting it all away. Landslides have come down and filled in around this vent. The soft material of the Warrendale is all eroded away.

Nesmith volcano, across the river south from Beacon Rock, with an elevation of 5,015 feet, is located so close to the river that when the gorge was cut, the volcano has been cut down in half..

Descending from Beacon Rock, the group disbanded for the return home, after having spent a day of very interesting study of geological features of the Columbia river gorge.

- E. M. Barr

# GEOLOGICAL NEWS LETTER

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MEMBERSHIP APPLICATION

## GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

### Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ______________

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

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I am particularly interested in the following branches of Geology: ______________
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Sponsored by: ______________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

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Signature

ANNOUNCEMENTS

## Lectures

Friday July 28 — Our president, Mr. Arthur M. Piper, will be our speaker and will present the third lecture in our series of maps, their principles and their significance and relation to geologic work. The particular phase of the subject with which he will deal he entitles
INTERPRETATION OF TOPOGRAPHICAL MAPS WITH SPECIAL REFERENCE TO LAND FORMS
This is the branch which deals more with the use of maps, rather than with the principles and processes governing their making, so it is of particular value to the geologic enthusiasts in our Society. Mr.Piper has spoken to us on former occasions, always with much acceptance; his training renders him well qualified to deal with this subject.

Friday Aug.11 — Annual Picnic at Mt.Tabor Park. All members and their friends are invited. Dinner starts at 6:00 p.m. Coffee with trimmings will be furnished. Program following dinner comprises some surprises, songs, and speeches. Come early and stay late, by order of committee, Dr. and Mrs. Claude C. Adams,Mrs.Mabel Smith,Mrs.Hazel Haaser,and Geary Kimbrell.

## Trips

Sunday July 30 — Leader: Mr. Ray Treasher. Starting time 9:00 a.m. from S.W.Front and Yamhill. Caravan will proceed out Baseline Road to the old Twelve Mile House, turn south toward Gresham - a stop will be made at the gravel pit for a discussion. Follow Section Line Road, Lusted Road. A stop at 500 Foot Terrace; a discussion on material in new road cuts. Dodge Park lunch. Return will be made by the north side of Sandy River, where several interesting stops will be made to study weathered gravels at 850 foot levels.

Sunday Aug.13 — Leader: Dr.A.C.Jones. Trip from Klickitat on Neils Lumber Company Railroad. Save this date - details of trip in next bulletin. We would appreciate knowing the approximate number you will have in your party (at the July 28th meeting), so we may advise Neils Lumber Company how many cars will be needed.

**********

Mr. Charles Fowler, late of 4933 N.E. Garfield street, father of Miss Myrtice Fowler, died July 8th, aged 77 years. The Geological Society of the Oregon Country extends heartfelt sympathy to Mrs. Fowler, Myrtice, and her two brothers.

A card from the Carneys at Washington, D.C., addressed to the Geological Society Thursday lunch, said "Wish you could all enjoy the many things that Mrs.Carney and I have seen and done. The days should really have 36 hours to be able to accomplish what we have to do in so short a time. Even at that with the quick Oh's and Ah's at the things we see, we are having a lovely time."

## Reed College Speaker

Mineral resources of the Pacific Northwest were discussed in a talk by Ray C. Treasher, geologist of the State Department of Geology and Mineral Industries, before the Institute of Northwest Affairs at Reed College on July 13th..

Getting away from merely cataloging the various mineral occurrences, Mr. Treasher approached the subject from two allied points of view: (1) the use of power, and (2) importance of the area in occurrences of so-called strategic minerals. The need for low power rates was stressed as an essential in order to attract electro-metallurgical industries, and the availability of essential minerals for such industries was discussed.

A skeleton list of some of the principal metals and ferro-alloys peculiarly adapted to electric furnace manufacture was given by the speaker together with northwest occurrences of those metals so used. An analysis of the availability and application of such essential minerals as ores of aluminum, magnesium, mercury, nickel, manganese, chromium, and tungsten, was made.

Mr. Treasher spoke of the importance of coal, silica, refractories, limestone, diatomite, salines, and especially clay occurrences in Oregon and Washington, as well as the vast resources of phosphate rock in Idaho.

The Institute of Northwest Affairs in this its second annual session held at Reed College from July 10th to July 21st covered a very broad field of subjects intimately connected with Oregon's present and future. Each subject was treated by the best informed speaker available.

**********

Two of our members, Mr. and Mrs. Paul Howell, who recently moved to Klamath Falls, were on their way north from that city on the morning of July 2nd when they saw the now famous meteor which startled Portlanders on that day. They were near Chiloquin at the time and the following day they called on Mr. T. Hugh Pruett in Eugene, and told him of their experience. Of the many reports which reached him Mr. Pruett says this one from Mr. and Mrs. Howell is the most southerly observation (220 miles from Portland) yet reported. He added that this is the second time Mr. Howell has reported a meteor since our bulletin carried Mr. Pruett's request for such reports.

**

Mrs. R. R. Poppleton and her daughter Grace with some relatives are making a circle tour through this western country. Leaving Portland they traveled through Hood Canal country to Victoria and to Vancouver, east over Trans-Canadian Highway to Glacier National Park, south through Yellowstone National Park to Grand Tetons, Jackson Hole country, and Salt Lake, east to Denver, south through part of Texas, west to Albuquerque, New Mexico, and San Francisco Fair.

## SUBMARINE CANYONS.

It is true that numerous submarine canyons and valleys have been found during the course of our charting surveys. The vast size of some of these canyons under the sea has so fired the imagination of a few writers of popular articles as to give great prominence to these spectacular features of the ocean floor. And while they are especially significant in the science of geology, many other remarkable submarine topographic forms have been found as well as the canyons.

But before describing a few of the interesting features we do know about, I wonder how many of us realize the true relation between the size and depth of the various oceans of the world and the earth itself. You can gain some idea of this if you will take a pencil and a sheet of paper and draw a circle about the size of a grapefruit. Just imagine that circle to be a cross section of the earth sliced through the way a grapefruit is when fixed for breakfast. If you have used a fairly sharp pencil, the thickness of the line you drew will be about equal to 15 miles thickness of the earth's crust. Now the deepest sounding known in all the oceans of the world is less than half the thickness of that line - about $6\frac{1}{2}$ miles, or 35,400 feet, to be exact. It is in the Pacific Ocean about 50 miles east of the Phillippines. If we could put Mount Everest into this great ocean deep, the world's highest peak would be covered by over a mile of sea water. About three quarters of the earth's surface is covered by the oceans, and if the continents were to be graded off so that the solid earth would be a smooth spheroid, the seas would still cover the entire globe to a depth of $1\frac{1}{2}$ miles. That is a lot of ocean; but when we think of it as a part of the pencil line you just drew, it would be only one-tenth the thickness of that line. It is well to remember these relative proportions when thinking of the oceans and the continents of the earth, because it is easy to acquire a magnified idea of certain things due to our limited human concepts.

One of the greatest submarine canyons occurs about 120 miles southeast of New York Harbor. This Hudson Submarine Canyon has been known for many years, but its true topographic form and size were not known until 1936 when it was thoroughly surveyed by the Coast and Geodetic Survey ship OCEANOGRAPHER.

These marine surveys of the Department of Commerce are made, of course, for the utilitarian needs of chart making, but the surveys have always yielded certain facts valuable to science - scientific by-products, we might call them - about the ocean margins of our planet. Until about 15 years ago accurate surveys of coastal waters were limited to areas within sight of objects on land, which surveyors could sight with instruments, and by trigonometry could accurately plot the position of soundings. In shoal water, soundings were taken by the old and well known hand-lead, but in deep water the usual method of sounding was to lower an iron or lead weight attached to the end of a fine steel wire until it hit bottom. In deep water this is a slow and tedious process. So very few soundings were made in the deeper waters because in the old days mariners had very little concern about ocean depths except in areas where shoals, rocks, and dangers to ships are found. In fact, prior to 1925 it has been estimated that there were only 15,000 soundings in all the deep ocean waters of the world. Most of these had been taken by cable companies and scientific and naval expeditions.

About a decade ago, however, sounding in the ocean depths was made an almost instantaneous operation by the invention and commercial adaptation of an instrument that measures the depth by timing the interval required for a sound, a musical note made electrically in the hull of a ship, to go to the bottom of the ocean and return as an echo. This instrument, very appropriately called a Fathometer, has been steadily improved and developed, and now a navigator so equipped can have before him an electrically recorded profile of the invisible submarine hills and valleys, mountains or plains which we now know exist under the ocean waters just as they do above the sea on the continents. When these submarine features are accurately surveyed and charted they constitute landmarks more lasting than some of those above the sea. They can serve to guide ships using echo-sounders even better than the visible ones on land, for, unlike the visible ones, the submarine hills and valleys are not obscured by fogs, mists, or darkness. So long as the echo-sounder operates, the mariner can "see" them, so to speak, through the ears of this remarkable instrument.

In the charting surveys, correct positions of the soundings are just as important as the accuracy of the depth measurement. So, in order to enable the marine surveyors to plot their soundings with certainty when out of sight of land, a method called radio-acoustic ranging was adopted and perfected by the Coast and Geodetic Survey. It derives its name from the combination of radio and the horizontal travel of sound in sea water. The details are a bit too involved to explain at this time, but it gives the most accurate positions possible and has been used successfully more than 100 miles from land, and for the first time it is possible to map the relief of the sea floor beyond sight of shore with a thoroughness comparable to land surveying methods.

These new methods are responsible for the discovery of many new and amazing facts about our ocean borders. We have learned, for example, that off our Atlantic Coast, between Chesapeake Bay and Cape Cod, the broad, shallow, submerged plain known as the continental shelf has the well-known beach shapes found today along the coast from Nantucket to Cape Hatteras. About 75 miles southeast of Atlantic City this broad, flat plain ends abruptly at the eastern "rim" about 600 feet below sea level. If we could take all the water out of the oceans and sand on this rim, we could look westward or landward over the flat plateau of the continental shelf; but to the eastward for 50 miles or more we would look over deeply eroded canyons and divides, sloping steeply from our vantage point to more gentle hills 10,000 feet below. Some of these canyons extend back into this plateau as much as 20 miles landward from the rim. In the Hudson Submarine Canyon, for instance, we could in some places look across from one edge to the other, a distance of only 5 miles, but the floor of the canyon would lie 3600 feet below. A river flowing down this canyon would be a fearful and wonderful sight indeed, because it would run down an average slope of 150 feet to the mile, 12 times the average gradient of the present Colorado River flowing in the Grand Canyon. This is only one of a dozen similar canyons found between Capte Hatteras and the eastern limit of Georges Bank, 200 miles east of Cape Cod.

Coastal shelves are very narrow off some coasts, as for example certain portions of the Pacific Coast of the United States and Alaska. One of the mightiest canyons known is found in Monterey Bay, California, and the head of this remarkable canyon is less than half a mile off the beach. This canyon of Monterey Bay, if stripped of its blanket of ocean, would certainly rival the scenic grandeur of the greatest of our western canyons.

And so we can count at least 100 large submarine valleys already known in different parts of the world. But they represent only one type of feature of interest to geologists. In the Bering Sea, just north of the Aleutian Islands, a volcanic cone arises out of more than a mile of ocean water just to break the sea surface and form what we know as Bogoslof Island - a small steaming island that has been styled the Island of Mystery because of its intermittent appearance and disappearance and change in form for the past several hundred years.

In the gulf of Mexico, 100 miles and more south of the coast of Louisiana and Texas, at the edge of the broad coastal shelf found in this region, many submarine domelike shapes have been mapped that may be salt dome uplifts. Will oil reserves some day be found under them also? No one yet knows. In the China Sea, west of the Philippines, we have mapped submerged atolls similar in shape and size to some of those forming the beautiful isles in the south seas.

There are also submarine valleys about the coasts of the Philippine Islands. Strangely enough, however, the largest submarine canyons are not necessarily always found off the greatest rivers as we know them today. The Mississippi River does not have a submarine canyon opposite its present mouth, but a comparatively small one exists about 40 miles southwest of the present delta. On the other hand, the Congo River of Africa has one of the largest submarine canyons known and it extends 20 miles back into the present Congo estuary. The 200-mile extent of the Atlantic Coastal Shelf lying entirely eastward from Cape Cod is cut up by numerous submarine canyons and valleys having no apparent relation to any land river.

What rivers carved out these imposing canyons now buried hundreds of fathoms deep beneath the sea? Was the ocean once so low that the shores of today stood 12,000 feet above sea level? Or were they formed in some past geologic age by submarine rivers or other processes about which our knowledge is practically nil? When were the canyons made? We do know from fragments of rock and materials dredged from some of the canyon walls by the ship ATLANTIS of the Woods Hole Oceanographic Institution that the canyons are very young geologically speaking.

What about the ancient Atlantis - that beautiful island empire, a mythical empire of unsurpassed art and culture, supposedly drowned beneath the waters of the Atlantic Ocean not long before the dawn of written history? Plato says he got his story from his great-grandfather who in turn is supposed to have heard it from Solon. Slender as the origin may be, this myth has lived through the ages and has achieved an immortality that no amount of scientific reasoning based on geology has yet been able to confirm. Have we in the submarine canyons, perhaps, some evidence that Plato's story may have been something more than a poet's yarn spun from the wool of his imagination?

Answers to these and other questions are still puzzing some of the best scholars, so I feel sure you will excuse me from venturing a guess. Our job as chartmakers is to get facts, accurate soundings which can be depended upon by our merchant marine officers and the Navy, and we feel that as our store of facts increases, so shall we approach nearer the truth. But certainly we shall find some of the answers to these questions written on the invisible features of the ocean floor. This is simply one of the fascinating and scientific phases of an engineering work that is serving practical needs.

And for those impatient people who feel that the exciting frontiers of the earth have all been explored, may I remind them that the submarine features so briefly described here represent only a very few of the prominent forms we are finding in the vast and unexplored portion of the earth under the sea.

- Lieut. Paul A. Smith,
Hydrographic Engineer,
United States Coast and
Geodetic Survey.

The Geological Society of America in cooperation with the Educational Division of National Broadcasting Company, recently presented a series of eight radio addressed by recognized leaders in earth science, under the theme "Frontiers of Geology". The first lecture in this series, "Marine Canyons", is presented in this issue.

**********

Membership Committee: Please take note of the following two new prospective members. Dr. Osgood passed out cigars at the Thursday luncheon - a son, Edwin Boyd, was born to Dr. and Mrs. E. E. Osgood on Saturday morning July 15th. Baby Edwin tipped the scales at eight pounds 6½ ounces.

Dr. and Mrs. David E. Weber are receiving congratulations on the arrival of a daughter, Patricia Fern, born Monday morning July 17th at the Portland Sanitarium. Baby Patsy weighed seven pounds three ounces.

**********

CAPE LOOKOUT TRIP.

Cape Lookout, on the Oregon coast, south of Tillamook, was the objective Sunday, July 25th, of a trip for summer students at the University of Oregon and members of the Geological Society of the Oregon Country. The trip was led by Dr. Warren D. Smith, head of the department of geography and geology at the university. Lloyd L. Ruff, of the Geological Society, was co-leader. The two groups met at Hemlock and proceeded to Allen's ranch, where the cars were left. The hike to Cape Lookout was over the trail leading to the Boy Scouts' Camp Meriwether, a distance of a little more than two miles. Then along the beach another two miles or more, to the farthest point possible at the base of this headland. The latter part of the way was rather rough going, over rocks large and small, and when the end of the long trail was reached, the hikers enjoyed a rest and lunch in the bright sunshine, sheltered from a strong wind by the high cliff.

Lunch was interrupted and considerable excitement caused when Louis E. Oberson discovered a sea anemone devouring a fingerling salmon four or five inches long. J. Martin Weber photographed the unusual scene . A number of these young fish were seen swimming nearby.

After lunch the Oregon coastline was discussed, and Dr. Smith gave a brief talk on the subject. Some time was spent here and at another point along the base of the headland in a search for fossils. The marine fauna is in Miocene strata, and among the species found were Spisula and probably Arca (Anadara?). Leo Simon found some small sections of whale bone.

Dr. Smith stated that most of the capes along the Oregon coast are made up of hard rocks, basalts in some cases, and in a few cases of very hard sandstone. The great bays are either in Tertiary sediments, shales and sandstones, or in Pleistocene material. Thus they make a composite coast with an alternation of bays and capes. There is evidence of both submergence and emergence, building up and cutting back. Headlands are being cut back and some of the bays are being cut off from the ocean by spits building across. Thus the coast line gets straightened out. There is some faulting along the coast, though some of the faulting runs at angles to the main coast line. Dr. Smith thinks the major factor is what we call progradation and retrogradation, because the old shore line can be seen back in at the heads of bays, and the coast used to be very irregular. At Port Orford, to the south, the coast line is very irregular.

This coast has been rising and falling. Coos Bay is what is called a ria coast because it is a drowned valley. The seawater has gone inland. Lower Alsea is drowned, and some of the other bays. The Rogue River also, only to a very slight extent. Farther north are found places where the sea has gone far back. But with the building of spits these bays are being gradually filled up. Tillamook Bay in time will be completely silted up and be all solid land. A good deal of it is now. The latest land movements have apparently been movements of elevation. This is fairly certain because we have terraces all along this Oregon coast, except in a few places.

Referring to the topography of Cape Lookout, Dr. Smith said some of the lava at this point flowed into the sea, giving characteristics of pillow lava, with chilled borders around the sides, where it cooled very quickly. A 40 foot terrace here corresponds to the elvation of the pillow lava. Other terraces are 225 feet up to 1500 feet on the seaward side of Humbug mountain, which is Cretaceous conglomerate from top to bottom. It was mapped by Diller. In the Cape Lookout district everything is Tertiary or Pleistocene. Here we have some sediments dipping northwesterly. They look like Newport Miocene. Some of the formation looks like that at the point at Newport, which is Monterey Miocene. The Monterey Miocene is just a veneer. Behind that is Oligocene black shale. All of that country back of Jump-off Joe has been caved. Lots of it slumps off every year. Dr. Smith's department of geology at the University of Oregon has a pictorial record of Jump-off Joe, beginning at 50 years ago. At that time it was tied to the mainland, being solid sandstone. 20 or 25 years later, picures show an arch. This is an actual graphic record, showing changes taking place in 50 years, and showing what occurs along this coast. It all depends on local conditions. At Newport, where the hard rocks are stripped away, and there is nothing behind but shales, it goes pretty rapidly.

At Cape Lookout are sediments that once were flat, or nearly flat, on the continental shelf. There were folded up and beveled off. Then there could have been submergence. And then these lavas came out from some vent and flowed down into the sea, just as lava in the Hawaiian Islands is now doing. There would be lots of steam and it must have been a very spectacular sight. This lava was later elevated, as we see it today. Sometimes it was coming out as a steady flow and when cooled, crystallized as columnar, and at other times it flowed out as a jumbled mass and rolled over, very irregular. Some of it partly cooled and other lava came along and rolled it along and jumbled it up, forming the pillow basalt. Later there was faulting. Either there was a series of extensive jointing, or there may have been a major eastward fault here. It is hard to explain its right angle trend otherwise.

Dr. Smith called attention to an apparent hanging valley, or slopes of a gully where a stream once came down, and stated that there are also some at Neahkahnie. Something has cut off these valleys and left them hanging in the air. They may have been cut off by faulting, or by ordinary marine erosion.

At the present time, Dr. Smith said, we have no accurate information or measurement that this coast is going either up or down. But Neskowin has sunk fairly recently, as evidenced by drowned tree stumps there. But Dr. Smith thinks that, as a whole, in the northern part of Oregon at least, the coast has been rising. Along the Clatsop beaches there is a series of eleven sand and gravel ridges that keep building up. And to show how they control man's activities, not only do the railroad and highway follow the swales, but also a golf course.

The Coast and Geodetic Survey keeps an accurate and up-to-date record of conditions around the mouth of the Columbia river, and a number of facts can be explained. Southwest storms coming in, in the winter, cause a northerly drift. In summer time, northwest winds cause a drift the opposite way. In only a very few instances does a spit run from the north to the southward. A spit goes northward from Cape Lookout, also one from Cape Mears at Tillamook Bay.

Referring to the wax found at the Neahkahnie beach, which has caused much discussion for a number of years, Dr. Smith said it has been analyzed as Siamese candle wax, and some of it bears a stamp or trademark. It is not a mineral wax, although some have thought it was a petroleum product. It was probably carried by a Spanish galleon from the Orient destined either to Mexico or Alaska.

The Salem contingent of several members of the Geological Society was represented on the trip by G. S. Paxson and family. The return to the cars was again via the Boy Scout Camp trail through the woods and over a sand dune called Little Sahara. Some Society members from Portland met Dr. Smith's group from Eugene Saturday afternoon at the coast.

- E. M. Barr

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TEEPLEITE, A HITHERTO UNKNOWN MINERAL.

A hitherto unknown mineral, which probably exists for a brief period only once in every half century or so, has just been added to the collection of the Smithsonian Institution. It has been given the name "teepleite" by its discoverers, W. A. Gale, of the American Potash and Chemical Corporation, Dr. William F. Foshag of the U. S. National Museum, and M. Vonsen, of Petaluma, California

It is a sodium borate chloride whose natural color ranges from pure white to pale buff. It is easily soluble in water. It was found during the late summer of 1934, when Borax Lake in Lake county, California, the earliest commercial source of borax in the United States, became almost completely dry during a prolonged drought. The floor of the lake became a mud flat, a condition not observed previously since 1861, when the moisture was reported to have disappeared entirely.

In the pools of brine remaining, crusts of salts were formed, and in the central area, covering as much as 2 acres, a shallow pool remained, beneath which beds of salt minerals of a light buff color were deposited. In the central portion of the lake bed, immersed and covered by a thick, brown, ciscous brine, were bodies of salts, the largest about 60 feet in length. These salts were very complex, but when an effort was made to analyze them, one was found which hitherto had not been reported in nature, although it had been prepared in the laboratory as an artificial compound. It was named in honor of the late Dr. John E. Teeple in recognition of his services in the field.

Later in the season, after several rains and cooler weather, the newly found mineral completely disappeared. It is not expected that it will be found again until another drought dries the lake almost completely.

Normally, says Dr. Foshag, its color would be pure white, and the pale buff tint can be accounted for by the presence of organic matter in the brines. In the final state of desiccation of Borax Lake these colored the water molasses brown. The luster of the natural mineral is glassy to somewhat greasy, becoming duller upon exposure to light.

- From Smithsonian Institution - July 20, 1939.

Data on the following river plan and profile has been received from the U. S. Geological Survey, and is copied from their monthly list of publications:

Oregon.

Hood River. Plan and profile of Hood River, Oregon, and tributaries, topography by Charles Hartman, Jr., L.L.Bryan, R. O. Helland, and C. O. Greenwood, Jr. Scale, 1:31,680 (1 inch - ½ mile); contour intervals on land 20 and 25 feet and on river surface 5 and 20 feet, vertical scale of profile, 1 inch equals 80 feet. 4 sheets (2 plan, 2 profile), each 22 x 28 inches. Price 10 cents each or 40 cents for the set.

The Hood River has its source in the glaciers on the north and east slopes of Mount Hood, and the beautiful scenery of the region through which it flows attracts annually thousands of tourists and vacationists. This map is the result of surveys made in connection with water-utilization studies, and it shows the parts of the river that afford opportunity for development for power or irrigation, including the main stream from mouth to the forks, East Fork to a point 2 miles above Cold Spring Creek, Middle Fork to Eliot Branch, West Fork to Ladd Creek, and Lake Branch to Lost Lake. The surveys show that these streams are without reservoir possibilities, with the exception of small storage capacity in Lost Lake at the head of Lake Branch. Probably the most valuable use of the water is for irrigation of the extensive orchards of apples and pears for which the lower Hood River valley is famous, but the steep gradient and well-sustained flow of the streams offer also excellent possibilities for development of power.

The U. S. Geological Survey also announces that the following quadrangles, that have been out of print, have been reprinted without revision, and are now available:

Albany
Sumpter

## U. S. GOVERNMENT FREE PUBLICATIONS

The various governmental agencies are circularizing their mailing lists with the information that publications sent under franks are subject to the following:

> Section 6 of the Treasury-Post Office Appropriation Bill, approved May 6,1939, provides that on and after July 1, 1939, no executive department or independent establishment of the government shall transmit through the mail, free of charge or postage, any book, periodical, bulletin, pamphlet, etc., unless a request therefore has been previously received by such department or independent establishment.

These agencies are revising their mailing lists and if anyone is receiving free literature from the government, regularly, they should so advise that governmental agency that they wish the arrangement continued.

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# GEOLOGICAL NEWS LETTER

VOL. 5 NO. 15 PORTLAND, OREGON Aug.10, 1939

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MEMBERSHIP APPLICATION

## GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

### Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ____________

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

______________________________
Address

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Business Address

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Telephone Number    Occupation

I am particularly interested in the following branches of Geology: ____________
______________________________

Sponsored by: ______________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________________
Signature

## ANNOUNCEMENTS

### Lectures

Friday Aug.11 — Annual Picnic of the Geological Society of the Oregon Country. Place: Mount Tabor Park. All members and their friends are invited. Time: Dinner starts at 6:00 p.m. Coffee with trimmings will be furnished. Program following dinner comprises some surprises, songs, and speeches. Harmonica contest - those participating bring their own instruments. Come early and stay late by order of the Committee, Dr. and Mrs. Claude C. Adams, Mrs. Mabel Smith, Mrs. Hazel Haaser and Geary Kimbrell.

Friday Aug.25 — Dr.Louis J. Wolf, Medical Director of the City of Portland Isolation Hospital, will present a lecture entitled

A SURGEON WITH PEARY IN THE ARCTIC.

He will tell not merely of his experiences and the difficulties and dangers encountered during the expedition, but will describe the nature of the scenery and weather, the customs, living conditions and food resources of the Eskimos, travel by means of dog team sledges, and sleeping in snow huts.

### Trips

Sunday Aug.13 — Beach trip to Spencer Creek. Many members have expressed a desire to have another trip to the beach and Spencer Creek is the best locality for fossil collecting. A. D. Vance, leader.

The trip committee has arranged the following tentative schedule up to and including the Armistice Day week-end.

Sept. 2-3-4 — Labor-Day week-end. Bend and Newberry Crater. The preliminary arrangements for this trip were made by our past president, Ray Treasher. We are awaiting confirmation as to details from Phil Brogan of the Deschutes Geological Society, who will be our leader of this outstanding event.

Sept. 17 — Leader: Dr. A. C. Jones. Trip from Klickitat on Neils Lumber Company Railroad. This trip will explore new country, and the railroad cuts will provide an excellent opportunity to study the geological formations.

Sept.30 Oct. 1 — Week-end trip. This trip will be under the leadership of Mr.Lloyd Ruff. He will take the Society to some of the dam sites proposed for the Willamette Valley flood control project. We hope to arrange with Dr. Smith for another banquet and lecture in Eugene for Saturday night.

Oct. 15 — Leo Simon will lead an autumn foliage trip which will also include plenty of geology. So many favorable comments were heard after a similar trip last year, that it has been decided to make this an annual affair.

Oct. 28 — Date not filled.

Nov. 11-12 Armistice Day week-end. Another one of those famous Eastern Oregon fossil hunting trips under leadership of A. W. Hancock. The exact destination has not been disclosed, but you can depend on Mr. Hancock to make it an interesting trip.

**********

NEW MEMBERS

Mr. F. W. Libbey - telephone BR 2276 - office 329 S.W.Oak street.
Mr.Lawrence A. TenEyck - telephone TA 4801 - 4801 NE Wasco street.
Mrs. W. F. Rogers - telephone GA 3461 - 3606 NE 19th Avenue.

******

Mr. Frank A. Ayre who is visiting his sister, Mrs. Lee Davenport, was a guest of Dr. Booth at our Thursday noon luncheon, July 27th. Mr. Ayre is general manager of Roan Antelope Copper Mines Ltd. and Mulfino Copper Mines Ltd., British concerns which produce about one quarter of the world's copper. These mines are in Northern Rhodesia, a British protectorate, 13 degrees below the equator in almost the exact center of Africa.

The talk Mr. Ayre gave the luncheon group on mines, working conditions for whites and natives, climate, and so forth, was most interesting, and we were very sorry that time was so short for there were many questions we would like to have asked regarding this far away place.

**********

## COBALT

Cobalt is one of the metals of which the United States is a heavy consumer, but to date all the cobalt used is imported. In 1937 slightly over $2\frac{1}{2}$ million pounds of cobalt ore, metal, and oxide were imported for use by United States plants. There has been no marketed production of cobalt from domestic deposits. The U. S. Bureau of Mines Minerals Yearbook for 1938 reports the discovery of a deposit from which samples, assaying up to 21% cobalt, were obtained from the Tombstone district, Arizona. The Cobalt Gold Mining Company, Gold Hill, Colorado, was considering exploration of its nickel-cobalt properties by core drilling. The operation of these properties is not reported for 1938.

The July 1939 California Mining Journal reports a recent discovery of cobalt in the Turnbull district west of Safford, Arizona. The new find is the Bluebird property, 41 claims, which have been leased by Ralph L. Crothwaite of Shepherd Chemical Company of Chicago, who have already started development. The Journal also reports a cobalt property owned by Preston Nuner, Mokelumne Hill, in the southern part of Amador County, California.

Oregon has several reported occurrences of cobalt. One of the most famous of these is the old Standard Consolidated Mines in the Quartzburg district of Grant county. This deposit has been variously reported as being near Sumpter, Oregon, in Baker county (3,6), and on Dixie creek in Grant county (1, 4, 7). The proper location, however, is section 12, T. 12 S., R. 33 E. The assays indicated 6.34% cobalt and 0.75% nickel. Apparently no effort has been made to produce the ore commercially.

Cobalt has also been reported from Jackson county by Dr. W. P. Chisholm in Gold Hill near the "Meadows" (5). The ore is reported to carry 4-$4\frac{1}{2}$% cobalt.

In Josephine county the Cobalt group (7), in the Illinois River district, is reported to carry a certain amount of cobalt.

Curry county is reported to have erythrite (cobalt bloom) in the ore of the Bunker Hill group, Collier creek district (3, 7).

A more recent deposit was reported in the Mining and Contracting Review of June 28, 1938, which states that "Gus Schermer continues to develop recent cobalt-nickel showings on his Clover Creek property, located about six miles from Keating".

Considering the fact that large amounts of cobalt are used each year in the United States, it is important that domestic deposits be developed to compete with imported ore. Occurrences and evidences of cobalt and nickel should be reported so that some effort can be made to produce this material on a commercial basis.

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## SHIFTING OCEAN LEVELS

Most assuredly, the sea level is not really level. There are, in the first place, minor and temporary irregularities, such as waves which one can see with the eye, and the ups and downs of the tide which one can measure with a tide gauge. But even if one keeps tide gauges running in different parts of the ocean for months or years, and thus determines for each locality the average or mean sea level at that place, it will be found that these average levels are not everywhere the same. Along a mountainous coast the gravitative attraction of the mountain masses pulls sea level considerably higher than it is along a lowland coast. Where prevailing winds blow the water on-shore, sea level may be raised from a few inches to a number of feet above the average or mean sea level. Take the case of the trade winds. These blow water westward across the Atlantic and pile it up in the Gulf of Mexico. As a result the sea is slightly higher on the west side of Florida than on the east side, and the famous Gulf Stream is born, flowing eastward around the southern end of the peninsula and then northeast across the Atlantic Ocean. Evaporation lowers sea level in some places, while the outflow of great rivers raises it in others.

Fortunately, most of these irregularities of the sea surface are not very great in amount; and still more fortunately, they are relatively permanent. You visit a coastal city without fear, feeling reasonably sure that the level of the sea will not change appreciably while you are there. Thousands of people build houses only a few feet above high tide, and many hundreds of thousands lie down on sandy beaches with children playing all about. It probably never occurs to them that if the water portion of the globe were suddenly to rise by only one millionth part of that globe's diameter, or were to slop over that much, just as one might slop a tiny bit of water from a basin, such relatively insignificant changes of sea level would overwhelm people and houses in a disaster such as has never been recorded in all human history.

When we stop to think about it, the degree of permanence of that unstable-looking water surface is really quite remarkable! But what would happen if sea level did rise, let us say, half way up the Empire State building in New York City?

Well, if that were to happen, both Louisville and St.Louis would become seaports on the enlarged Gulf of Mexico. Most of the state of Mississippi and all of Louisiana and Florida would lie under the ocean. Much of Europe would be submerged, and incidentally Hitler would lose more German territory than he has added by his policy of conquest.

Geologists believe that changes of several hundred feet have occurred quite recently in the earth's history, some of them since man has lived on this globe. But such changes are usually slow, and not readily noticed. The only changes which attract much popular attention are the relatively slight and wholly temporary ones due to hurricanes, earthquakes and volcanic explosions. Hurricanes at sea raise waves that are often called "mountain high", but scientific measurements indicate that these waves rarely rise more than 50 or 60 feet above the troughs or depressed areas between them. More damage is done to coastal cities built on low shores, by the temporary rise of sea level produced when winds of hurricane force pile water up against the shore. In the New England hurricane of last September winds with a velocity of 100 miles an hour raised the waters of the Atlantic 10 to 15 feet above normal high tide at Westerly, Rhode Island. During the Galveston storm of September 8, 1900, the Gulf waters rose 20 feet, and were the principal agent of destruction in the city.

When earthquakes occur under the sea, as a result of the sudden displacement or slipping of rocks forming the sea bottom, - great waves of water sometimes sweep over the adjacent coasts, destroying houses and drowning thousands of people. Such earthquake waves, or tidal waves as they are sometimes erroneously called, have left boats stranded on the roofs of houses in Alexandria on the coast of Egypt. The great earthquake at Lima, Peru, in 1724 was followed by a wave 80 feet high which carried four vessels far inland and devastated coastal regions. A later earthquake wave carried a United States war vessel a quarter of a mile into the land, where it lay stranded for eleven years, until another great wave carried it still farther inland.

Volcanic explosions, in or under the sea, may cause even more destructive waves. In 1883, following the explosion which partially destroyed the volcano of Krakatoa in the East Indies, waves of enormous height wrought destruction over great distances. On the southern end of Sumatra one wave was over 70 feet high and carried a gunboat two miles inland. On parts of the Java coast the water rose 135 feet, causing such destruction of towns and loss of life as made this explosion one of the worst catastrophes in human history.

That the sea has sometimes been much higher than now, in relation to the continents, is proved by the finding of sea shells, wave-cut cliffs, beaches, old sea caves, and other marine features on the slopes of the lands, hundreds or even thousands of feet above present sea level. Such elevated beaches are found 1500 feet high on the mountainous coast of California. That the sea surface has also been relatively much lower than now, is proved by the finding of river-carved valleys, shore beaches and other land forms under the sea. Thus Chesapeake Bay is clearly the submerged valley of a former Chesapeake river to which the Susquehanna, the Potomac, and the James rivers were merely tributaries; while a submerged channel of the Hudson river can be followed far out under the open ocean.

Perhaps you noticed that I spoke of these past positions of sea level as being higher or lower than now in relation to the lands. In other words, they are merely relative positions of sea level. It still remains to be proved whether high-level sea beaches owe their position to a drop of the sea or a rise of the land. Similarly, the submerged valleys of Chesapeake Bay and the seaward continuation of the Hudson can be explained equally well by a geologically recent rising of sea level, or a geologically recent sinking of the land.

How, then, can a geologist tell whether it is the sea level or the land level that has changed?

A famous Scotchman names John Playfair many years ago explained very clearly the only way in which this can be done. If it is the sea level which has changed, he pointed out, the old shorelines ought to be found at the same elevation all over the world. This is because sea level must rise and fall uniformly on all parts of the globe. But if it is the land level which has changed, the elevated shorelines may appear in some places and not at all in others; and where they do appear, they may be found to slope upward or downward when followed along the coast. This is because some lands may rise while others sink; and any uplifted land mass is likely to be warped or tilted.

This principle is called Playfair's Law, and perhaps you think it has solved the difficulty for the student of ancient marine levels. Unfortunately, this is not the case. We do feel very sure that sea level has repeatedly gone up and down by uniform amounts all over the world. When the great continental glaciers formed over parts of North America and Europe, the water thus piled up on the lands in the form of thick ice caps must have been evaporated from the oceans to give the necessary snow and ice. Hence sea level must have fallen, perhaps a few hundred feet, perhaps more. When the ice caps melted and the water flowed back into the ocean, sea level must have risen. But unfortunately the weight of the ice piled up on the continents probably caused those parts of the land to sink unevenly. Melting of the ice apparently allowed the land areas relieved of this load to rise, but to rise unequally. Furthermore, in all parts of the world we find that land areas have repeatedly risen and fallen irregularly due to other causes than ice formation and ice melting. Hence the likelihood that old shore-lines left at uniform altitudes by drops in sea level have been distorted out of their original positions by unequal warping of the lands.

Under such conditions, how can anyone tell whether these warped shorelines were carved when the sea was higher; and if they were, what was the level at which they were originally carved?

On its face the problem does look insoluble. Yet many investigators are working hard to solve it. They hope to discover some parts of the world were disturbing forces have not been active in recent geologic time, and where horizontal shorelines high above sea level are found along the coast. Under such conditions, they would feel that the elevated shorelines must result from a uniform drop of sea level, and hence that a key area had been discovered which could be used to unravel the complicated shore history of more disturbed regions.

Despite discouraging difficulties the study is still going on in many parts of the world, and success may eventually crown these labors. If it does, it will be a great achievement. For if we can discover how far the sea has risen on the lands, and when these rises of sea level took place, we can date many important events in recent earth history. If we can tell how far the sea level has dropped below its present position, and when such drops occurred, we may be able to explain and to date forms now found on the ocean floor. If the sea level has dropped many thousands of feet sometime in the past, we could easily explain by normal stream erosion those gigantic canyons, some of them deeper than the Grand Canyon of Colorado, which constitute one of the most spectacular features concealed beneath the restless waters of the ocean.

- Douglass Johnson, Columbia University.

This talk by Professor Johnson was the second in a series of eight radio addresses presented by the Geological Society of America under the theme "Frontiers of Geology".

## A NEW FUNDAMENTAL TIME DIVISION.

A new fundamental time division - the 89.36 year sunspot cycle. This has just been introduced by H. Helm Clayton in a report on mathematical analysis of solar activity just issued by the Smithsonian Institution. By mean of it, Mr. Clayton shows, he can make fairly accurate predictions not only of the times of recurrence of maximum and minimum numbers of these titanic whirlwinds in the sun's atmosphere of fire, but also their amplitude at different recurrences.

The great cycle in turn is split into eight component cycles. These might be likened to eight "seasons" on the sun, due to some unknown factors in its own physical constitution. Sunspots are attracting constantly more and more attention because of their known and suspected correlations with conditions on earth. They are known to affect the earth's magnetic field, and consequently radio transmission. They are strongly suspected of exercising a dominant influence over weather.

Up to the present, however, means of predicting them have been quite unsatisfactory. It has long been known that there is a basic sunspot cycle, during which the spots increase from minimum to maximum numbers and back to minimum again, which repeats itself approximately every 11 years. This, however, is only an average. In the past 150 years it has been as short as 9 years and as long as 13 years. Nobody has been able to predict with any confidence when a cycle would repeat itself.

It also has been impossible to predict very accurately the amplitude of either minima or maxima. At some of the eleven-year recurrences the sun has been far stormier than at others. It has just passed through one of the most tempestuous periods known since sunspots have been under observation and now is on its way back toward "fair weather" once more.

The trouble has been that the eleven-year cycle is just an approximation. It is made up, as has been demonstrated notably through the researches of Dr.Charles G. Abbot, Secretary of the Smithsonian Institution, of several constituent cycles. The maxima and minima of several of these cycles tend to come together approximately every 11 years. These minor cycles are of varying length and amplitude. They appear at first to be inextricably confused. The minimum of one may occur at the maximum of another, reducing its normal amplitude. Or two or more maxima may occur together, raising the amplitude far above normal. The problem has been first to compute the normal lengths and amplitudes of these cycles and then to determine the points of their concurrence.

This has involved very laborious statistical procedures. Mr. Clayton has analyzed the yearly sunspot data since 1793, or as long as entirely reliable records have been kept. He finds a constant recurrence of eight cycles, one of which is the basic period which he recalculates at almost precisely 11.17 years. The others are 5.56, 8.12, 8.94, 9.93, 11.14, 14.89, 19.86 years respectively. All are very nearly submultiples of the fundamental period of 89.36 years, a period in which all their concurrences will have taken place. This, then, becomes the major sunspot period, and the one upon which predictions must be based.

Mr. Clayton tested the predictive value of his work by projecting his theoretical sunspot curve forward from 1880, and comparing it with the actual maxima and minima and their amplitudes. Except for one maximum, that of 1928, it fitted almost perfectly. Projected into the future it shows that the sun is already on its way toward a sunspot minimum to be expected about 1945, after which it will rise to a new maximum, but a slightly lower one than that through which the solar system has just passed, in 1949.

There is still the possibility, Mr. Clayton points out, of uncovering new periodicities in the complex statistical tangle, and these would be expected to bring the theor~~e~~tical curve closer to the actual one. It is all convincing evidence, he believes, that these solar tempests cannot be considered as irregular explosions in the sun occurring with a randomness which cannot be predicted, but that their frequency is governed by definite laws, however complex these may be.

Mr. Clayton also advances some tentative correlations between solar activity and atmospheric pressure, particularly in the high altitudes.

- From the Smithsonian Institute,
April 5, 1939.

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SHORTITE, A NEW MINERAL.

The Geological Survey, Department of the Interior, recently announced the discovery of a new mineral, officially named "shortite".

Composed of a double carbonate of sodium and calcium, the new mineral was found and identified by J. J. Fahey, chemist, in the Geological Survey laboratory. It was discovered as disseminated well-formed crystals in sections of core from the John Hay oil and gas well, drilled by Mountain Fuel Supply Company on leased Government land in Sweetwater county, Wyoming, at depths of 1,250 to 1,800 feet below the earth's surface. Shortite was named in honor of Dr. M. N. Short, a former geologist of the Survey who now is Professor of Optical Mineralogy at the University of Arizona.

Although the commercial value of "shortite" is not yet definitely known, the new mineral is associated with considerable quantities of trona, sodium carbonate-bicarbonate, which does have potential commercial value. Trona was identified in a sample from this same well in 1938 by R. C. Wells, chief chemist of the Geological Survey.

Additional samples for further laboratory examination will be collected by Mr. Fahey who has left Washington for the shortite-bearing area. It is expected that sections of core, two inches in diameter, and totaling a few hundred feet in length, will be transported to Washington.

The new find probably will be one of the few mineral discoveries for the year. So thoroughly has the earth been combed that, during the past two years, only about twenty new minerals were discovered in the entire world.

A full, technical description of the new mineral will be published in The American Mineralogist.

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# GEOLOGICAL NEWS LETTER

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## MEMBERSHIP APPLICATION

## GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

### Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ________________

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

______________________________
Address

______________________________
Business Address

______________________ ______________________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ____________________
______________________________

Sponsored by: ______________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________
Signature

## ANNOUNCEMENTS

### Lectures

Friday Aug.25 — Dr.Louis J.Wolf, Medical Director of the City of Portland Isolation Hospital, will present a lecture entitled

A SURGEON WITH PEARY IN THE ARCTIC.

He will tell not merely of his experiences and the difficulties and dangers encountered during the expedition, but will describe the nature of the scenery and weather, the customs, living conditions and food resources of the Eskimos, travel by means of dog team sledges, and sleeping in snow huts.

Friday Sept.8 — Mr. Earl K. Nixon, Director of Oregon State Department of Geology & Mineral Industries, will be the speaker of the evening. Subject will be announced in next bulletin.

### TRIPS

Sept. 2-3-4 — Labor-Day week-end. Bend and Newberry Crater. The preliminary arrangements for this trip were made by our past president, Ray Treasher. We are awaiting confirmation as to details from Phil Brogan of the Deschutes Geological Society, who will be our leader of this outstanding event.

Those going on the Labor-Day trip are strongly advised to make their cabin reservations early, as Labor Day vacationists fill the Bend area. The following cabins are suggested by Mr. Brogan:

South City Limit Motel (Geo.Ludowitz)
Pine Tree Auto Court.
Gateway Auto Court
Wahee Auto Court

Sunday Sept.17 — Leader: Dr. A. C. Jones. Trip from Klickitat on Neils Lumber Company Railroad. This trip will explore new country, and the railroad cuts will provide an excellent opportunity to study the geological formations.

Sept.30 Oct.1 — Week-end trip. This trip will be under the leadership of Mr.Lloyd Ruff. He will take the Society to some of the dam sites proposed for the Willamette Valley flood control project. We hope to arrange with Dr.Smith for another banquest and lecture in Eugene for Saturday night.

Sunday Oct.15 — Leo Simon will lead an autumn foliage trip which will also include plenty of geology. So many favorable comments were heard after a similar trip last year, that it has been decided to make this an annual affair.

Sunday Oct.28 — Date not filled.

Nov. 11-12 — Armistice Day week-end. Another one of those famous Eastern Oregon fossil hunting trips under leadership of A. W. Hancock. The exact destination has not been disclosed, but you can depend on Mr. Hancock to make it an interesting trip.

A note has just been received from Miss Eva Catlin, who has been spending the summer at Camp Willapa, Nahcotta, Washington, in which she says she expects to be in Seattle the coming year. "Will surely miss the Society - think I'll have to start a little one up there if they don't have one".

Harriett, the youngest daughter of Mr. and Mrs. Amza Barr, became the bride of Russel N. Barth on Sunday, August 13th. The ceremony took place at 4 p.m. in the Evangelical Church, after which a reception was held at the home of her parents, where a host of relatives and friends greeted them. Mr. and Mrs. Barth will make their home in Portland.

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On former occasions Mr. Pruett has generously given of his time and effort for the benefit of our Society and we are again indebted to him for allowing us to publish in full his report of the now famous "Portland Meteorite" which so startled our citizens on the morning of July 2nd last. Substance of this report appeared in Magazine Section of Sunday Oregonian, August 6th. When reading the report it does not require much imagination to realize the tremendous amount of patient work involved in piecing together and appraising the worth of the multitude of scattered evidence which poured into his office, and then coordinating it into a connected and logical account from which to construct the map showing the path traversed by the meteorite. It is a matter of pride to our Society, too, that three or four of our members made valuable contributions of the mass of observations submitted, and Mr. Pruett has graciously acknowledged them.

We express our thanks to Mr. Pruett, as well as our appreciation of the vigor and effectiveness with which he is functioning as the Pacific Direction of the American Meteor Society. His work and that of other representatives of that Society is building up a fund of facts which is clearing away many of the mysteries concerning these stony immigrants from space.

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## THE PORTLAND METEOR OF JULY 2, 1939

By J. HUGH PRUETT
Pacific Director, American Meteor Society.

Shortly after eight o'clock, Sunday morning, July 2, the writer's telephone rang. At the other end of the line was Ford Hand, Eugene druggist. "Has anyone called you yet about the big shootin' thing that streaked across the northern sky a few minutes ago?"

An hour later Mr. Hazen of the Oregonian called from Portland to learn if there had been any indication of an earthquake in the Eugene area. "Here in Portland we have received literally hundreds of calls regarding a loud noise and jarring of houses a few minutes before eight. We cannot seem to account for it." Mr. Hand's observation of the brilliant daylight meteor at practically the same time as the Portland disturbance seemed to give an explanation of the latter.

A busy day followed. There were calls from local reporters and long distance conversations with various news agencies in Portland. Radio stations discussed the excitement at every news broadcast - and often between. By 6 p.m. most announcers had settled down to the meteoric theory.

It seems doubtful if anything of this nature ever before gave Portland such nation-wide publicity. Newspaper clippings from all over the country indicate that this event was made prominent news everywhere. Dr. Clyde Fisher of the Hayden Planetarium wrote, "Your meteor made front page news in the New York Times two days in succession." Many Northwestern papers considered it three-day news. Even the editorial pages discussed it.

The early reports appeared quite contradictory. Some said the meteor seemed to be going north; others, east; still others, south, and west. Careful study of the accompanying diagram will show that all were correct.

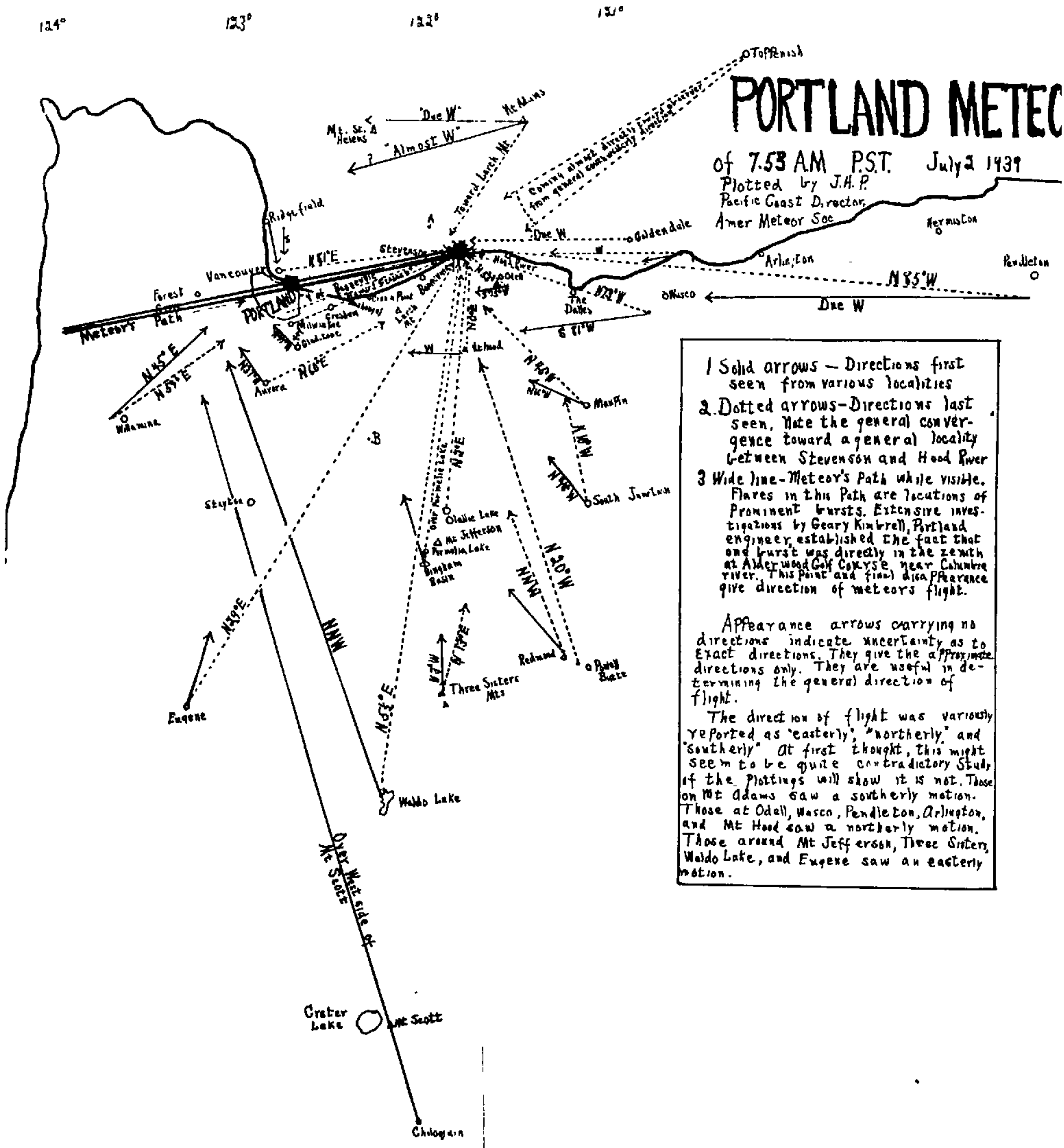
In the vicinity of Portland the sky was spotted with clouds which interfered greatly with observations. Very few in that area saw the meteor itself; only the smoke through the cloud spaces after the arrival of the sound. Some descriptions seem to be simply those of clouds. At many places outside of Portland the sky was clear, and excellent views were obtained, even by those over 100 miles from any part of the meteor's flight.

The news agencies cooperated splendidly by requesting that observers send first-hand data to the Pacific Coast headquarters of the American Meteor Society. At this writing, such reports have been received from 91 observation points in Oregon and Washington. With most of those reporting, considerable additional correspondence has been carried on. Various types of charts and instruments for measuring angular distances were sent to many of these in order that we might learn - as accurately as memory would serve - just where in the sky the meteor was seen. The directions and angular heights above the horizon where the meteor "seemed" to be from widely separated localities at the times of appearance and disappearance were the most important bits of information needed in determining the actual path of the meteor in space. A single observer's estimates of the distance and height of a fireball are of no value at all. Each of two persons 100 miles apart will often report, "It was not over a mile away and about 4000 feet above the ground."

# PORTLAND METEO[R]

of 7.53 AM P.S.T. July 2 1939

Plotted by J.H.P.
Pacific Coast Director
Amer Meteor Soc




1 Solid arrows — Directions first seen from various localities

2. Dotted arrows—Directions last seen, Note the general convergence toward a general locality between Stevenson and Hood River

3 Wide line—Meteor's Path while visible. Flares in this Path are locations of Prominent bursts. Extensive investigations by Geary Kimbrell, Portland engineer, established the fact that one burst was directly in the zenith at Alderwood Golf Course near Columbia river. This Point and final disappearance give direction of meteors flight.

Appearance arrows carrying no directions indicate uncertainty as to Exact directions. They give the approximate directions only. They are useful in determining the general direction of flight.

The direction of flight was variously reported as "easterly", "northerly," and "southerly" At first thought, this might seem to be quite contradictory Study of the Plottings will show it is not. Those on Mt Adams saw a southerly motion. Those at Odell, Wasco, Pendleton, Arlington, and Mt Hood saw a northerly motion. Those around Mt Jefferson, Three Sisters, Waldo Lake, and Eugene saw an easterly motion.

Meteors are most deceiving things. No one can tell where they are by simply looking at them. A party on the southeastern slope of Mt. Adams reported the recent fireball seemed to be "starting southward from the top of the mountain". A group on the northeastern side of Mt.Hood took it for fireworks shooting northward from the summit above them.

Since the Portland meteor was distinctly seen by several in the bright morning sunlight when fully 150 miles away, what a sight it would have been had it occurred after dark! It would have been widely observed and its path much more easily traced. This is the only daylight fireball the American Meteor Society has attempted to trace since this work started in the Pacific states in 1932. It has proven by far the most difficult. The other 12 appeared at night. Perhaps the fact that it is the thirteenth also complicates matters.

Splendid work was done in Portland and as far south as Gladstone by Robert E. Millard, the musician-astronomer, and by Geary Kimbrell, one of the city engineers. Mr. Kimbrell took his transit to various observation points and had the observers point out the places in the sky where they saw the smoke cloud. The angles of azimuth and altitude were measured. It was found that from nearly all of Portland the smoke appeared north of the zenith. But on the Alderwood Golf Course, near the Columbia river, three highly intelligent golfers agreed it was directly in the zenith. A resident near this locality also reported that it was directly overhead. Several persons living on the north side of the river wrote that they saw it somewhat south of the zenith. This fairly definitely establishes one spot in the meteor's path.

The final disappearance gives us another rather restricted location in the path. One is much more certain where a meteor seemed to "blink out" than where it started. When we receive a large number of reports, the place over which a meteor ceased to be luminous is always fairly definitely determined. The appearance point is much harder to handle. All do not catch sight of the fireball at the same time. It is well known by meteor tracers that most persons are inclined to place the starting point farther back than actually seen. Their memory on this does not serve them as well as the definite picture of the place of final explosion.

Note the dotted arrows. These run from various places in the directions toward which individual observers saw the fireball disappear. Any two of these lines if perfectly drawn would cross at the spot over which the meteor ceased to glow. But it was not possible to have two trained surveyors stationed beforehand on Mt. Adams and Mt. Hood with complete instrumental equipment for exact angular measurements on the expected meteor. Such an object is not expected, so we have to take the directions from those who have made no preparations for the observation. But a large number of these directions are very valuable, especially if there are definite landmarks over which the fireball was seen to disappear.

From the splendid convergence of so many long-distance arrows, it is very convincing that the meteor's visible flight ended about midway between Stevenson and Hood River, and over the Columbia river, or slightly north of it. Most of the arrows are flying directly toward this locality. Other scattering ones do not hit the "bull's eye", yet strike in circles closely surrounding it. A few fly rather wide of the mark. The disappearance lines from Gladstone and Willamina are evidently running toward the cloud spottedness in and around Portland. There, like a bursting bubble, the fireball was gone and no one could tell where.

Having established the disappearance locality and the Alderwood Golf Course as two spots over which the fireball passed, we can easily construct the general line of flight and extend it back to where the solid appearance-arrows indicate it likely became visible. This spot is harder to determine. Chiloquin, south of Crater Lake, reported it appeared on the left side of Mt. Scott. This is quite definite and gives the appearance a little west of Forest Grove. Many of the solid arrows run toward this general region. Perhaps it was cloudy there and only those from a distance, seeing above the clouds, sighted it over this locality.

Some members of a party of five ascending Mt.Adams reported the meteor appeared "due west." Others said, "Almost west." The general direction of appearance seemed "towards Mt.St.Helens." But 15 degrees south of "due west" would still seem quite definitely "towards Mt.St.Helens", and yet fit other observations. The sky was crystal clear in the Mt.Adams region, so the fireball could easily have been sighted when at a considerable distance out at sea. That the meteor was traveling slightly toward the north is definitely shown by the arrows from all localities generally east from Bonneville. Washougal reported smoke both due north and due west, another argument in favor of the path as constructed.

The height of the meteor over Portland is somewhat uncertain. But it must have been below 30 miles, the approximate upper limit of the ozone layer, for above this height sounds would reflect back and never reach the earth. The seemingly best angles reported give heights of from 15 to 27 miles (average 21 miles) when over the Alderwood Golf Course, and between 5 and 12 miles over the disappearance point east of Stevenson.

The time of appearance was most commonly reported as 7:50 a.m. Mr.Millard caught the first sound waves at his astronomical observatory on Council Crest Drive at 7:55:25, "with an error of not more than two seconds." Assuming the plotted path correct and the height 21 miles when at the nearest approach to the observatory, we find Mr. Millard was 22 miles from the fireball. (Quite safe!) It would take the sound almost exactly two minutes to travel this distance. This places the time at approximately 7:53½ a.m.

The sound was heard at several places 40 miles from the meteor's path. At Stayton and the headwaters of the Clackamas river it was very distinct. It is known that heavy meteoric thunderings are heard to distances of 50 miles. There is then a zone of silence. Beyond 90 miles it may again be heard. Attorney H. E. Slattery is certain he heard it distinctly at his home in Eugene, about 100 miles from the meteor. Those nearest the fireball said the sound was terrifying. Several described it as seeming to be forceful pounding on the walls of their houses, followed by more distant rumbling. On whichever side of the house one happened to be, the pounding seemed right there.

When one does not see a meteor but hears later the long-continued rumbling, one very often misjudges the direction the object is traveling. The first blast comes from the nearest point in the path. Since the fireball travels much faster than the speed of sound, rumblings from greater and greater distances continue to reach the hearer for a minute or longer. The sounds come both from the direction from which the meteor approached and the direction it disappeared. If the sounds are louder from the direction of approach, the rumblings will be heard to die away farther and farther in that direction. Many around Portland farther east reported the sound seemed to be going toward the west.

There seems to have been a violent explosion followed by three milder ones right over Portland. At each explosion a huge cloud of smoke appeared. Then from Portland on to the final disappearance a smoke trail of lesser intensity was traced. Jesse Baker, near Odell, stated that at the end point the meteor suffered a complete "blow up" which threw fragments in all directions. Observers some distance from the path obtained the best views of the smoke effects. Parties on Mt.Hood and Mt.Adams gave excellent descriptions.

The angle to the horizontal that the meteor seemed to approach the earth depended upon the location of the observer. Those almost directly in front of its flight saw it coming down at about a right angle to the horizon, 90 degrees. Goldendale and Toppenish reported such a descent. Mrs.Ralph McCully of Pendleton showed by a diagram that it descended at about an 80-degree angle, with a motion somewhat toward the north. Those who had a side view, such as South Junction, Maupin, Silverton, Olallie Lake, and Waldo Lake, estimated the slope of descent at from 20 to 40 degrees. If we assume that the fireball dropped 20 miles in height from Portland to the disappearance point 45 miles eastward, we obtain an average slope of 24 degrees. Most side-view diagrams showed a steeper descent near the disappearance point.

As to the average speed of the meteor, this would be easy if we knew the length of the visible path and the time required for the flight. Fireballs traveling as slowly as 10 miles per second have been seen at night. The Lazy meteor of near 10 p.m., April 17, 1934, is a general example. It was a dull red color and took fully 20 seconds for its visible flight. Such meteors raise little noise disturbance and would be rather difficult to see in the daytime. When a fireball becomes white-hot - as was evidently the recent one - it means that it is tearing through the air at real speed.

Prof. Alfred Skei of Benson Polytechnic High School of Portland, viewing from Mt.Adams, evidently first saw the object when it was a considerable distance out over the ocean. He estimated the time of flight as four seconds. Being a mathematician, his opinion is worthy of consideration. The writer believes from the direction of appearance given by Professor Skei that he saw the fireball while it traveled almost 140 miles. This would given an average speed of around 35 miles per second. The great luminosity is an argument in favor of this high speed.

As to the actual size, nothing definite can be stated. Eugene and many other places at great distances from the line of flight reported the meteor appeared half the diameter of a full moon. It is well known, however, that a fireball of relatively small solid dimensions will subtend a very large angular diameter because of the huge envelope of incandescent gas. Fireballs that raise a terrible disturbance of light and sound while in the air, have upon landing been found to have a diameter of only a few feet or less. Of course, the speedy ones lose considerable of their mass during the fiery flight through the atmosphere.

L. L. Avery south of Council Crest reports that even his chickens are conscious of the presence of celestial visitors. On the fateful morning, his first intimation of astronomical happenings was the wild stampeding of his 600 pullets toward the chicken house. He looked up to see if a hawk were inspiring the precipitous retreat. Due north he saw the smoke cloud. Considerable time elapsed before the sound arrived. Mr. Avery explains that chickens are excellent star-gazers as their eyes are so placed that they see upwards at all times.

L. L. Elliott, 5108 S.E. 59th Avenue, Portland, described the sound as "something like the starting all at once of a lot of old model-T Fords with the gas turned on full, - yes, a very odd noise." He took it to be "another clap of thunder of an unusual nature that had escaped from the corral where California keeps such things, and had wandered up Oregon way".

Now that the excitement regarding the meteor's flight is past, many are looking for meteorites, the solid fragments that may have reached the ground unconsumed. Some of these may be a few miles east of the disappearance point - on dry land or in the Columbia river. Dr. H. H. Nininger, the Denver meteoritic expert, has found solid remnants under the visible paths of some meteors. In one case particles were found at a considerable distance to the north. There was a strong wind from the south at the time of flight.

Already from eight localities have come announcements of curious stones believed to have been dropped from the Portland meteor. Two of these specimens have reached the writer. They are not meteorites.

Since no authenticated meteorite has been found in Oregon or Washington since 1902 - often reported "tree meteorites" (clinkers) notwithstanding - it is hoped that someone will soon find a fragment from the already famous Portland meteor. Please send samples for identification to the writer at the University of Oregon. It is not necessary to send specimens which are honeycombed with holes. These are simply lava or clinkers from a fire. Meteorites are never porous, but are solid and heavy.

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## LAST FEEDING PLACE OF TITANOSAURUS.

The last pasture of the gigantic titanosaurus, 20 ton monster of 80,000,000 years ago, is being explored by Smithsonian Institution paleontologists this summer. The great reptiles, 75 feet long and more than 12 feet high, browsed on the succulent vegetation of great swamps where parts of the Rocky Mountains now stand in the Upper Cretaceous period of geologic time just before the dawn of the time when mammals, the remote ancestors of man, became the dominant creatures on earth.

The explorations are being directed by Dr. C. L. Gazin in the North Horn area of the Manti National Forest in central Utah. During the past two summers considerable fossil skeletal material of the titanosaurs has been collected, and Dr. Gazin hopes to obtain enough more this summer to reconstruct a whole skeleton.

Hitherto these great plant-eating dinosaurs had been known in North America from only two bones found in 1921 by a U.S.Geological Survey geologist in New Mexico. Remains of the family previously had been found in India, South America, Indo-China, southern France, and Madagascar. Their actual presence on this continent remained in doubt until the Manti Forest discoveries.

These titanosaurs were neither the largest nor most fearsome of the great reptiles. They probably were rather stupid, inoffensive creatures having enough to do all day long to find enough vegetation to eat. They are noteworthy, however, as the last of the giants. They were coming into a time in earth's history when the environment became impossible for the race.

There is no hint in the Utah formations as to what happened, says Dr.Charles W. Gilmore, of the U.S. National Museum, who obtained the first remains. No break can be found between the Upper Cretaceous and the Paleocene, when the fossils of very primitive mammals become abundant in the rocks. One explanation, Dr. Gilmore says, is that in this period came one of the great uplifts of the Rocky Mountain area. The swamps were destroyed and towering peaks arose in place of them in the course of a few million years. The great reptiles were swamp creatures, unable to adjust themselves to an environment becoming increasingly dry and mountainous.

The beds also contained fossilized bones of the fearsome horned dinosaurs and of the "duck-bills", which were among the latest to survive. The titanosaurs were notable not only because they were so far out of the region hitherto assigned to them by paleontologists, but also because of their weird appearance, with enormously long necks and tails.

Dr.Gazin expects to continue this summer his excavations into the Paleocene strata of the formation. Here he has already collected material from which several hitherto unknown species have been described. There is a possibility that the formation constitutes a bridge into the Eocene, or Dawn age, about 50,000,000 years ago, when mammal life began to assume essentially its present-day forms, and flowering plants and singing birds appeared on earth. Such specimens can be found, if at all, only in the uppermost strata.

- Smithsonian Institute , July 15, 1939.

# GEOLOGICAL NEWS LETTER

VOL. 5 NO. 17 PORTLAND, OREGON Sept.10 1939

OFFICIAL PUBLICATION OF THE

GEOLOGICAL SOCIETY OREGON COUNTRY

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DR & MRS ARTHUR C JONES
3300 S W HEATHER LANE
PORTLAND, OREGON

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY




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Editor-in-Chief and Business Manager

Raymond L. Baldwin
345 U. S. Court House
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Associate Editors

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______________________________

Sponsored by: ______________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________
Signature

ANNOUNCEMENTS

Lectures

Friday Sept.8 — Subject: STRATEGIC WAR MINERALS AND OREGON MINERALS.
Speaker: Mr. Earl K. Nixon, Director State Department of Geology and Mineral Industries.
Strategic minerals, as defined by the War Department, will be discussed in a general way, and then Oregon's position as a producer of some of those minerals will be outlined. A timely statement by one who can make it authoritatively and tell it interestingly. Illustrated.

Friday Sept.22 — Subject: THE WILLAMETTE RIVER BASIN PROJECT - Geologic Features affecting Structural Design.
Speaker: Mr. Frank Kochis, Designing Engineer, U.S.Engineers.
This will be a timely discussion of this interesting subject in view of the official trip to the sites of some of the projected structures which is planned by the Society the following week. Mr. Kochis has an intimate acquaintance with both field conditions and the theories of principles involved, so this is a fine opportunity for those who cannot take the trip to acquaint themselves with the nature of this big project. To those who plan to go, hearing this lecture will add much to what they can gain from the visit. It will be illustrated by lantern slides.

Friday Oct.13 — Subject: To be announced later.
Speaker: Dr. Edwin T. Hodge
Whatever his subject, we are assured of a treat!

Friday Oct.27 — Subject: HUNTING FLUORESCENCE IN MEXICO.
Speaker: Dr. Courtland L. Booth.
Dr. Booth made an extensive trip thru Mexico early this summer and he will present to us the results of his geologic observations by word, by picture and by an exhibit of specimens.

TRIPS

Sunday Sept.17 — Leader: Dr. A. C. Jones. Trip from Klickitat on Neils Lumber Company Railroad. This trip will explore new country, and the railroad cuts will provide an excellent opportunity to study the geological formations.

Sept.30 Oct.1 — Week-end trip. This trip will be under the leadership of Mr.Lloyd Ruff. He will take the Society to some of the dam sites proposed for the Willamette Valley flood control project. We hope to arrange with Dr.Smith for another banquet and lecture in Eugene for Saturday night.

Sunday Oct.15 — Leo Simon will lead an autumn foliage trip which will also include plenty of geology. So many favorable comments were heard after a similar trip last year, that it has been decided to make this an annual affair.

Sunday Oct.28 — Date not filled.

Nov. 11-12 Armistice Day week-end. Another one of those famous Eastern Oregon fossil hunting trips under leadership of A. W. Hancock. The exact destination has not been disclosed, but you can depend on Mr.Hancock to make it an interesting trip.

**********

Dr. E. E. Osgood is leaving for an extended trip to the East where he will make several addresses before medical societies.

Miss Jean Curtiss Booth, daughter of Dr. and Mrs. Courtland Booth, and Herman Edwin King were married Wednesday evening, August 30th, at First Methodist Episcopal Church.

Mr. Earl K. Nixon addressed the Montavilla Kiwanis Club Tuesday evening, August 29th. His subject was "Rocks and Mineral Resources of Oregon".

NEW MEMBER.

Mrs. Emily M. Moltzner, BE 0911 1505 SW 14th Avenue
Business address - Secretarial Service, Morgan Bldg.,Portland, BE 9109

**********

In this issue we are publishing the third in a series of radio addresses presented by the Geological Society of America under the theme "Frontiers of Geology": "The Role of Minerals in the Present International Situation", by Prof. C. K. Leith of the University of Wisconsin.

**********

COWLITZ GLACIER ON MOUNT RAINIER.
An Exceptional Geologic Exhibit

by Carl Price Richards.

For several years past one of the main channels of investigation pursued by the Research Committee of the Mazama Club has been the study of glacial phenomena. Over a continuous period of four years they made periodical measurements of the rate of movement of the ice at four different lines across Eliot Glacier on the northeast side of Mount Hood, and the findings were published in the December 1928 MAZAMA. Covering that period and continuing annually ever since, measurements also have been made of the recession of the same glacier, as well as similar measurements of Coe and Ladd Glaciers on the north side of the mountain. The effort involved in making these studies was considerable and the getting together of a volu[illegible] party at the proper time was difficult and, occasionally, impossible, yet no [illegible] been missed on Eliot and only two or three on the less accessible glaciers.

[illegible] method of approach was tried, which, though it does not supersede [illegible] ends it considerably. This method was to study the gla[illegible] an airplane, and the first flight was made around Mt. [illegible] photographs were obtained of all its glaciers, special [illegible] portions.

[illegible] flight was made around the snow peaks of [illegible] Rainier and Mt.St.Helens were encircled [illegible] obtained. A third flight was made in [illegible] s made of all the glaciers on Mt.Jefferson

Geologists Plan Trip—A trip into the Klickitat country Sunday has been planned by the Geological Society of the Oregon Country. Dr. Arthur C. Jones will lead the party of 82 members and friends who have signed up to go. Members of the society will be guests of the Neils Lumber company and will be taken for a short ride on the company's private railroad. Dry ice wells in the territory will also be visited.

Pathfinders to Hike—Pathfinders will visit Badger lake and vicinity, leaving Saturday morning as early as possible and hiking by way of Gunsight butte, Lookout mountain and Oval lake. Flag Point lookout [illegible]

[illegible] se flights comprised the illustrations in two [illegible] on record an authentic description of the nature [illegible] mountains. With such reports available, students [illegible] will have for comparison reliable information of the [illegible] this period, thus enabling them to appraise the ex[illegible]

Thre[illegible] report were prepared, one being placed in the archives of the Mazamas, the second in the Reference Department of the Portland Public Library, and the third was given to the Committee on Glaciers of the American Geophysical Union at Washington, D.C. This committee acts as a sort of international clearing house in all scientific matters dealing with glaciers.

One of the photographs obtained during the flight around Mt.Rainier revealed a feature on lower Cowlitz Glacier which hitherto, as far as is known, had not been recorded or noted. That picture, which is reproduced with this article, showed on the left half of the ice stream, which is characterized by a large medial moraine, a series of curved, transverse bands, beginning immediately below the ice falls and extending for over two miles downstream. They appeared as a series of crescents, alternately light and dark, with their convex side facing downstream, the dark bands being about 25 per cent broader than the light ones.

Similar banding was known to occur on some glaciers in Alaska and a few in Switzerland, but no example of it was known in the United States. Those in Switzerland were studied by Forbes 90 years ago and by Tyndall 4 or 5 decades later, but, apparently, no finally satisfactory explanation of their origin was established.

Clearly, then, unexpectedly revealed here in our own territory, was a good example of this unusual glacial phenomenon affording an opportunity for investigation and study. So it was planned, as opportunity offered, to make a trip to Cowlitz Glacier on foot and examine it more closely. When Dr.Laurence Gould was here last year he was shown the photograph and at once evinced great interest in it, expressing the desire to accompany the party which visited the glacier. It was not until this summer, however, that such a trip could be arranged and, on August 12th last, the party of seven met at Paradise Lodge in Mt.Rainier National Park.

The afternoon was spent in visiting the terminus of Nisqually Glacier and, after camping overnight at Paradise camp grounds, a start was made about 7 a.m. to hike over to Cowlitz Glacier, carrying camping equipment so that a night could be spent near it. About 11 o'clock the party reached the top of the cliff overlooking the vast arena some 1200 feet below, through which flowed the great ice stream, and most of the members of the party viewed for the first time those interesting bands. The precipitous nature of the walls above the ice made it advisable to get on to the glacier by going in an easterly, or downstream direction, so the afternoon was spent in getting down there and exploring the lower reaches and the terminus. Incidentally, too, a flock of 39 mountain goats, the original Mazamas, was seen, and one or two of the party succeeded in getting within about forty feet of those timid, wary and agile creatures.

Next morning the party explored the glacier upstream as far as the base of the ice falls, traversing over the area of the bands. Strangely, the bands do not appear as prominently when viewed from the cliffs above the glacier as they do in the photographs and, when one is actually walking over their surface, they are still more difficult to discern. The surface generally is smooth, more so in fact than that of many glaciers, and the bands are purely a matter of color, there being no wave or undulation, such as might cast shadows. On the dark areas, the ice, which was devoid of any snow covering, was impregnated with a fine rock dust near the surface, which was absent on the light ones, which difference causes the banded appearance. But how the rock dust comes to be unevenly distributed in so regular a fashion was not evident. One or two possible explanations were suggested, but objections outweighed them, and not even Dr. Gould would commit himself. So the problem remains a matter for further observation, investigation and research.

Another very prominent feature of lower Cowlitz Glacier is its large medial moraine. In appearance it seems to be a large embankment of rock fragments, piled up on the flat surface of the ice, and extending for over two miles down the approximate center line of the ice stream. On closer inspection, however, it proves to be a sinuous triangular prism of ice, covered with only a relatively ~~A~~ thin layer of rocks. It resembles a hugh highway embankment; at its upper end it is only a few feet high, but it attains a height of 80 or 90 feet farther down. At its lower end it merges into the surface moraine, a typical characteristic of the lower reaches of alpine glaciers.

The origin of this formation is due to the difference between the ablation of the ice where it is exposed to the sun's rays and to warm winds, and where it is protected from such by a covering of rocks. It is further evident from the abundance of small streams of water, each carrying more or less rock particles in suspension, which flowed in small gullies over the exposed ice, that erosive agents were also at work. Thus ablation and erosion contribute to reduce the level of the exposed ice, leaving the rock covered area more or less at its original level, the edges of which slough away, giving it its triangular shape.

The fact that this bank which constitutes the medial moraine is a ridge of ice covered with rock, it would seem, successfully disputes the contention maintained by some, that such a moraine consists of rock fragments embedded deeply in the ice, or even reaching to the floor of the glacial valley.

It may be added that the trip was a most enjoyable one throughout. Perfect weather favored the occasion, and the two nights spent in the open were memorable indeed. The sky was crystal clear, there was no moon and the heavens were a truly gorgeous spectacle. To city dwellers, the brilliance and sparkle of the myriads of stars, when seen through the pure mountain air, is always a revelation, as well

LOWER COWLITZ GLACIER - MT. RAINIER*
Photograph taken from an airplane - October 6, 1936.
It was this view which first revealed the presence of the curved bands on this glacier, the only instance of such known to exist in U.S.A. The picture also shows the large medial moraine.
*Photograph by Carl Richards. Cut, Courtesy of The MAZAMAS.

as an inspiration.

The personnel of the party was as follows: Kenneth Phillips, chairman of the Research Committee, was leader. Then, alphabetically, Russell Collins; Dr. Laurence Gould; Mr. and Mrs. Alfred Monner; Donald Onthank, president of the Mazamas; and Carl Richards.

To those who desire to study further the subject of glacial bands and medial moraines, the following references may serve as a guide:

J. D. Forbes: The theory of glaciers. (1859) Edinburgh.
John Tyndall: The glaciers of the Alps. (1896) New York
Bradford Washburn: Morainic bandings of Malaspina and other Alaskan glaciers. Geol. Soc. Am., vol.46, 1935.

## FRAGMENT OF "PORTLAND METEOR" FOUND

Of rare type known as "Howardite"

On the morning of August 30th the Oregonian carried the story of an important find, of which Mr. Pruett had told us in a letter received the previous week. Quotations from that letter follow: "One piece of the Portland Meteor has been found and completely checked on. It was found under a tree by Jerry Best, Route 2, Washougal, Washington, the day after the commotion. He did not send it to me until last week. We were sure it could be nothing else. I sent it on to Dr. Nininger at Denver and have been informed by him - by telegram and later by a letter - that it is a splendid specimen of the rare type known as Howardite. The specimen is about the size of a tennis ball. The outside is a deep black and without the least sign of weathering. It was found on top of the needles under the tree. It had not had the least bit of rain on it so was fresh out of the heavens. The inside is very conglomerate in structure with the general color effect of a very, very light gray. Looks almost white in comparison with the very black fusion crust. We have the crust broken over only a small section. Greenish yellow crystals of olivine are quite numerous throughout. The surface shows the fluting effect caused by the air."

"The University technician, Don Hunter, and a photographer spent yesterday (August 24) along the Columbia. They interviewed Mr. Best and followed up another clue farther east. The latter was just a big rock. They searched in the region of the find but nothing more turned up. Dr. Nininger says there are doubtless large numbers of fragments scattered along many miles of the river."

"Mr. Best presented me with the splendid specimen. I am naturally highly pleased."

Mr. Pruett also enclosed a copy of a letter received by him from Dr. H. H. Nininger, Director of American Meteorite Laboratory at Denver, Colorado, which we quote in part: "You have doubtless received my wire by this time. The specimen which you sent is a genuine meteorite and a very fine specimen. I shall postpone cutting it until a search is made for other pieces, of which there must have many fallen. This meteorite appears to belong to the group of Howardites which are usually quite friable and therefore are largely destroyed in the aerial conflict. What remains usually falls in the form of small fragments nicely glazed over with the black crust. I haven't a doubt that the area sprinkled is fairly large and that if a careful search is made among the residents of that region many good specimens may be collected. A former student of mine lives in Portland and I shall be glad to direct a search if you wish. Of course it is up to you."

"Meanwhile I would like to retain this specimen for further examination, and if plenty of material is found there will be no good reason for cutting this specimen, as this type of meteorite is not improved by cutting to any great extent."

"If the published maps of your survey have been correctly reproduced then we have here a case where the shower probably took place several miles back from the end point of the meteor, just as was the case in the Pasamonte fall which belongs to the same friable group of meteorites."

## THE ROLE OF MINERALS IN THE PRESENT INTERNATIONAL SITUATION.

In recent times three prominent nations have repeatedly announced by word and deed that they are out for a redistribution of the world's raw materials and that there can be no lasting peace until they have accomplished their purpose. Without such redistribution they cannot get very far with their other ambitions. The drive is centered largely on mineral raw materials because these are the basis of industrial power, which is in turn the basis of military power. In modern times military power is coming more and more to be measured in terms of guns, ships, automobiles, and airplanes; in short, industrial products, rather than by manpower alone. Nations favored by possession of mineral supplies necessary for industrialization are the ones which in modern times have taken a commanding position in world affairs.

It happens that much the larger part of the world's mineral resources is under commercial and political control of the democracies, and therefore the defense of democracy and the defense of the mineral position more or less coincide. It is true that democratic countries without important resources have also felt the pressure, but their ultimate defense is bound up with that of the democratic "have" nations.

The control of the larger part of the world's mineral wealth now centers in nations bordering the North Atlantic Basin, where the Industrial Revolution started. The great coal and iron supplies of these nations permitted huge industrial development from which emanated the exploitation of supplementary mineral resources in other parts of the world. A great preponderance of the world's industrial power is concentrated along an axis extending from the Great Lakes in the United States eastward through Central England and West Central Europe, and most of the mineral resources of the world are tributary to this power axis. England and the United States control, politically or commercially, nearly three-fourths of the world production of minerals. Not less important, they control the seas over which the products must pass. Classed with the "have" nations also are France and her colonies, Russia, and several smaller nations.

The position of the nations dominant in the mineral trade is now being seriously challenged by the less privileged nations, including not only the dictator nations, but others like Mexico, Chile, and Brazil, where nationalism is rampant, and the commercial hold of resources by aliens is being weakened.

The challenge is not temporary and not merely due to the whim of individuals. When population pressure outstrips capacity for food production, the only way to maintain or improve the standard of living is to provide means of purchasing food outside through the growth of industry or through the forcible acquisition of more territory. With the rapidly increasing scale of industry, the demand for the necessary raw materials becomes concentrated on the few large mineral sources capable of meeting the new scale. Hence the growing dependence of the deficient nations on more distant sources of supply and the growing necessity of controlled access to them in peace and war. Partial success in obtaining supplies merely builds up the demand for more, and there is no guarantee that the process would stop even with complete equalization. Opportunity to purchase the necessary supplies during peace time is not regarded by the "have not" nations as sufficient protection to their national interests, partly because the terms are dictated by the more fortunate nations, partly because the means of purchase are limited, but very largely because the supplies could be shut off during war or during economic boycotts.

It is not easy for us living in a nation abundantly supplied with mineral resources to realize the urgency of the demand by the less privileged nations, but if we were put in the same position the cause doubtless would seem a more reasonable one.

The challenge of the "have-not" nations has taken various forms. First is the effort to find and develop domestic supplies and to find processes which will make domestic supplies of submarginal grades available. All possible substitutes are used for minerals in deficient supply. Such efforts have gone far enough to demonstrate their essential futility. Their cost is excessive, and they have contributed to exchange difficulties which lessen the capacity to pay for raw materials still needed from abroad. The inevitable consequence is the pressure for control of more supplies outside through acquisition of territory. Parallel with the drive for more territory is the drive for commercial control of minerals, principally by the method of barter, and also by blocked exchange and bilateral treaties.

For illustration, the net result of the autarchic effort in Germany still leaves her dependent largely, in some cases wholly, on foreign sources for her requirements of at least 15 industrial minerals. The deficiencies in iron, oil, and copper are the most critical because of the volume required. The domestic production of these minerals is being increased, but at excessive cost, and at best by 1940 Germany will still be dependent on foreign sources for 50% of its iron and 50% of its oil, and 75% of its copper.

Offsetting the gains Germany has made in developments at home are the growing costs and difficulties of securing the minerals still needed from foreign sources, owing to the growing handicap of exchange.

If the German domestic effort toward self-sufficiency in minerals promised real success, there would be less pressure for the return of colonies, or for the acquisition of political control of other territory, or for ruinously expensive barter. It is just because it is not succeeding, and is at the same time narrowing access to the world raw material markets, that Germany is intensifying her efforts to secure raw materials, by one means or another, outside of her own boundaries.

If time permitted, much the same story could be told of Japan and Italy.

## POSSIBLE SOLUTION.

How shall the problem be met?

Whatever theoretical merit there may be in the policy of appeasement, an examination of the actual possibilities seems to make this course impossible from the standpoint of practical politics. The cession of all of the colonies would not accomplish much for the reason that the sum total of their mineral resources, which have been carefully listed, is far short of the requirements of the "have-not" nations. The acquirement of Abyssinia, Austria, Czecho-Slovakia, Manchuria, and large parts of China have done little to meet the mineral requirements of the "have-not" nations. Real appeasement by this method would require the ceding of considerable parts of self-governing nations, including English-speaking, French, and Russian domains, as well as supplies controlled commercially by the English-speaking people outside their borders, notably in South America Still further, it would mean division of control of the sea to assure continuity of movements from distant territories. In short, the scale of the transfer is unthinkable from a political standpoint.

Much is said about the possibility of appeasement through elimination of trade barriers and restoration of free circulation of raw materials between countries, which is the goal of the Hull reciprocity treaties. In essence, however, this is merely an effort to restore the old status in which the balance of power is retained by the "have" nations by virtue of their possession of the larger share of the world's mineral resources, and it leaves the other nations in their old inferior position. In a recent speech, Dr. Hjalmar Schacht, former president of the Reichsbank, called this procedure "the recipe of the well-to-do". We like it, of course, it is our story, but other nations emphatically do not and they are out to supersede it by barter methods.

Ultimately appeasement may have to include some sort of collective guarantee of equality of access to raw materials. This would require the public recognition by the "have" nations of the concept that their fortunate raw material position is one of trust, to be administered not only for their own material advancement but for that of others, thereby lessening causes of world friction. The practical working out of this concept is enormously difficult. It would require a degree of objective thinking and of correlation of activities at home and abroad which is far beyond anything yet attempted or regarded as practical. Considerations of temporary and local self-interest will certainly postpone the attainment of this Utopian goal too long to be of material help in solving the immediate problem.

My conclusion, therefore, reached with reluctance, is that appeasement for the present will fail and that the privileged position of the "have" nations will greatly stiffen the defense of our material position. The military preparation for this defense is already well under way. The preparation of defense against economic penetration is still sadly in arrears but will doubtless be formulated when and as forced by the course of events. The application of mineral embargoes to disturbing nations is not an unlikely outcome.

It seems probable for political reasons that the necessary degree of cooperation between the "have" nations for mutual defense will not be reached until further inroads have been made on their mineral domain at home and abroad; in other words, that cooperation will be defensive and not the result of an affirmative effort to organize in advance in the hope of limiting future conflict and maintaining a certain amount of law and order by force. The ultimate problem of finding some way to administer the world's mineral resources from the standpoint of world welfare and peace remains for the future.

## THE POSITION OF THE UNITED STATES.

Now a word as to the special position of the United States, the world's largest producer, the largest consumer, and the largest distributor of minerals and their products. The frontiers of our mineral industries, including sources and markets, extend to nearly all parts of the world. It is part of our domain that is ultimately at stake in any struggle for the redistribution of mineral resources. Even the hazard involved in any attempt to maintain neutral shipping rights in this field may be enough to involve us in the struggle.

The self-sufficiency of the United States in mineral raw materials is relative, not absolute. If all our imports were cut off, our industry would indeed return to the "horse and buggy days". We could build neither an automobile nor a modern battleship exclusively from our own materials. Our standard of living is definitely threatened, and we are likely to resist the change, even though recognizing the appeal of a policy of isolation as an alternative to war. Our defense will certainly extend to our important mineral interests outside of our borders in North and South America, some of which are already under attack.

The United States shares with other democratic nations both the immediate problem of defense of its material position and the longer-range problem of alleviating the raw material grievances of the "have-not" nations in the interest of world welfare and peace.

- C. K. Leith

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Business Address

________________ ________________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ________________
________________________________

Sponsored by: ________________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

________________________
Signature

## ANNOUNCEMENTS

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Speaker: Mr. Frank Kochis, Designing Engineer, U.S.Engineers.
This will be a timely discussion of this interesting subject in view of the official trip to the sites of some of the projected structures which is planned by the Society the following week. Mr.Kochis has an intimate acquaintance with both field conditions and the theories of principles involved, so this is a fine opportunity for those who cannot take the trip to acquaint themselves with the nature of this big project. To those who plan to go, hearing this lecture will add much to what they can gain from the visit. It will be illustrated by lantern slides.

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Sunday Oct.28 Date not filled.

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**********

We are quoting in part letter just received from Mrs. Griswold, who is now located at Fairbanks, Alaska: "Alaska is a glorious place and I am attaching a copy of a news item that was in last week's paper, on my return from crossing the Arctic Circle and visiting Fort Yukon."

"Here you certainly get first hand information about placer mining and also hard rock or quartz mines as they call them. Some time when I have a little more time I will write a short sketch of my trip from Seattle to Ketchikan, where I stayed a month and then on to Fairbanks.

"I have learned to use canned cream as real cream costs only $1.00 a pint. Other things are priced accordingly, but I just love Alaska. I am office manager for Montgomery Ward's, and meet all the sour doughs and miners. The first gold nugget I had in my hand weighed 10-3/4 ounces on my mail scales, valued at $300 or more. I have been given specimens of scheelite, jamesonite, bismuthite, and quartz with gold thru it so large you didn't need a glass to see it.

"I think of the Thursday luncheons quite often and wish you could all come to Alaska some time and enjoy the wonders that I am seeing here."

The following is a clipping from the newspaper mentioned in Mrs. Griswold's letter:

"Aero-Geologist.

Pictures and diagrams from her geology text book leapt to actuality when she scanned the terrain near the Yukon from the air, said Beth Griswold upon her return from a round trip flight to Fort Yukon. She described the aerial vista as 'grand and imposing with lakes spotting the tundras like polka dots, and the Yukon lazily meandering its winding course.' The flight was made with Pilot Dick Hawley of Pilack Flying Service. Also passengers on the flight were Mrs. Dick Hawley and two tourists, Dorothy Greenleaf and V. Elizabeth Fischer."

We will look forward with interest to Mrs. Griswold's impressions of things geological and otherwise in the Alaska country.

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Mr. A. D. Vance announced at the Thursday noonday luncheon that he had joined the Grand-daddy's Club.

Mr. and Mrs. Carl Richards are on a vacation in southern Oregon, with a possible trip to the San Francisco Fair before returning home.

In a recent letter received from Dr. Hodge he said: "I have been busy placer mining all summer, have reduced my weight to my 19-year old stage and am again as hard as nails and brown as a berry".

Your editor and business manager missed the Bend meeting on account of car trouble en route, but did make Madras where we spent Saturday night and enjoyed an early half hour with Turk Irving Sunday morning before starting homeward. Their lovely flower garden and courteous welcome at that early hour were very refreshing to disappointed travellers.

**********

Taylor, Frank Bursley

CORRELATION OF TERTIARY MOUNTAIN RANGES IN THE DIFFERENT CONTINENTS.

Geological Society of America, Bulletin no.40, pages 83-84-85, 1929.

In North America, three main ranges or systems of ranges seem well defined: (1) The Rocky Mountains, (2) The Cascade Mountains, including the Sierra Nevada, and (3) the Coast ranges. All three take northwesterly courses in the western part of the continent. The Rocky Mountains are the farthest inland and the oldest. They are an older range, rejuvenated by uplift and moderate folding mainly in the late Cretaceous and early Tertiary. The Cascade Range lies nearer to the Pacific Coast and is of younger age. The closely set Coast ranges lie next to the ocean throughout, forming a chain of islands between Puget Sound and Mount Fairweather. They are the youngest of the three and are still actively in the making. On account of the simplicity of their relations, the Tertiary ranges of North America are taken as the basis of correlation.

Alaska, west of the great mountain angle, belongs structurally to Asia. At this angle all three ranges turn to westerly courses, the Rockies running west as the Endicott Range to Bering Strait. The Cascade Range, swinging in the wide curve of the Alaskan Mountains, finds continuation in the great festoon arc of the Aleutian Islands. The Coast Range turns to the southwest in the Chugach Mountains and continues in the Afognak, Kodiak, and Trinity Islands. Thus, the Rockies and the Cascade may be followed into Asia with little likelihood of error. The Rockies continue first in the Stanovoi Mountains, and farther on in the Great Khingan. Bending to the west through smaller ranges, it reappears in the Tian Shan, and from the Pamirs it appears to run on in the Kindu Kush, the main line trending toward the Caucasus, another line bending around the south end of the Caspian Sea.

The Cascade Range, so clearly continued in the Aleutian arc, seems to extend through the whole line of festoons to Luzon, in the Philippines. The main line seems to pass on through Palawan into Borneo. Farther on it follows the Malay Peninsula northward and seems to continue in one of the back ranges of the Himalaya system. Beyond this its course to the west seems uncertain, at least as far as southeastern Persia. Farther west its course seems fairly clear through the Zagros and Taurus Mountains, through the Cyclades Islands, and through the Pindus Mountains to the Julian Alps, beyond which it appears to merge into the main Alpine arc. Farther west it is not yet clearly identified, unless it reappears in the Sierra Nevada-Balearic Islands line in Spain.

Trending to the southwest, the Coast Range plunges under the ocean at the Trinity Islands. No feature on the ocean floor suggests its course beyond, but if the nine major earthquake epicenters recorded by Milne, mapped by Reeds, and recently discussed by the writer* mean what they seem to mean they suggest strongly a new or incipient arc of the Coast Range now forming on the ocean floor. Another line of epicenters runs south to the Marshall Islands about on the west limb of the new arc produced. In the Malay earthlobe, the Andaman-Java-Ceram arc appears to correspond with our Coast Range. According to Suess, the main Himalaya range stands as Number 1 in front of the Andaman-Java arc which, as Number 2, laps around the east end of the Himalayas, in which case the Mentavi-Timor arc may also be part of Number 1.

* Bull. Geol.Soc.Am., vol.39, 1928.

It seems probable, therefore, that the main range of the Himalayas and the Mentavi-Timor arc are younger than the Coast Range in North America.

Since the whole Tertiary Mountain belt of the earth is substantially a unit in diastrophism, it seems fairly safe to correlate the most northerly of the Tertiary ranges - the Hindu Kush, Caucasus, Carpathians, Swiss Alps, and Pyrenees - with the Rocky Mountains of North America. South of Japan, the Mariannas-Pelew arc is evidently later than the Cascade range, but older than the Coast range.

The cause for Australia seems simple. The mountains of the eastern border seem to correlate with our Rockies - an older range rejuvenated in the late Cretaceous and early Tertiary. The arc of New Guinea, New Caledonia, and New Zealand appears clearly to be of Cascadian age, while the arc of the Solomon Islands, the New Hebrides, et cetera, is intermediate, like the Mariannas-Pelew arc in the northern hemisphere. Finally, island lines running southeast and east from the Marshall Islands may possibly correspond to the incipient Coast Range arc in the Northern Pacific.

South America, Middle America, and the West Indies appear to present the most difficult problems. The West Indies appear to belong structurally mainly to South America, Middle America mainly to North America. The Andes, like the Alps in Europe, appear to combine in one range, or in several very closely appressed ranges, the three Tertiary diastrophic episodes seen in North America.

The correlations here suggested are based mainly on the physical continuity of the ranges, as of the Rocky to the Stanovoi Mountains, and of the Cascade Range through the Aleutian arc to the other festoon arcs of eastern Asia. In other cases some dependence is placed on the principle of corresponding order in similar series, as when Australia is compared to eastern Asia. If these correlations are sound they show genetic relationships and a systematic plan in the whole Tertiary Mountain system of the earth.

- R.C.T.

**********

GEOLOGY AND THE SEARCH FOR PETROLEUM.

The experience of mankind has shown that useful minerals are distributed throughout the earth with great irregularity. Some regions may have, for example, rich deposits of the precious metals but may be poorly supplied with coal and oil. For this reason, when man, in the course of his cultural development, found that some mineral was of value, it was generally necessary for him to search diligently for places where it could be found. Early man, of course, found such minerals and rocks as he had learned to use on or near the surface. With further experience he learned that more valuable deposits often lay concealed beneath; he dug pits and shafts to extract them; and thus the art of mining had its beginning.

In the finding of minerals, we moderns have become very skillful. In the more accessible parts of the globe the surface has been thoroughly prospected, and this has led to the discovery and development of many important mines. But the supplies of minerals obtained by such exploration have not been sufficient for man's industrial requirements, and the search has been extended to many areas where the desired minerals cannot be seen on the surface and where their presence in the earth beneath can only be determined by extensive and costly investigation.

What has just been said with reference to minerals in general is especially true of petroleum. This mineral is so volatile that such small quantities as reach the surface by seepage from beneath generally do not accumulate but either evaporate or are carried away by running water, but in some regions, such as Mexico and Mesopotamia, where the oil is heavier, the liquid portion evaporates and leaves a solid residue, asphalt. In places where petroleum seepages and asphalt deposits are found, these materials have, since the dawn of history, been used in religious ceremonials, for burning in lamps, for medicine, and in the construction of ships and buildings. Such uses were quite local, and it is only within the last 75 years that petroleum has become an important article of commerce.

Up to the middle of the last century artificial light was obtained chiefly by the use of such animal fats as tallow and whale oil. But with the increasing use in industry of machinery requiring lubrication and with the general advance in wealth and culture which sought more and better lighting, the supply of such fats became inadequate, and their prices were greatly increased. An economic incentive was thus created to find some other substance that might fulfill these requirements. In England the need was met by the discovery that oil could be distilled from certain coals, and coal-oil came into existence. And, in America, George H. Bissell, having seen in the laboratory at Dartmouth College a sample of "rock-oil" from Pennsylvania, visited Oil City and acquired a tract of land containing oil springs. He submitted samples of the oil to Professor Silliman of Yale College, who reported that it was a valuable illuminant. Bissell returned to Pennsylvania and financed the drilling of the Drake Well on Oil Creek near Titusville. Thus 80 years ago was born the American oil industry, and a new industrial era - "The Age of Petroleum" - came upon the scene.

During the next 20 years nearly 25,000 oil wells were drilled in the Appalachian region. Throughout this early period, the oil operators located their wells from such indications as the presence of oil in springs or along water courses, the trend of the country, and the supposed courses of underground streams of oil. This search for oil was not perceptibly influenced by such views as the scientists of that time held as to the origin and occurrence of petroleum. However, the attention of geologists was immediately attracted to this new and interesting mineral deposit, and some reasonably accurate observations were made on the manner in which the oil deposits had accumulated. Professor Henry D. Rogers had published, in 1858, his report on the Geological Survey of the State of Pennsylvania. He had noted that the rocks in western Pennsylvania were folded into a succession of waves, the crests of which were called "anticlines". Soon after the Drake Well was completed, Rogers called attention to the fact that he had mapped such an anticline along Oil Creek, and he attributed the accumulation of oil in that area to the influence of this structure. Other geologists of the period - Andrews, Dana, and Hunt - also recognized that geologic structure was the controlling factor in the location of oil fields; in 1865, Hunt clearly stated the basic conditions necessary to oil accumulation: the presence in the rocks of organic materials from which oil could be formed; openings in the rock which would prevent the oil from escaping; and proper structural conditions, such as anticlinal folds. Seventy years of subsequent geological research have only strengthened these original principles.

Nearly 20 years were to pass, however, before any effort was made to apply accumulated geologic knowledge to the search for new deposits of oil and gas. The number of professional geologists in the United States was very small, and most of these were engaged in teaching in eastern colleges. It is unlikely that they exercised any appreciable influence on the finding of oil and gas fields prior to 1880. In 1883, I. C. White, who had been a geologist on the Pennsylvania State Survey, was employed by commercial interests in Pittsburgh to locate deposits of natural gas. He successfully applied the anticlinal theory, as it was then called, to the location of gas deposits and in prospecting for oil. He was the first geologist to specialize in oil and gas and became the foremost oil geologist of his time. Up to near the end of the last century, however, oil fields were abundant and were found at comparatively shallow depths, so that there was very little incentive to use scientific methods in searching for oil deposits. The employment of professional petroleum geologists commenced in California in 1897, on the Gulf Coast about 1900, in Mexico in 1909, and in Oklahoma in 1913. Today there are about 5000 petroleum geologists in the United States, with probably 2000 more working in other countries.

One might ask, since petroleum is found by drilling wells, just who do we need geologists?

It is true of course that the sands and other porous rocks which contain the oil can actually be found only by drilling wells. However, the important point is to drill the wells in places where there is a reasonable expectation that oil will be present. Wells drilled at random have a much smaller chance of success today than when the industry was young. Just as in a railway system, the responsibility for the movement of trains and for keeping the line clear for the engineers is placed upon the dispatcher, so in the oil industry the responsibility rests on the geologist to select locations for wells where the conditions are favorable to the presence of oil and to discourage drilling in areas where there is little chance of success.

Everyone knows that there are large areas both in the United States and elsewhere throughout the earth where the rocks are of such a character that they may contain commercial deposits of petroleum only under highly exceptional conditions. Granite, marble, and slate are examples of rocks which have been formed in such a way that any petroleum which they once may have contained has been driven out of them. These and other rocks have such great density that there is no place for oil in them. Geologists are now completely in agreement that petroleum is of organic origin - that is, that it has been derived from the animal and plant life of the far-distant past. Therefore, rocks which were formed under such conditions that they had little or no organic content are much less likely to contain petroleum than those which are rich in that respect. The great thickness of red rocks which form such conspicuous features of our western landscape are, for example, very poor risks as sources of petroleum for, when they were deposited, very little organic matter was included in them.

But after such unfavorable areas have been eliminated from consideration the search narrows down to finding localities where the underground conditions are favorable for the accumulation of oil. The layers of rock that in past ages were laid down in the bottom of the sea have, in the earth's later history, been subjected to the action of titanic forces. As a result, the strata have been uplifted and depressed, folded and fractured, so that structural conditions in great variety have been created. Areas in which the rocks are in an attitude suitable for retaining oil are conveniently termed "structures" by the oil industry. These may range from gentle folds, such as the early geologists found in western Pennsylvania, to the spectacular domes of the Gulf Coast where oil has accumulated on the top of or around the sides of immense bodies of salt which have been forced upward under tremendous pressure through many thousand feet of overlying rocks.

It has been found that, in rocks which are sufficiently porous to act as reservoirs, the oil and gas tend to accumulate in the areas which are structurally highest. Where water is also present in the reservoir, it occupies the structurally lower portions. Hence, "highs" are sought by the geologist as most favorable to the presence of commercial oil deposits.

Up to within a decade or two the petroleum geologist, in searching for oil structures, carefully studied and mapped the rocks exposed on the surface. But, as time went on, and the more evident structures had all been found, the geologist almost despairingly searched the country for even slight structural clues that might suggest the presence of other concealed oil fields. Then within a few years there were placed in his hands several new and ingenious weapons with which he might make a fresh attack on the strongholds of the earth. Modern science has placed at the disposal of the physician such instruments as the cardiograph and the X-ray machine whereby he may obtain accurate information concerning the functioning of organs within the human body. In a similar way, other branches of science have contributed to the advancement of structural geology and to the ability of the geologist to explore the depths of the earth. The physicist has designed instruments of great delicacy and precision by which slight differences in the attraction of gravity and in the earth's magnetic field may be measured. The electrical engineer and the physicist have together perfected that marvelous instrument, the exploration seismograph, whereby the structure thousands of feet below the surface can be mapped by the use of sound waves created by charges of explosives detonated near the surface. These waves pass downward into the earth until they reach some layer of rock which echoes or reflects them back to the surface. The time which it takes for the waves to travel down and back is accurately measured, and the depth to the rock layer can thus be computed. By thus measuring the depth to many points on a rock layer, a picture of the structure at great depths is obtained, and the localities which are structurally high can then be selected.

By lowering an electric conductor into wells in process of being drilled, a highly detailed and faithful picture is obtained of the succession of the rocks through which the well has penetrated, as well as vital information as to which particular beds may contain oil and gas. The chemist is also aiding in the search for oil fields by his ability to detect by very accurate methods of analysis the distribution in the soil of minute quantities of substances which are significant of the presence of petroleum beneath. Another specialized branch of geology has also been of great assistance. The materials which are removed in drilling wells are carefully scrutinized by the paleontologist for the presence of small fossils which may accurately indicate the geologic age of the beds penetrated. Thus through the application of techniques derived from several branches of science the geologist is now enabled to find oil structures which only a few years ago would have been completely beyond his reach.

As a result of this increasing skill in the finding of favorable structures, of the invention of new types of drilling equipment, and by improvements in the art of drilling wells, the production of petroleum has fully kept pace with the increasing demands of industry and transportation. The amount of oil which is present in the known oil fields of this country would, at the present rate of consumption, be sufficient for only 12 years if no more oil were discovered. If our future needs are to be met from domestic sources, new oil fields, with reserves of oil equal to or exceeding our present annual consumption, must be discovered each year. The finding of two or three hundred new oil fields annually is no light task and requires constantly increasing technical skill and more thorough understanding of the scientific principles which control the origin and accumulation of petroleum.

Petroleum geologists have faith in their continuing ability to master these problems and to do their part toward the maintenance of that vital element in our social and economic structure - the supply of crude petroleum.

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The above article, "Geology and the Search for Petroleum", by William B. Heroy, is the fourth in the series of radio addresses presented by The Geological Society of America under the theme "Frontiers of Geology".

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METEORITE SPECIMENS ADDED TO THE SMITHSONIAN INSTITUTE COLLECTION DURING 1939.

Forty-one meteorite specimens have been added to the collections of the Smithsonian Institution during the past 12 months. They include the second largest ever found in the United States, parts of several which were seen to fall, and several of very unusual mineralogical structure.

Of the latter, perhaps the most unusual was an ataxite, picked up in a field near Soper, Okla. It is a lump of iron which has no discernible structure. The molecules of the metal seem to be just crushed together into an orderless mass under conditions which cannot be duplicated on earth.

The second largest yet found in the United States as a single mass, now on exhibit at the San Francisco Fair, was found by a deer hunter near Goose Lake, Calif., and turned over to the U. S. Forest Service. It weighs 2,573 pounds.

Rare types of iron from the heavens were obtained from Argentina and Chile, and several specimens came from the newly discovered Box Hole crater in Central Australia.

Perhaps the greatest interest attaches to those actually seen to hit the earth. One of these just added to the national collection is the so-called Seneca Township meteorite, found in 1923 but believed to be one seen falling in 1903 on the farm of Sidney a Perry in Lenawee County, Michigan.

Mr. Perry and his two brothers were standing near the farmhouse about an hour before sunset, with the black clouds of a thunderstorm in the west. As they were looking at the sky a brilliant fireball suddenly appeared against the black background of clouds. At first this fireball seemed to be coming directly toward them but as it approached it seemed to move more and more toward the south. Its course was described as parallel to the horizon and so low that it seemed to skip the tops of trees. It gave out a brilliant white light at first, throwing off sparks. Then the color changed to red which grew dimmer and dimmer until it was no longer visible.

Altogether this meteorite was visible for two or three seconds. As it disappeared a "rushing sound with a hiss" was heard which seemed to end in a hayfield about 150 yards from where the men were standing. At the same instant a sound was heard like that of something hitting the earth. They looked for it the next morning, but because of the uncut hay the search was difficult and nothing was found. Twenty years later, in almost the precise spot, it was found by Mr. Perry's son-in-law while cultivating corn.

The second of these specimens from observed falls is the so-called Cherokee Springs meteorite, seen to strike the ground in two parts northeast of Spartanburg, S.C., on July 1, 1933. Several observers saw the fall. It was described graphically by G. E. Mayfield, proprietor of a store at Cherokee Springs:

"I was sitting on the porch of the store talking with Arthur Swafford. We heard a noise like an airplane, and for 2 or 3 minutes it seemed to be getting nearer. Finally we went to the edge of the porch to look for the plane. On looking for it to come into view I caught sight of the meteorite just as it struck the limb of a hickory tree to the rear of the Methodist church. As soon as it struck the sound died away. It went into the ground, which was sandy, about 15 to 18 inches, then bounced out and was lying 15 inches from the hole it made."

"I hurried to the spot and picked it up but found it was so hot I had to change it from one hand to the other to keep it from hurting my hands. It fell in a grove of trees. It struck a hickory limb about three quarters of an inch in diameter and cut it off as if cut by shears."

This was the larger mass, weighing about 12 pounds. The smaller one was observed at even closer range. It fell on the farm of E. P. Cash near Chesnee, SC., Mrs. Cash being only about 50 feet from where it struck.

Both of these meteorites came to the Smithsonian from Stuart H. Perry, Adrian, Mich, publisher.

The national collection of these stones from the sky is being enlarged rapidly, says Dr. William F. Foshag, curator of mineralogy, by specimens found by individuals - mostly of small size - throughout the country but especially in the Middle West.

- Smithsonian Institute,
September 3rd, 1939.

**********

Preliminary announcement of courses at Portland Extension Center just came to hand. We note the following in Geology section:

"Edwin T. Hodge, Ph.D., Professor of Economic Geology, Oregon State College. G 201p, 202p. General Geology. Three terms, Thursday, 7:15, room 110."
First class, Thursday, October 5.

In the Bacteriology section, Bac 350p. Public Health. Fall term, Tuesday 7:15 room 204. Dr. Weinzirl. First class, Tuesday October 3.

**********

The American Museum of Natural History, New York, has been added to our mailing list, at their request. We are sending them a complete file of our Geological News-Letters. In return they have sent all papers on geology and paleontology which have appeared in their series from 1936 to date. This amounted to 47 papers, a very nice addition to our library.

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GEOLOGICAL NEWS LETTER

VOL. 5 NO. 19 PORTLAND, OREGON Oct.10 1939

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Portland, Oregon

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MEMBERSHIP APPLICATION

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ____________

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

______________________________
Address

______________________________
Business Address

______________________________ ______________________________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ______________________________
______________________________

Sponsored by: ______________________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________________
Signature

ANNOUNCEMENTS

Lectures

Friday Oct.13 — Dr.Hodge, who was to have lectured to us on this date, is unavoidedly prevented from doing so, but will find a date later in the season. In his stead, Mr. Alfred Monner will take us on a tour of some of the geologic and scenic areas he has visited and which he has captured in the form of excellent kodachrome slides. He will show pictures of Central Oregon and the Steens Mountain country; also those he took during the recent Mazama Research Committee trip to Cowlitz Glacier on Mt.Rainier. Mr.Monner is no stranger to us; his previous lecture is recalled as one of exceptional interest. On this occasion he promised to go one better!

Friday Oct.27 — Subject: HUNTING FLUORESCENCE IN MEXICO.
Speaker: Dr. Courtland Booth
Dr. Booth made an extensive trip thru Mexico this summer and he will present to us the results of his geologic observations by word, by picture and by an exhibit of specimens.

TRIPS.

Sunday Oct.15 — Mr. Leo Simon will lead an autumn foliage trip which will also include plenty of geology. So many favorable comments were heard after a similar trip last year, that it has been decided to make this an annual affair.

Sunday Oct.29 — Mr. Bruce Schminky will lead a trip into the Boring section, to study some of the weathered gravels found in that vicinity.

**********

It has been brought to the attention of the Editorial staff that some of our reporters have been negligent in reporting some items of interest to all- one being a wedding last spring. Miss Ruth E. Hickman and Robert M. Campbell were married April 17, 1939. The Society extends best wishes and congratulations at this late date.

At three meetings during the past week Mr. O. E. Stanley showed colored slides taken on his vacation trip to Mexico, the Grand Canyon, Boulder Dam, and Bryce and Zion canyons. First showing was at a luncheon meeting of Professional Engineers of Oregon Wednesday Sept.20. Second showing at meeting of the Women's Auxiliary of City of Portland Employees Beneficiary Association, Monday evening Sept.25. Third showing was to the Mazamas Wednesday evening Sept. 27th.

Friday evening, September 22nd, Mr. Thomas A. Carney at a meeting of the Oregon Agate and Mineral Society, lectured on his recent eastern trip and displayed some of the material he had collected.

Saturday evening, September 23rd, Mr. Leo F. Simon lectured to the Multnomah Garden Club on Wild Flowers adapted to the gardens and birds of the Portland area.

**********

In Dean Collins' column "Among our Neighbors", on editorial page of the Oregon Journal, in the issue of September 20, our fellow member Leo F. Simon and family are given a very nice write-up as being past masters in the art of baby-bird feeding.

Through courtesy of Mr. H. N. Wallace, 2529 NE 59th Avenue, the following books and bulletins have been added to our library:

U.S.Geological Survey - 22nd Annual Report - 1900-1901.
- Part I - Directors' report and a paper on Asphalt & Bituminous Rock Deposits.
- Part III - Coal-Oil and Cement.
- Part IV - Hydrography.

The Mineral Resources of Oregon
- Vol.1 - No.5, 6, 7 and 8.
- Vol.2 - No. 2, 4.
- Vol.3 - No. 1

**********

New Member

Miss Mary Ada Henley 2015 SE Pine St. EA 1475.

Change of Address

| | |
|---|---|
| Miss Helen C. Brady | 2003 NE 19th Ave. GA 4155 |
| J. M. Weber | Thomas Edison High School, 220 Beach St. |
| Mrs.Elizabeth S. Griswold, | Fairbanks, Alaska, c/o Montgomery Ward & Company. |
| Miss Eva Catlin | 5020 7th Ave. NE., Seattle, Wash. |
| Dr.& Mrs.D.B.Lawrence, | Dept.of Botany,University of Minnesota,Minneapolis,Minn. |
| H. B. Wood | 1243 High St., Eugene, Oregon. |

***********

That "truth is stranger than fiction" would seem to be exemplified in the accounts of the meteor which so startled the people of this locality on the morning of July 2nd. Now, in the following story from Prof.Pruett's skillful pen, it takes on exciting and dramatic qualities as well.

Once more we are indebted to Prof.Pruett for a valuable contribution. It is hoped that it may be the means of spurring our members to a search for tangible evidence of the meteor and that they may be successful in that, as they were in accumulating the less tangible, but highly important, evidence embodied in the stories of eye witnesses of the meteor's spectacular flight.

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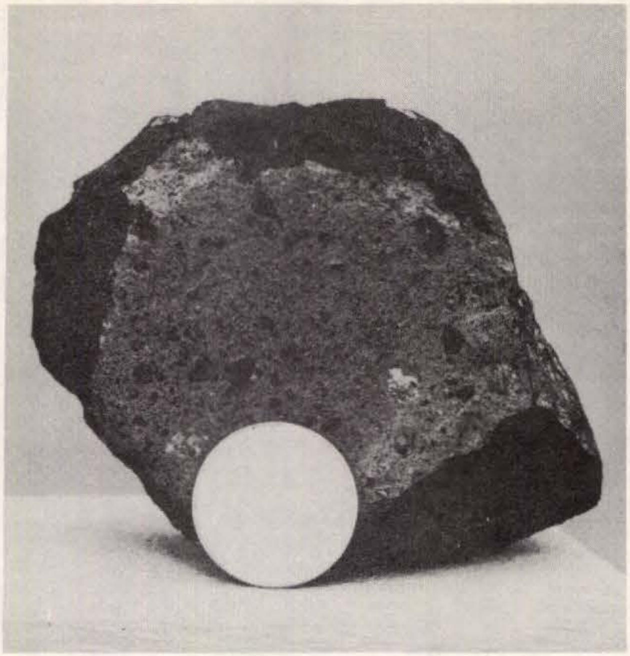
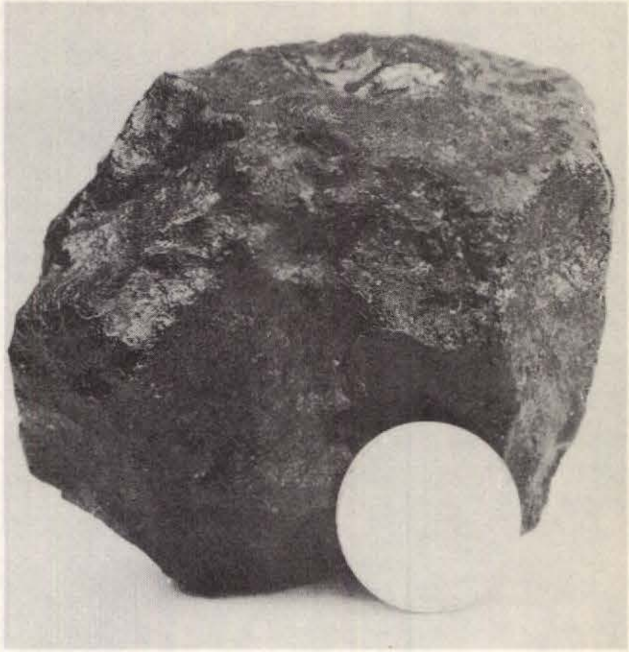
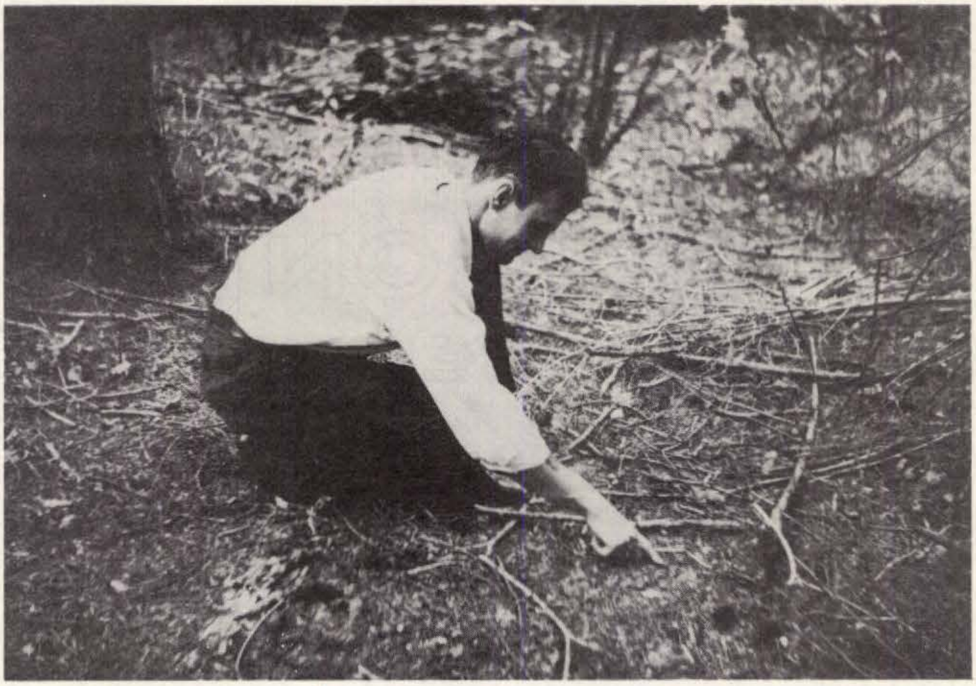


Cut face of the Washougal Meteorite
showing light gray interior.
(Size indicated by dime.)



Washougal Meteorite showing unbroken
black fusion crust.
(Size indicated by dime.)



Jerry E. Best, finder of the Washougal Meteorite,
pointing to the spot where he picked it up. The
black spot is not the place; the real place does
not show any indentation in the picture.
(Bruce Nidever photo)

# THE WASHOUGAL METEORITE

By J. HUGH PRUETT
Pacific Director, American Meteor Society.

Since 1932 when the American Meteor Society appointed a regional director for its activities in the Far West, hundreds of rock samples - probably far over a thousand - have been received at the University of Oregon from hopeful finders who believed they had discovered genuine meteorites. Large numbers of these specimens were said to have been seen to fall. With the kind assistance of Dr. Warren D. Smith, University geologist, all have been carefully examined, and any that have shown the least resemblance to celestial visitors have been forwarded to Dr. H. H. Nininger of Denver, the noted authority on meteorites.

Until August 1939 not a single meteorite had been picked out of the continuously increasing pile of quartz, granite, shale, basalt clinkers, and other things too numerous to mention. Two years ago Dr.Smith confidently predicted that "if patient work continues, some day we shall be rewarded by the discovery of a genuine meteorite."

On the afternoon of August 18, 1939, a small box came through the mail. Don Hunter, University technician and member of the Society for Research on Meteorites, remarked - as he often before had done - "Another 'meteorite' has arrived." After some time the box was unwrapped. Out came a black, varnished-appearing stone about the size of a tennis ball. The surface had a rippled effect, and the many corners were nicely smoothed.

It attracted almost instant attention. It was absolutely different from anything previously received. A few small breaks in the surface crust revealed a light gray interior of very conglomerate structure. Mixed in the general mass were numerous black grains and a good supply of yellowish green crystals.

The letter accompany the curious rock was opened. It was from Jerry E. Best, Route 2, Washougal, Washington, and said in part:

"I am sending what I believe to be a piece of the meteor that passed over here on July 2. I would have sent it sooner except that I did not know your address. . . Next morning (July 3) after listening to the radio reports, I went to check up. Cutting up over the ridge through a small grove in back of the house, I found the piece of meteor (?). The broken spots on the outer covering were caused by myself and friends to see what it was. It couldn't have had much speed when it landed because of the condition of the duff under the trees. Even right after picking it up it was hard to tell where it had been lying. I even climbed most of the trees around the spot to see if there were any broken twigs in the upper branches.

"You are welcome to the object if it is of any use to you, and you can assuago my curiosity if you will be so kind as to let me know what it is. One lady I know claims it's a piece of concrete dipped in tar."

After reading Mr. Best's letter, it was easy to believe that his suspicions were well founded. Tests were at once started on the specimen. Various paint removing chemicals were applied to the black crust. They produced not the least effect. A small piece of the crust was broken off and held in a hot flame. Paint or tar would at once have succumbed to the ordeal of fire, but not the sample under test. Not the least disintegration took place. It was right at home in intense heat.

It was found that the rock as a whole was slightly magnetic, and that small metallic appearing grains clung readily to a magnet. The yellowish green crystals certainly looked just like olivine, a chemical commonly found in meteorites. A preliminary test for nickel gave negative results, but it was recalled that about half a dozen meteorites are known which contain no easily detected amounts of this metal. The lack of sharp corners pointed definitely to rounding by fusion.

The next day the sample was shown to Dr. Smith. After examining it he said, "If that is not a meteorite, it is surely a good imitation. I believe it should be sent to Dr. Nininger at once." It was mailed a few minutes later.

August 23rd, a Western Union message arrived from Dr. Nininger:

"Specimen genuine meteorite. No doubt many specimens have been picked up in vicinity . . . . letter follows".

When the letter arrived it read:

"The specimen you sent is a meteorite and a very fine specimen. I shall postpone cutting it until a search is made for other pieces, of which there must have many fallen. This meteorite appears to belong to the group of Howardites which are quite friable and are therefore largely destroyed in the aerial conflict. What remains usually falls in the form of small fragments nicely glazed over with black crust. I haven't a doubt that the area sprinkled is fairly large and that if a careful search is made among all the residents of that region many good specimens may be collected. . . .

"If the published maps of your survey have been correctly reproduced, then we have here a case where the showering probably took place several miles back from the end point of the meteor, just as in the case of the Pasamonte fall which belongs to the same friable group of meteorites."

Accompanying the letter was a copy of a note sent to Dr. Frederick C. Leonard of the University of California at Los Angeles. Further information is received from this:

". . . This meteorite appears to resemble closely the fall of March 24, 1933, at Pasamonte, New Mexico, and that of August 8, 1933, in Sioux County, Nebraska. It is an almost complete individual of irregular form, encased in beautiful, glossy black covering of glass which is quite thin. Its form indicates a thorough breaking up of the parent mass, this specimen appearing to have been released too late for the irregularities of its surface to be erased.

"The interior of the specimen consists mainly of finely divided, light gray material resembling volcanic ash. Embedded in this are crystalline fragments of olivine and probably other minerals as yet unidentified. A few rusty spots suggest the presence of metallic iron but a test for nickel gave negative results.

"This fall adds weight to the suggestion made by the writer (Jour. Geol. vol.XLVI, no.6, p.890) that probably Howardites are not as rare as has usually been supposed."

When the meteorite was mailed to Dr. Nininger, he was told that he might cut off one corner (about one-tenth of the entire mass) for his own collection. His letter indicated he would not cut it at once. But he was advised by wire to do so and return it. It had been planned that Dr. A. H. Kunz of the University chemistry faculty should announce the discovery and show the specimen at a luncheon talk on meteorites before the Eugene Rotary club on August 29. That morning the specimen returned minus the portion given to Dr. Nininger. The wide, smoothly-cut face gives a nice opportunity to study the conglomerate interior.

(At his Rotary talk before 115 men and one woman reporter, Dr. Kunz passed around a few typical specimens of various kinds of meteorites. His talk almost finished, the new meteorite had not yet been mentioned nor shown. A joking Rotarian, entirely unaware of the Washougal find, called out, "Now where is the Portland meteor? Why don't you show us a piece of it?" To the utter astonishment of all, Dr. Kunz answered, "All right, I'll do it. It's right here in my pocket.")

The Pasamonte fall, which the Washougal resembles in structure, came from the huge meteor of 5 A.M. March 24, 1933. It was observed from New Mexico, Colorado, Kansas, Texas, and Oklahoma. Many excellent photographs were obtained of the immense luminous train which persisted until the coming daylight blotted it out.

Dr. Nininger very painstakingly traced the visible path of this splendid meteor. He checked and rechecked all his data but always got the same solution. Meteorites are usually found only beyond the end point of the luminous flight. After the meteor ceases to glow, unburned fragments travel on for many miles before coming to earth. Search as he would, Dr. Nininger could find no remnants where they might be expected. But finally he heard of a "find" several miles behind the end point. Thus his luck began. Persistent search for two years resulted in the recovery of 70 pieces of this rare Howardite type, the largest being about two-thirds of a pound in weight. Another collector gathered several more. They were found along a rather narrow path extending back from 10 miles to 38 miles behind the disappearance locality of the luminous meteor. All were nicely glazed over by the black fusion crust. The fireball, made up of material not very firmly cemented together, was losing fragments constantly during many miles of the last of its flight. The pieces were not found in a line directly under the calculated path but between four and five miles north of this line. The wind was from the south that morning.

Since the Washougal meteorite is constructed of material very closely resembling the Pasamonte, it is most probable that fragments fell from the Portland meteor over a considerable length of the last part of its visible flight. As plotted by the American Meteor Society, this meteor passed over northern Portland and finally disappeared about 50 miles eastward on the north side of the Columbia river. If the meteorites are scattered in a way resembling the recovered Pasamonte fragments, they should be found along a path from about 12 to 40 miles east of Portland. Mr. Best's find comes close to the first distance. Correspondence of the two meteors to such fine points is not probable, yet in general the scattering may be quite similar.

The heavy smoke puffs and continuous trail marking the path of the Portland meteor during the last 50 miles of its flight, indicated rapid disintegration inte fine particles. No reports have reached the writer regarding respiratory inconveniences resulting from meteoritic dust. For the entire day following the Pasamonte fall, all residents of a community near the disappearance point detected a sulphurous odor and suffered from a queer type of throat irritation such as they had never experienced before. Long articles by Dr.Nininger on this most interesting meteor and the finding of meteorites may be found in Popular Astronomy for June 1934 and June 1936.

The Washougal meteorite is the first object of this nature ever found and identified as such in the State of Washington. A few years ago the Spokane Press offered a prize of $5 to the person who would put Washington "on the map" meteoritically. But it escaped giving the award when last spring it ceased publication. Only a few states in this country are still in the "have-not" column. Dr.Nininger's list published in 1933 shows 41 states favored with celestial visitors.

The question is frequently asked, "How do we know that the Washougal meteorite is a fragment of the recent Portland meteor?" Since it was not seen to fall, a proof from this source is lacking, yet we are very firmly convinced that it is connected with the disturbance of July 2. Let us list a few of the reasons:

(1) It is like the Pasamonte meteorites which were found in such abundance along the projected path of the rapidly disintegrating, heavy smoke-producing, noisy, highly-luminous fireball of 1933 which in action so closely resembled the Portland meteor. Had our meteor occurred at night, it would doubtless have been just as terrifying in appearance as its close relative of 1933, and would have been seen at very great distances.

(2) No huge noisy fireballs likely to have dropped meteorites have passed along this section of the Columbia river since the Pacific meteor of April 9, 1933, and the Twilight meteor of November 17, 1933.

(3) The Washougal meteorite was picked up about 24 hours after the appearance of the Portland meteor. Its fusion crust was extremely new and glossy, and showed not the least weathering or dirt splashes such as do meteorites which have lain in the open for some time. It was fresh out of the heavens.

(4) When found, it was on top of the layer of needles under a fir tree through which it evidently had passed. Had it fallen only a few weeks earlier, there would likely have been considerable trash on top of it. Later examination of the hard ground under the thick layer of fir needles showed a depression about 1½ inches in depth.

As soon as the telegram arrived from Denver confirming the meteoritic nature of the find, plans were started for a search for other fragments. That afternoon, August 23, Don Hunter and Bruce Nidever started by auto to Portland. They spent the following day interviewing Mr. Best and carrying out a general scouting trip along the north bank of the Columbia for 70 miles beyond Washougal. They returned to Eugene late that night, without additional meteorites, but very enthusiastic over what they had learned about the "lay of the land" and with plans for another trip.

Information regarding the Washougal find was given to Mr. Baldwin, editor of Geological News-Letter, about a week before it was released to the press, in the hope that some members of the Geological Society of the Oregon Country might find time to do a little searching in the suspected territory before the general rush started.

A recent letter from Dr. Nininger gives many suggestions concerning methods of search. No man in North America - perhaps in the world - has been so successful in the recovery of meteorites as has this Denver scientist. In 1933 the official list of finds for the entire world since the beginning of history was about 1000. In 1937, the number had increased to 1,127. Of the more than 100 added between 1933 and 1937, Dr. Nininger had found slightly over half of them. A list published in 1938 increased the number of 1204. The writer is not informed as to what part of the total to date since 1937 is due to Dr. Nininger's work. (A "find" includes all the recovered members of a certain "fall". Thus, the 17,000 pieces recovered from the Holbrook, Arizona, fall are counted as a single find.)

Dr. Nininger's methods bring results never even approximated by those using others. He writes that every one living in the region where fragments may have fallen should be informed as to what to look for. He finds that personal visits by the searcher are much more effective than letters or newspaper articles, although all methods help. If the people are impressed with the scientific value of meteorites, the great majority will be very willing to cooperate and report any fragments they may recover.

A second auto trip by a University of Oregon party was made Sept.3. Mr.Don Hunter again headed the party, which included, besides himself, Miss Delores Van Cleve and Mr. Fergus Wood. Getting an early start out of Portland, they spent the entire day from early morning until after 8 p.m. interviewing residents from Vancouver to a little east of Washougal. They made 36 calls at farm homes and talked with about 100 people. Miss Van Cleve had previously prepared abundant information on cards which were handed out to those interviewed. They found only one person who had not heard of the Portland meteor nor the Washougal find. Practically all showed great interest in the subject and promised to report promptly anything they find which seems to be remnants from the great Portland meteor.

Mr. Best, a highly intelligent young man of 27, recently wrote:

"Out of curiosity the other day I covered a number of different fields to see how long it would take to thoroughly search the ground in looking for more pieces. According to my figures it would take one man approximately 18 months, exclusive of Sundays, to cover a township. Apparently if I go out now and search deliberately, I would probably have a long gray beard before finding any more - yet. There is always that 'yet'. Maybe I'll stumble on another piece tomorrow."

The writer has accepted Mr. Best's kind offer to present to him the splendid find. It now rests in the cabinet with the rest of his private collection of meteorites.

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Occasionally there comes up a reference to the meteorite which is supposed to have fallen near Sublimity, Oregon, about 50 years ago. The story goes that late one summer afternoon a loud hiss was heard in the sky, and a ball of fire was seen coming toward the earth. The ball hit the ground, and after plowing along for a space, finally lodged in a hillside on the J. Smith ranch near town.

It seems that old time residents of Sublimity do not understand why the newspapers continue to say that only three meteorites have ever been found in Oregon. In the Oregonian of August 27, 1939, the Sublimity correspondent of this paper had a short article in which he asks, "If there are only three known meteors that have fallen in Oregon, and the Sublimity meteor is not one of them, then what is the Sublimity meteor?"

Dr. Francis T. Jones of Pacific University read this item, and recently when in the Sublimity vicinity investigated. He obtained a small sample from the "meteorite" and enclosed it in a letter, Aug. 30, to the writer. The letter follows:

"Today I was near Sublimity so looked up the meteorite. A Mr.Alex Doerfler purchased the stone, so I finally discovered. I got some samples by going to his place about 6 miles north of town although I didn't see him personally. His wife directed me to the stone. It is just another disappointment in my judgment. Looks like a piece of andesite to me. Maybe gabbro. I'll enclose a small chip. Non-magnetic, no free iron, etc. Didn't find any eye witnesses. Only second hand information."

To the writer, the sample looks just like a large chunk of andesite which rests in his rock garden. It is definitely not meteoritic. To get the highest authority on the subject to pass on it, a portion was sent to Dr. Nininger for a definite signed statement. A postal card from him reads as follows:

"The piece of rock sent you by Dr. Francis T. Jones of Pacific University, and obtained by him from the 'Sublimity meteorite' owned by Mr. Alex Doerfler has been examined. I find that it is not a meteorite. H. H. Nininger."

Without doubt a very brilliant fireball was seen from Sublimity late one afternoon over half a century ago. Most likely it disappeared behind a nearby hill. Although it may have been 100 miles distant, it probably appeared to strike the top of the hill. A rock was found there which has since been taken to be a meteorite.

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# GEOLOGICAL NEWS LETTER

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MEMBERSHIP APPLICATION

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ______________

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

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Address

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Telephone Number Occupation

I am particularly interested in the following branches of Geology: ______________
________________________________

Sponsored by: ______________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________
Signature

## ANNOUNCEMENTS

### Lectures

Friday Oct.27 — Subject: HUNTING FLUORESCENCE IN MEXICO.
Speaker: Dr. Courtland Booth
Dr. Booth made an extensive trip thru Mexico this summer and he will present to us the results of his geologic observations by word, by picture and by an exhibit of specimens.

Friday Nov.10 — Subject: GEOLOGICAL FORMATIONS OF BRITISH EAST AFRICA.
Speaker: Mr. Frederick G. Leasure, Director of Vocational Education, Portland Public Schools.
Mr. Leasure spent some ten years in the Kenya country and, during his extensive travels over that area occasioned by his work, he absorbed a fund of information concerning its geologic form and its natural history; he will discuss these "from a layman's point of view." His experiences in hunting the big game of that region were as exciting and thrilling as they were varied. Stories of these will be included in his discourse and, it should be added, he tells those stories vividly!

Friday Nov.24 — Subject: GOLD IN OREGON, WITH PARTICULAR REFERENCE TO DREDGING.
Speaker: Mr. F. W. Libbey.
As a mining engineer on the staff of the State Department of Geology & Mineral Industries, and one who has concentrated on problems relative to dredging, Mr. Libbey, a member of our society, speaks with authority on this subject. He has an extensive background of mining experience in various parts of western United States and was consulting mining engineer on the U.S. Engineers' recent mineral survey directed by Dr. Hodge. Gold, in addition to possessing a halo of romance, is of real economic importance to our western states, and a discussion of its geologic setting and the how's and why's of the way it is obtained, will afford us an evening of great interest.

Friday Dec.8 — Subject: VACATIONING IN THE LAND OF THE CLIFF DWELLERS.
Speaker: Mr. Thos. A. Carney.
A tour thru these ancient dwellings of man by means of colored moving pictures, accompanied by a descriptive talk by one who has visited them recently, will open a fascinating vista in archeology. Our fellow-member, Mr. Carney, is well remembered as one who "puts on" his lectures in real style; no effort is spared to perfect the presentation and, on this occasion, he hints that it will be better than ever! (Note:- Tom made an extensive tour this summer - canyons and cataracts, mountains and mesas, as well as the New York and 'Frisco Fairs, fell before his ubiquitous cameras - so we are likely to see more than cliff dwellers during this evening!)

### TRIPS

Sunday Oct.29 — H. B. Schminky, leader.
Portions of the drainage areas of Deep Creek and Eagle Creek, both tributaries of the Clackamas River, will be explored by the caravan. An attempt will be made to fix the boundary of the gravel deposits bordering the Clackamas River. Some interesting tuff and agglomerate beds may help

to fix this boundary. The roads to be followed on this trip will be new to most members of the society and those attending will be introduced to two fine picnic localities.

In order to save daylight, the group will leave SW Front Ave. and Yamhill St. at the Public Market at 8:30 a.m. Thos desiring may join the party at the town of Eagle Creek on the highway to Estacada. The Boring and Estacada quadrangle maps cover the area to be visited.

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We have just received a letter from Mrs. Stockwell, in which she said "I am now in Salem and have accepted a position with the State Unemployment Compensation Commission".

Mrs. Stockwell's address in Salem is 745 N. Church St., Tel.4827.

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Two of our members, Thomas A. Carney and A. W. Hancock, were in Seattle last week end as delegates to the Northwest Federation of Mineral Societies representing the Oregon Agate and Mineral Society.

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O. E. Stanley showed his colored pictures of the San Francisco Fair, Bryce and Zion Canyons, and the Colorado River, at a meeting of the Oregon section of the American Society of Civil Engineers on Monday evening, Oct.16th.

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In Dean Collins' column "Among Our Neighbors" Oct.20th we note the following regarding one of our members:

"Three years ago O.E.Stanley took up photography in a serious way. His record since he began doing candid cameras and such runs into 12,000 Leica negatives alone. In all, he has filmed and indexed plates and films on some 20,000 subjects. Moreover, there is a complete record of conditions under which each negative was taken."

****

At the annual meeting of the Mazamas held on Monday, October 2d, the award of the Parker cup trophy was made to Kenneth N. Phillips. This award is made each year to the member of the Mazama Club who is adjudged to have rendered the greatest service in furthering the objects of the organization. Ken's energetic pursuit of the work of the Research Committee, of which he has been chairman for the past five years, in conjunction with a year on the Executive Council as editor of the Mazama monthly, as well as other efforts on behalf of the club's activities, well merit this fine tribute. The same evening, also, when the results of the club's annual election of officers were announced, Mr. Phillips was declared a director for the ensuing three years.

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ORIGIN OF MOUNTAINS: OR HOW MOUNTAINS RISE.

"I will lift up mine eyes unto the hills, from whence cometh my help." These words were used by the psalmist in a figurative sense; but to the geologist they are literally true. He turns to the great mountain ranges for the finest exhibits of geological features that the earth affords. There, in the large vertical distances between ridge tops and canyon floors, the rocky shell of the globe is exposed most clearly and to greatest depth. There the operation of important geologic processes can be seen engaged in the age-long task of changing landscapes; swift water cutting deep canyons such as the Royal Gorge of Colorado; glaciers grinding at the mountain summits and fashioning sharp peaks like the Matterhorn in the Alps and Mt. Assiniboine in Canada; volcanoes piling up their lavas and cinders to make some of the grandest masses of the Andes and other great systems. The science of geology owes an important part of its development to the clear revelations in mountain belts; it is continuously enriched and clarified by contributions from these great storehouses.

But the mountains also present mysteries in themselves and pose additional hard problems for the geologist. It has long been known that many of the highest ranges and peaks are made of limestone and related rocks that contain shells and other fossilized remains of creatures that once lived in the sea. Nicolas Steno, a brilliant physician and priest of the seventeenth century, observed the abundant marine fossils in the rocks of the high mountains in Italy, and recognized the practical application of the Biblical statement, "the low places shall be made high". In the giant Himalaya Mountains of northern India, rocks that represent former sea floors are miles above the positions in which they were formed. Therefore mountains have not existed as we now see them since the beginning of time; they represent uplift, by gigantic forces, of some areas that once were near or even below sea level.

It is clear also that the great mountain systems are not all of the same age. Some are made entirely of ancient rocks, and have been worn down until they are only the low stumps of once lofty ranges, others carry on their towering summits young marine strata that contain shells and bones of animals very like those in the present seas. Our Appalachians are vastly older than the Rockies and the Alps. In the East Indian Islands, southeast of Asia, mountain ranges are now actively growing, lifting to even higher elevations coral reefs that recently grew in warm seas. Thus mountains come and go in successive generations, as do human individuals and races. Forces responsible for the mighty uplifts reside in the Earth, and apparently are as active today as they were in the distant past. What are these forces, and how do they operate? To these questions geologists do not as yet venture positive answers. The problem is one of the largest and most fascinating still awaiting solution. We can make only partial answers,and suggestions.

The present systems of high mountains lie in long chains that make conspicuous belts on a world map or globe. The Andes, Rocky Mountains, Coast Ranges, and related systems make an almost continuous zone of highlands through the western side of the Americas, from Cape Horn to Alaska, a distance of 11,000 miles. Another belt of lofty chains reaches 9,000 miles from the East Indies through southern Asia and Europe to Gibraltar. These long chains rise above the general surface like gigantic wrinkles or welts. In each of them the rocks are mashed, bent, and broken as if they had been squeezed in a gigantic vise. Layers of limestone, shale, and sandstone that originally lay on nearly horizontal sea floors have been buckled so severely that in many places the layers are vertical or even overturned. In some ranges the rocks have been sheared across under the enormous pressures, and immense sheets have been driven forward for many miles one over another, until they now overlap like shingles on a roof. If we could restore these rocks to their original positions, by straightening and untangling the buckled and telescoped layers, each of the great mountain belts would be much wider than we now see it. By such a restoration, the space occupied by the Alps of Switzerland and northern Italy would be widened as much as 150 miles. Similarly, if the layers of rock that were buckled to form the Appalachians of Pennsylvania, and now resemble the folds in a crumpled blanket, could be smoothed out toward the southeast until they once more lay flat, they would be extended sufficiently to cover also the entire State of New Jersey.

Since the layers of old sea deposits are steeply inclined in the great mountain chains, it is a comparatively simple matter to measure the total thickness of these deposits. The results are astonishingly large - as much as 30,000 to 40,000 feet. In other words, before these old marine deposits were disturbed they were flat-lying, one layer on another, the top layer near sea level and the lowest layer 6 to 8 miles below sea-level! It is not to supposed, however, that any of the seas in which the deposits were laid down ever had any such depth. Indeed, most of the sandstone, shale, and limestone beds found in mountain belts show by their character that they were formed in shallow water, or even in tidal flats and marshes. Therefore, before each of these belts were elevated to form mountains, it was occupied by a sea whose floor kept sinking progressively; the water was kept shallow because sand and mud accumulated continuously, and built the floor upward. Finally, after these deposits of sediments were several miles thick they were crushed and elevated into mountain ranges.

As we stand in the clouds on Pikes Peak or one of the other mountain summits of Colorado, it is difficult to project the imagination backward to the time when all of the rocks in that rugged landscape lay beneath a vast sea that stretched unbroken from the Gulf of Mexico to the Arctic Ocean. Yet the rocks themselves testify to this fact. That time was of course long ago. Although the Rockies are much younger than the Appalachians, their history has been long by ordinary human standards. The old seaway existed fully 50 millions of years before the convulsion began that lifted the sea floor to mountain heights. The uplift itself started more than 5o million years ago, and was repeated in widely spaced pulses, the last of which occurred more than a million years ago. Mountains indeed follow each other in a succession of generations; but the complete history of one generation occupies a vast expanse of time.

Thus the great mountain chains originate in belts of weakness in the Earth's crust. During the early part of the history, this weakness is manifested by progressive sinking of the sea floor as sediments accumulate on them. Later, the weakness is evident in the crushing and yielding of the rocks as they are forced upward. But what is the source of energy for the stupendous work of lifting mountain masses?

A generation ago it was generally agreed that the Earth is steadily cooling and shrinking, except for a comparatively thin outer shell in which the temperature remains nearly constant. If this were true, the result would be similar to that in a shrivelling apple, of which the skin remains almost unchanged in size and therefore becomes more and more wrinkled as it adjusts itself to the drying and shrinking inner portion of the apple. Reasoning from this analogy, the "contraction hypothesis" maintains that the great wrinkles or welts that have formed successively on the Earth are a necessary adjustment to keep the crust snugly fitted to the slowly shrinking interior. Some geologists still favor this theory as the best that has been offered. Others are far from satisfied with it. They point out that large parts of the crust - for example, in the Great Basin region of Nevada and Utah - appear to have been pulled apart and not compressed; that the long period of sinking in the seaway, before elevation of a chain begins, is not explained by continuous compression in the crust as the result of a contracting interior; and that the great amount of crumpling and telescoping in the Alps is far more than could be accomplished in a single belt, during a short geologic period, by a general contraction of the globe.

There is a bold and fascinating theory, now looked upon with favor by some good geologists in many lands, that continents themselves move laterally at an extremely low rate, to be sure, but through long distances, given time enough. According to this concept, North and South America have been moving bodily westward. Resistance to the movement, at the forward or western edge, has caused the weaker belts near that margin to buckle up into mountainous wrinkles. Similarly, Europe and Africa have moved toward each other, thus forcing up the Alps, Atlas, and other mouhtain chains near the Mediterranean. The general scheme presented by these theorists is about as follows: Each continent is a great plate, some tens of miles thick, made chiefly of granite. It lies on rock that is darker in color and heavier, known as basalt. At some depth beneath the continental plate the rocks are very hot and therefore weak; they are kept rigid by the great pressure on them; but they can be made to flow like a very stiff liquid. In one version of the theory, it is supposed that great convection currents exist in this deep hot zone of the Earth. Heat is supplied by radium and similar elements scattered in small quantities through the rocks. A great convection current rises slowly and, coming to the base of a strong continent, is turned laterally. The slow current then carries the continental plate laterally with it, but only by overcoming powerful resistance in overriding the strong rocks of the ocean floor. Any weak zone in the continent, either at the forward edge or even near the middle of the continental plate, may be crushed and forced up as a mountain chain. Thus at one time the floor of the old seaway that occupied the site of the Rocky Mountains was buckled up, although it lay more than a thousand miles inland from the western edge of North America. In more recent time a weak belt extending along the western edge was crushed, forming the Coast Range of California.

The idea that continents actually move was suggested by the remarkable correspondence in form between the western edge of Africa and the eastern edge of South America. If these two edges are placed together - not on a flat map but on a globe that has the curvature of the Earth's surface - the close fit is really remarkable. If, at the same time, North America is placed as close as possible to the western edge of Europe, the Atlantic Ocean practically disappears. The argument that these continents once really occupied those positions is reinforced by striking similarities in the geologic features in the lands on opposite sides of the Atlantic, both in the north and in the south.

How can we ever check this startling theory that our continent, apparently so firm beneath us, is carrying us westward at a rate so slow that the hour hand of a clock, by comparison, is swiftly moving? Astronomers in all lands are cooperating in an attempt to solve this problem, by determining, with great precision, latitudes and longitudes in all continents, and rechecking the locations at five-year intervals. Perhaps in fifty or a hundred years an unmistakable movement will be detected. Possibly the information will have to accumulate for centuries to give any sure result. This may be a problem that no individual or generation can hope to solve; the solution may require that successive generations, like the several runners in a relay race, link together their best efforts, each passing on the baton at the end of his lap.

The great mountains inspire us with the grandeur of their size and form. Mysteries that surround the cause of their rise from the low places impress us with our ignorance of the Earth on which we live. Evidence that the mightiest ranges of past ages have crumbled to dust humble us with a realization of our own fleeting existence in a world where all things change - even the landscapes molded on the strongest rocks.

- C. R. Longwell
Yale University

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"Origin of Mountains: or How Mountains Rise", by Prof. C. R. Longwell of Yale University, is the fifth in a series of eight radio addresses presented under the theme "Frontiers of Geology" by the Geological Society of America.

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## OUR GEOLOGICAL SOCIETY

The Geological Society of the Oregon Country was founded a number of years ago under the able leadership of Dr. Edwin T. Hodge and since that time has come to fill a very definite need in the community. Enrolled under its banner are people from all walks of life, to learn more about the things around them in everyday life. Most of these people are "amateurs" in a scientific sense, that is, few of them have had professional training other than certain cultural courses in geology offered by the University Extension Center.

A recent address by Dr. Herbert L. Hawkins, professor of geology, University of Reading, to the British Association for the Advancement of Science, considered the "Local Scientific Societies and the Community".1/ Dr. Hawkins' remarks fit the organization of the G.S.O.C. so perfectly that it may be of interest to review them. He also points out some of the pitfalls that lay in the path of amateur societies of this kind, and some of the activities which may be stressed in order to make their existence more secure.

In the opening paragraph he says, "Whatever may be its peculiarities, its success or failure, each society has originated in much the same way as all the others. In most cases, its history can be traced back to the enthusiasm of an individual, who has attracted and stimulated a small coterie of friends or disciples. Organization has followed; and, whether it was invented or adapted from previous models, it has produced a miniature copy of a democratic state, complete with cabinet and treasury." This certainly is an almost clairvoyant knowledge of the organization of the G.S.O.C.

He continues: "The aims of these societies vary somewhat, some being devoted to research, others to instruction. The former type of society is in constant danger of decline, for it needs continuous stimulation by new enthusiasts in successive generations; the latter is fortunate if it avoids the comatose senility of a social club."

"Sociability is, however, the key to the success, and almost a raison d'etre, of a local society. Unless this is an association of friends, it belies its name and loses its efficiency. It is not in the academic eminence of its members, but in the spirit of cooperation and enjoyment, that the value of the society lies. For this reason a society that organizes field-excursions as an essential part of its program is a far more lively institution than one where the members meet only in the enforced silence of a lecture-hall. The element of friendly intercourse may, naturally, degenerate into a mere picnic; but even that is preferable to the priggish snobbery of a lion-hunt."

From the above statements, it would appear that G.S.O.C. has been wise in its practice of bimonthly field trips, and that these field trips constitute a most valuable part of its existence. It would certainly be regretted if the membership would decide to abandon this activity.

"A society attracts to membership others besides those whose natural enthusiasm marks them as leaders in its enterprises. Although the danger of over-emphasis of

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1/ Hawkins, Dr. Herbert L., Local scientific societies and the community: Science, vol. 90, no.2334, pp.261-264, Sept.22 1939.

the social side may be thus increased, such recruits are to be welcomed. Some may become interested and inspired, but all will contribute something, be it only a subscription, to help the society's work. . . . In the great majority of cases, the members of local scientific societies are "amateurs" in the generally accepted sense of that term. Their scientific work is their hobby; and in the present pressure of business life few have time or energy to spare for a pastime that demands intellectual effort. . . Not until retirement ensures leisure for following their own devices can most business men undertake the responsibilities or even enjoy the privileges of active membership."

Our Society must truly be an unusual one, for if Dr. Hawkins is correct in his statement that most business men must wait until retirement in order to participate actively in a scientific society, it is worthy of note that there are few, if any, "retired" people on our membership list. Most of them are actively engaged in some sort of enterprise for earning a living, and yet they find, and take, time to seriously study their hobby.

The next idea is one that should be considered very carefully. It is one that has been applied to G.S O C.,rightly or not, and every effort should be made to guard against it.

"Probably the most fatal disease that can overtake a local society is that which gives it a reputation for erudition. If there is any truth in the fear of a prospective member that he or she would feel ignorant in a company of savants, membership should be avoided at all costs, for the society is not worth joining. Interest, not intellectual, should be the gauge of suitability; humble inquiry is more appropriate even to the specialist than declamation of a learning that is only ignorance in disguise. Mutual sympathy and encouragement must be the spirit of the society; all are there to learn, and no teacher needs to be reminded that he learns of at least as much from contact with keen students as they are likely to learn from him."

Dr. Hawkins then considers the subject of collecting. He says: ". . .From early childhood the jackdaw-complex is deeply ingrained in most of us; and although specimen-collecting may become a vice, it shares that risk with all other virtues. So long as mere miserly acquisitiveness is avoided, the arrangement and study of collected material can revive memories of past thrills and prolong the joys of field work. . . . An important duty of every scientific society should be the control, by precept and example, of the mania for collecting."

"But there yet remains ample scope for the training of collectors; and almost every society is likely to include some members who can guide and counsel the uninitiated. Collection involves dissociation of the specimen from its natural environment; in the majority of cases that environment is one of the most informative features of the specimen. . . . Paradoxical though it sounds, it is nevertheless true that a collection of specimens without adequate labels is less useful than a collection of labels without specimens. Every particular of the circumstances attending the collection of the specimen should be written down at the actual time and place -- memories get blurred at the end of a day. Even details that seem irrelevant should be noted; wider experience may show that just such points had the greatest significance."

"In the matter of collecting, the local society has no need to encourage an inborn instinct, but rather should guide and restrain. A collection made for a definite intellectual purpose is unlikely to lead to decimation of its materials. But the collecting of specimens is really a pandering to low instincts; a far more important and fruitful activity is the collecting of facts."

". . . In the matter of research, the greatest contribution that can be made by scientific societies comes from their ability to keep, check, and publish records of transient phenomena."

"As regards geological and archeological studies, there can surely have been no period in the past more favorable than that in which we find ourselves today. For one reason or another, excavation is a dominant feature of our present activities; and, however shallow it may be, every hole is likely to reveal something of interest. Modern methods of excavation are so speedy and mechanized that much of their revelations can be observed only by perpetual watching. Here the local society can find scope for important and urgent work. Every society should acquire a large-scale map of its area, and plot on it every site where a glimpse, however fleeting, of the subsoil has been possible. Pin-pricks on the map, with numbers written against them, to correspond with card-index entries giving all the particulars, would soon make the map a priceless record. Only accuracy and persistence are wanted to achieve results that could not fail to increase the knowledge that all local societies are nominally out to acquire."

". . . There could surely be no better compilers than those residents in any district who have trained themselves to observe facts and to tabulate them methodically. Such problems as the yield of springs and wells, the availability of road-metal, sand and gravel, the quality of the soil, . . . are all of a nature that demand accurate observation on the spot. . . . All who love their country (in both senses of the word) can find here congenial and valuable work that is needed urgently.

To review the statements of Dr. Hawkins, and his advice to scientific societies is that:

1. They must be founded on sociability.
2. Field-excursions are an essential part of any program that is to persist.
3. The Society must avoid any attitude of mental snobbishness; no one should feel "too ignorant" to join, and interest should be the gauge of suitability.
4. Collecting should be controlled so that it becomes not a mere collecting of things.
5. Every specimen should be properly and accurately labeled with full details and particulars.
6. The greatest contribution that a society can make is to keep, check, and publish, records of transient phenomena.
7. Keep a record of every excavation, hole, etc., that reveals sub-surface conditions; a large-scale map plotted with locations, and a card-index of pertinent data.

The Geological Society of the Oregon Country is in the fifth year of its history. It has maintained itself with a slowly, but surely, increasing membership and interest on the part of its members. It has a long and fruitful life ahead of it, if it will occasionally check on the reasons for its existence, and make some effort to justify this existence. Dr.Hawkins has pointed the way in a very interesting and instructive manner, and it may be that the G S.O.C. can profit by a careful consideration of the points set forth.

- R.C.T.

GEOLOGICAL NEWS LETTER

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## Executive Board




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MEMBERSHIP APPLICATION

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

## Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ____________

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

______________________________
Address

______________________________
Business Address

______________ ______________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ______________

______________________________

Sponsored by: ______________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________________
Signature

ANNOUNCEMENTS

Lectures

Friday Nov.10 — Subject: GEOLOGICAL FORMATIONS OF BRITISH EAST AFRICA.
Speaker: Mr. Frederick G. Leasure, Director of Vocational Education, Portland Public Schools.
Mr. Leasure spent some ten years in the Kenya country and, during his extensive travels over that area occasioned by his work, he absorbed a fund of information concerning its geologic form and its natural history; he will discuss these "from a layman's point of view." His experiences in hunting the big game of that region were as exciting and thrilling as they were varied. Stories of these will be included in his discourse and, it should be added, he tells those stories vividly!

Friday Nov.24 — Subject: GOLD IN OREGON, WITH PARTICULAR REFERENCE TO DREDGING.
Speaker: Mr. F. W. Libbey.
As a mining engineer on the staff of the State Department of Geology & Mineral Industries, and one who has concentrated on problems relative to dredging, Mr. Libbey, a member of our society, speaks with authority on this subject. He has an extensive background of mining experience in various parts of western United States and was consulting mining engineer on the U.S.Engineers' recent mineral survey directed by Dr. Hodge. Gold, in addition to possessing a halo of romance, is of real economic importance to our western states, and a discussion of its geologic setting and the how's and why's of the way it is obtained, will afford us an evening of great interest.

Friday Dec.8 — Subject: VACATIONING IN THE LAND OF THE CLIFF DWELLERS.
Speaker: Mr. Thos. A. Carney.
A tour thru these ancient dwellings of man by means of colored moving pictures, accompanied by a descriptive talk by one who has visited them recently, will open a fascinating vista in archeology. Our fellow-member, Mr. Carney, is well remembered as one who "puts on" his lectures in real style; no effort is spared to perfect the presentation and, on this occasion, he hints that it will be better than ever! (Note:-Tom made an extensive tour this summer - canyons and cataracts, mountains and mesas, as well as the New York and 'Frisco Fairs, fell before his ubiquitous cameras - so we are likely to see more than cliff dwellers during this evening!)

Friday Dec.22 — NO MEETING on account of the proximity of this date to Christmas.

Friday Jan.12 — Subject: GEOMORPHOLOGY OF EUROPEAN BATTLEFIELDS.
Speaker: Dr. Edwin T. Hodge.
A discussion of the facts of geology as they affect national interests. The reasons for the rise and fall of empires do not lie entirely in the economic nor ethnologic fields. The influences of land forms in the territories concerned sway the fortunes of contending nations to a remarkable degree. A review of this phase of geology in its relation to the present European conflict will help greatly to a true appraisal of the international situation. We are privileged to have it brought before us by our own Dr. Hodge, who, as we all know, is qualified to speak with authority on the subject.

TRIPS.

Saturday and Sunday Nov.11-12 — Pony Butte and Madras trip. A. W. Hancock, leader. Caravan will leave SW Front & Yamhill streets, Saturday at 8:00 a.m. and proceed to junction of Ashwood Road and Dalles-California Highway. This is between mileposts 79 and 80. At this point caravan will be joined by members of Deschutes Geological Society. Caravan will proceed to Pony Butte region where agate filled nodules are found. If time permits Venora Grade will be visited. Saturday night to be spent at Madras. Sunday morning Gray Butte will be visited where fossil leaves of the Bridge Creek formation can be secured. Geologists will be in attendance to start and settle all arguments. Caravan will start return trip to Portland about 2:00 p.m. Sunday.

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It is with sincere regret and sorrow that we announce Mrs. Warren D. Smith passed away Monday night, October the 23rd, after a short illness. The sympathy of members of the Geological Society of the Oregon Country go out to Dr. Smith and family in their bereavement.

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The Society is indebted to Mr. M. H. Calef for the gift of 27 pictures, a valued addition to our album. The collection covers six trips. Mr. Calef arranged the pictures for the album and included on each page a written explanation. Many thanks, Mr. Calef.

NEW MEMBER

George Ice — 1654 Tenino St.

COLORED MOVIES OF KINGS CANYON, CALIF.

To be shown in Public Service Auditorium, Wednesday, November 8, at 8 p.m.
Admission Free

A letter has been received from the Mazamas inviting members of the G.S.O.C. to attend the special showing, which they have arranged, of pictures of the Kings Canyon country. It is this area, now proposed to be made a National Park, which John Muir, the famous naturalist, described as far surpassing the scenery of the Yosemite Valley. These pictures were shown at the recent convention of the Federation of Western Outdoor Clubs at Norden, Calif., and Mr. Ed. J. Hughes, the Mazama delegate there, who did considerable climbing in Kings Canyon this summer, acclaims them as an exceptionally fine portrayal of that ruggedly scenic territory. Let us compliment the Mazamas with a big turnout of our members at their meeting.

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Below is a synopsis of a recently issued Water Supply Paper of the U.S.G.S., of which our president, Arthur M. Piper, is the principal author:

It deals with an area where the amount of water available approaches the boundary between sufficiency and scarcity, hence, a knowledge of the factors governing an intelligent policy of conservation is required if human prosperity is to continue in that area. This report fills that need, and does it in the thorough and complete manner which we know to be typical of our president's approach to such problems.

Water-Supply Paper 780. Geology and ground-water hydrology of the Mokelumne area, California, by A.M.Piper, H.S.Gale, H.E.Thomas, and T.W.Robinson. 1939. vii, 230 pp., 22 pls., 28 figs., Price $2.25.

The Mokelumne area, about the city of Lodi in central California, is a fertile plain that has been intensively developed for the cultivation of grapes, deciduous fruits and other crops. Of necessity its great productiveness is maintained by irrigation. Extensive irrigation from wells began about 1907 and has increased steadily, until in 1932 about 50,000 acres (80 per cent of the area) was so watered. The yearly pumpage from wells has been as much as 114,600 acre-feet (1928-29), and as many as 2,500 wells have been equipped with irrigation pumping plants. This report is concerned with the extent to which the supply of ground water, and hence the productiveness of the area, are dependent upon the water flowing in the Mokelumne river and the extent to which the supply of ground water may be influenced by regulation of the river - in particular, by the substantial regulation that is accomplished by the Pardee Dam of the East Bay Municipal Utility District, which began to function in March 1929. With respect to ground-water replenishment by seepage loss from the river, it is concluded that (1) the yearly replenishment has tended to increase for at least two decades, owing to gradually prolonged use of the Woodbridge Reservoir and to the gradual increase in head between surface water and ground water as ground-water levels have been lowered progressively by pumping, and (2) the rate of replenishment tends to be greater under regulation than under the so-called natural regimen, to the extent that regulation has maintained a moderately large wetted area and stage in the river through the later part of each pumping season when the ground-water levels have been lowest. The report describes the geomorphic features, geologic structure, and stratigraphic units and redefines two other units. It also analyzes critically the hydrologic features of the area in order to establish sound principles for equitable utilization of the water resrouces of the area. The report is illustrated by an areal geologic map, a map that classifies the irrigated tracts, and numerous diagrams that show fundamental geologic and hydrologic features.

Water-Supply Paper 864. Surface water supply of the United States, 1938, part 14, Pacific slope basins in Oregon and lower Columbia River Basin; N.C.Grover, chief hydraulic engineer; G.H.Canfield and G.L.Parker, district engineers. 1939. v, 184 pp., 1 pl. Price 25 cents.

Prepared in cooperation with the States of Oregon and Washington.

# AN OCCURRENCE OF VIVIANITE IN OREGON

By Francis T. Jones.

Specimens of clay from a well dug in June 1939 on the farm of Mr. J.P.Cooper near Cornelius, Oregon (sec.17, T.1 S., R.3 W.) contained distinct blue smears and spots, owing to the presence of vivianite. The well-digger stated that these spots were white when first exposed but soon became blue. This vivianite-bearing clay was found about 30 feet below the land surface adjacent to portions of an old tree, whose wood was dark but still fibrous and was identified under the microscope as one of the common cedars.

Several specimens of the clay taken to the laboratory contained an earthy, pulvurulent, indigo-blue material filling small (2-3mm) cavities in the somewhat sandy clay. The blue spots were irregularly distributed but were rather closely clustered in some areas; a few were elongated. In some specimens the blue material appeared to occupy holes left by the rotting out of rootlets or twigs of the tree aforementioned. In these cavities, some of which had been filled with a loose sandy material, small crystals (up to 1 mm) were found singly and in clusters. Microscopic examination showed these crystals to be pale blue in the central portions and dark blue around the edges. In some cases the dark blue portions were symetrically related to the crystal as a whole.

Although the external outlines are not perfectly sharp the crystals appear to be very thin, monoclinic plates, tapering from the center to the knife-like edges. Striations exist on most of the crystals.

In polarized light the crystals show marked pleochroism; blue to almost colorless. The refractive indexes agree with those listed for the mineral Vivianite, as do all the other characteristics noted above. Dana records a similar occurrence of Vivianite at Eddyville, Ky.

In composition Vivianite is a hydrous ferrous phosphate - $Fe_3 (PO_4)_2 \; 8H_2O$, white when unoxidized but becoming blue as part of the iron is oxidized to the ferric condition. Long exposure leads to a complete browning of the crystals.

The mineral has no recorded uses although it is doubtless smelted along with other ores when it occurs with them as in the case of its presence in bog iron ore (limonite).

Examination of more specimens of the wood revealed small vivianite crystals in cracks and partially rotted knots where the crystals grew on the few remaining fibers. Some cavity fillings in the clay appear to be limonite. Probably the clay is derived from basalt. At greater depths highly altered basalt is present.

**********

KLICKITAT, WASH., TRIP.

The Society's trip on Sept.17th to the Klickitat, Wash., district, attracted an unusually large number of members and friends. Over a hundred registered during the lunch hour at the plant of the Gas-Ice Corporation. The main object of the trip was to study the geology to be seen along the route of a new logging road in process of building by the Neils Lumber Company of Klickitat. However, of equal interest was the visit to the Gas-Ice Corporation's plant to see the manufacture of dry ice, especially to those who did not make the trip a year ago. Dr. Arthur C. Jones was leader.

The trip on the logging road was by speeder and covered a distance of 8 miles each way. On account of the large crowd, it was necessary to make two trips to accommodate all. The new road follows the valley of the Klickitat river into the Mt.Adams country. This valley is in Columbia River basalt. Numerous patches of ash beds were seen in the cuts, the ash having evidently come from Mt.Adams, and is believed to be fairly recent.

A formation locally called "funny face" was a striking feature seen in a high vertical cliff. The lava had cooled in columnar form, the pillars radiating in all directions from a central core, and the formation had the appearance of being an intra-canyon flow. The walls of the canyon were made up of basalt columns standing in the usual upright position, and at right angles to many of those in the center of the formation.

At the terminus of the 8-mile speeder trip, filled with geological interest, a short hike up a slope took the visitors to two open springs charged with carbon dioxide gas. The gas could be seen bubbling up through the water. The larger spring, or well, is named for a pioneer, being known as Rusk Spring. Mrs.Neils, of Klickitat, accompanied one group to the springs, and, in a little talk, explained that the Indians have known and used this water a hundred years or more. They call it "bubbly water".

Mr. Walter Rathert, superintendent of logging and construction, representing the Neils Lumber Company, was host for the speeder trip, seeing to it that all went well. Two gasoline speeder trains of two cars each were used, recalling that other occasion, three years ago, when this same means of transportation was used for a thrilling trip through the upper Clackamas river canyon.

This was the second trip of the Geological Society of the Oregon Country to this district. On Sept.25th of last year a visit was made to the Gas-Ice Corporation's plant near Klickitat. Dr. J.C.Stevens was leader. Afterward he made a comprehensive report on the history of the plant, analysis of the gas, and production of dry ice. Included was an extract from the report of Claire P. Holdredge on the geology of the region. The report was published in the Society's official bulletin vol.4 no.20, Oct.25, 1938.

This year again the Corporation set up tables in the bottling room and provided packing boxes for seats, so that the visitors might be comfortable while enjoying lunch. It also furnished coffee and cream. Samples of the carbonated water were passed around, and with it, orance juice. Guests of members and others were introduced, among them Mr. Jack Newburn, mananger of the plant.

Mr.Stevens spoke of the immense deposit of carbon dioxide that is believed to underlie the district, and which comes to the surface through crevices in the basalt. He explained the preparation of the carbonated water, also the process used in manufacturing the dry ice.

While the group traveled toward Klickitat during the morning, some geology was studied along the way. The first stop was one mile east of Stevenson to see an intrusion in the Eagle Creek formation, also called Warrendale. The greenish color seen is due to metamorphism of the basic lavas, which are of andesitic type. In a quarry at this point are to be found zeolite crystals.

A brief stop was made at highway tunnel no.2, where there is amygdaloidal basalt. This particular Columbia River basalt, versicular, very porous, has gas hole fillings of opal and agate, called amygdules. Similar rocks were found at a locality in the upper Clackamas canyon on the occasion of the Society's trip there. The formation at Tunnel no. 2 was columnar, with brickbat on top.

Just before entering Underwood, gravels in an old river bed were examined. There was a crosscut of the bed in a high bank. The gravels were a conglomerate, covered by a blocky deposit containing large boulders, and thought to be post Troutdale.

The large petrified tree, near Klickitat, seen by those who made the trip a year ago, was visited again, and found to have disintegrated considerably. It is exposed in upright position in the bank beside the logging road. The Society's picture album contains some views of the tree as it appeared a year ago, also a number of other pictures taken by members in this locality on both trips. One shows a splendid example of columnar basalt. None finer has been seen on any trip yet taken by the Society.

- E. M. Barr

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Geologic Map and Guide of Oahu, Hawaii (Stearns, H.T., U.S.Geological Survey).

The Society's library has recently been given a copy of this geologic guidebook, which is available for use of members planning or reviewing trips to Hawaii. While written in a popular style, the geologic information is authoritative and technically valuable.

The topographic map, scale 1:62,500 (practically 1 inch to the mile) has contours on 100-foot intervals, and shows areal geology and two structural sections on NE-SW lines, one through Honolulu and one through Schofield Barracks. The accompanying text is chiefly a log of geologic features observable on motor roads of the island, with numerous photographs and sketches. A series of diagrams gives a pictorial geologic history of the island. The bulletin has obviously been prepared with a view to its being used by motoring tourists.

- KNP.

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DEEP EARTHQUAKES.

Geologists have told us that the two thousand million years of the earth's existence has been one of perpetual change. They tell us that the everlasting hills and solid mountains which we see today are really only temporary scenery for the present passing act; in the next scene this will all be replaced with some other background, better suited to the progressing plot and characters. The earth in shifting the stage will crumple or fracture the strongest rocks and push them aside a distance of tens of miles. It will raise rocks, now being formed from mud on the ocean floor, up and up until they form mountains towering miles above the sea. This is an act which has been well perfected by ample previous rehearsals. We know it will be put on again, for we can today actually see the scenery being shifted and hear the noisy preparations backstage.

The preparations are betrayed by the great earthquakes which repeatedly occur in certain regions of the earth. These earthquakes represent sudden snapping and cracking of the rocks as they are crumpled or fractured in the course of the slow earth movements which in the end will accomplish so much change.

After a large earthquake one can often measure the total amount of rock movement which took place. It may be as much as 50 feet for a single quake. In a relatively short time, geologically speaking, the displacements we are now observing will amount to tens of miles.

Geologists are accustomed to regard the shallower rocks of the crust, where temperatures and pressures are moderate, as constituting a zone in which rock-failure by fracturing or breaking is favored; whereas at depths of more than 30 miles, where temperatures and pressures are high, it is generally believed that the yielding of rocks takes place like the slow flow of tar by a process of plastic deformation. In conformity with these ideas, it was long believed that earthquakes were confined to shallow depths; indeed only a dozen years ago a depth limit of about 30 miles was definitely assigned to them. But in 1928, Wadati in Japan began publishing an important series of studies which revealed striking evidence for the existence of very deep origins. Students of earthquakes at once were on the alert for confirming observations. It was soon found that the existence of the deep foci could be proved by several convincing types of evidence, and today no doubt remains about the reality of the deep quakes. It is probable that more than 10 per cent of all large earthquakes are deep, if by deep we agree to mean an origin below the 60-mile level. Foci as deep as 400 miles have been observed - an impressive depth even on the scale of the earth, for it represents one-ninth the distance to the center. In energy, the deep quakes are of about the same order of magnitude as the shallow ones.

The mystery surrounding the nature and cause of these deep quakes is surely an enticing topic for speculation. Because of reluctance to accept the idea of sudden slipping or fractures at depths of several hundred miles, where temperatures are probably about 4000° f., it has been proposed that these quakes are produced by some type of chemical reaction occurring with explosive violance or by sudden recrystallization of unstable mineral forms, accompanied by a change in volume. A second theory assigns to them the same origin as shallow quakes, namely, sudden breaking of the rocks under stress. In a third, it is suggested that under the extremely high pressures that exist at depth primary shearing movements initiate explosive chemical reactions in the rocks. Violent atomic readjustments of this type have been shown by Professor Bridgman actually to occur, and frequently, in his laboratory experiments upon the shearing of materials under very high pressures. This type of reaction is, however, conditioned upon the existence of a sliding motion. Hence this third theory is really included in the second, because the explosive reaction is itself caused by the process of sliding.

Since 1920 some 300 foci deeper than 60 miles have been located with satisfactory reliability. Geographically these 300 are all concentrated into only four relatively small areas of the earth, namely, in the Japanese Isles where slightly more than 100 have been well observed; near the East Indies, where about the same number are known: along the West Coast of South America, where over 90 are clearly recognized; and finally, in a small area of the central Himalayas, where some two dozen have been recorded. It is significant that these areas are all regions of the highest present-day mountain-building activity and also provide a maximum abundance of shallow quakes.

In depth, deep quakes may originate at all levels down to the maximum of 400 miles thus far recorded. There are, moreover, interesting and significant peculiarities in the depth distribution. For example, of 93 South American quakes, 77 occur in an upper zone within 180 miles of the surface, few or none at all in the zone 180 to 300, whereas 15 occur in the deepest zone, 360 to 420 miles. Furthermore, the 16 ultra-deep quakes mentioned all occur inland, 500 or more miles from the coast, whereas the shallower group is concentrated along the coast line. The distribution apparently reflects stress and strength conditions at these depths. To a lesser degree the other geographical groups also exhibit interesting peculiarities in depth distribution. These, however, we shall not have to discuss.

What evidence is there as to which of the three alternative theories is most valid?

If an earthquake were of explosive nature, like a blast of dynamite, the initial ground movement would be everywhere outward; and it would be so recorded at all seismograph stations, regardless of their direction and distance. On the other hand if the movement at the origin is of a sliding type, the directions of the initial ground movements recorded will differ in a regular manner at different seismic stations. In some regions the initial movement will be toward, in others away from the focus. All studies of deep quakes which have thus far been made show a pattern for the initial motions such as might have been caused by slipping displacements at the origin. In no case has the explosive type of displacement pattern been observed. This evidence, of course, is unfavorable to the hypothesis that an appreciable percentage of deep quakes are of explosive or chemical type.

What seems to set off these deep quakes?

If earthquakes are produced by failure under geological stresses which are accumulating exceedingly slowly, then because of this very slowness we must expect the rocks to be poised for long times almost at the breaking-point. Hence a very slight additional stress might serve as the last straw to touch off a quake. Especially careful statistical studies of the times of deep earthquake occurrences have recently been completed. These times were studied in relation to their position with respect to the pull of the moon and sun to see whether small tidal forces exert detectable effects in controlling the times of origin. If the triggering effect really exists, it would be natural to suppose that the major stress causing the quake is of the same kind as the small one which, so to speak, gave it the final push. It was found that no triggering behavior could be shown in the case of the Himalayan, Japanese, or East Indian quakes. In the case of the South American group the question is still open. The odds seem to be about 70 to 1 that the moon's position does influence the times of occurrence of the South American quakes. These odds are based upon knowledge of 93 quakes and have fluctuated rather strongly in the past. For instance, when only 57 were available, the odds were about 300 to 1. We can not yet be sure, therefore, that the effect is real but must await further observations. Since the South American deep quakes occur at the rate of only 6 or 8 per year, it will perhaps be 5 to 10 years before the question can be answered with certainty.

In review, the picture which has been outlined is as follows: Deep quakes occur only in a few regions where normal or shallow seismic activity is especially intense. They occur at all depths down to 400 miles; the different regions exhibit certain individual peculiarities as to depth distribution. The quakes apparently involve a slipping rather than explosive type of motion at the source. In South America, there is tentative evidence that the quakes are correlated with the moon's tide-producing forces. From such evidence as this, most seismologists now believe that deep quakes are produced in the same manner as shallow ones and represent sudden fracture of strong rocks.

The facts also strongly suggest that a common stress system, operative at both shallow and deep levels, is the common cause of the shallow and deep quakes. In regions of intense mountain-building activity, the deep crust is evidently able to store large amounts of energy elastically, even when the stressed condition is built up slowly, by a normal process of geological evolution. This point is of prime importance because all other evidence concerning the rigidity of the deep earth is derived from studies of stress variations which are far too rapid to have geological sanction. But if the nature of deep earthquakes has been correctly interpreted, we conclude that in at least four different regions the mountain-building process is accompanied by abundant fracturing of strong materials at great depth. This does not imply, of course, that elsewhere the process of rock-yielding does not normally occur by the gentler method of slow flow. Indeed our best examples of present rapid rock movement are occurring without pronounced seismic activity and apparently without any deep earthquakes. I refer to the rapid vertical movements observed in northeastern North America and the Peninsula of Sweden which are explained as a viscous recoil after the melting of the thick ice sheets which recently covered these regions. This process evidently differs essentially from that involved in mountain building.

The messages which deep quakes are providing us are still incompletely interpreted and understood. But we have already translated enough of them to prove that the story they have to tell is of the utmost significance. The deep quakes furnish the most localized and specific messages which are received from the depths. Their future study, we may hope, will furnish evidence of capital importance concerning the mechanics of mountain-building processes.

***

The above article "Deep Earthquakes" by Prof. L. B. Slichter, of Massachusetts Institute of Technology, was the sixth of a series of eight radio addresses presented by the Geological Society of America under the theme "Frontiers of Geology".

**********

GROUND-WATER SUPPLY IN WILLAMETTE VALLEY, OREGON

"Although the extensive Willamette Valley of western Oregon has an average yearly rainfall of about 37 inches, the rainfall during the later half of the growing season is commonly no more than in the semi-arid eastern part of the state and may be even less and in many years is inadequate to mature crops fully. The scanty rainfall has been advantageously supplemented by irrigation."

The Geological Survey, United States Department of the Interior, in cooperation with the Department of Soils of the Oregon Agricultural Experiment Station, investigated, among possible methods of obtaining water for this supplemental irrigation and for other uses, the feasibility of pumping from wells and has now completed a report on the investigation. In order to make the report available in advance of publication, typewritten copies open to public inspection have been placed on file by the Geological Survey at its main office in Washington, D C., at the field office of the ground-water division in Portland, Oregon, with the State Agricultural Experiment Station at Corvallis, Oregon, and with the State engineer at Salem, Oregon.

The report interprets the basic data pertaining to the ground-water resources of the Willamette Valley that had previously been made available in like manner."

(The above news release of Oct.23, 1939, refers to a report on ground-water supply in Willamette Valley prepared by Arthur M. Piper, currently president of the Geological Society of the Oregon Country.)

- KNP.

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# GEOLOGICAL NEWS LETTER

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## Executive Board




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MEMBERSHIP APPLICATION

## GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

### Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ____________

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

______________________________
Address

______________________________
Business Address

______________________ ______________________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ______________________
______________________________

Sponsored by: ______________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________
Signature

## ANNOUNCEMENTS

### Lectures

Friday Nov.24 — Subject: GOLD IN OREGON, WITH PARTICULAR REFERENCE TO DREDGING.
Speaker: Mr. F. W. Libbey
As a mining engineer on the staff of the State Department of Geology & Mineral Industries, and one who has concentrated on problems relative to dredging, Mr. Libbey, a member of our society, speaks with authority on this subject. He has an extensive background of mining experience in various parts of western United States and was consulting mining engineer on the U.S.Engineers' recent mineral survey directed by Dr.Hodge. Gold, in addition to possessing a halo of romance, is of real economic importance to our western states, and a discussion of its geologic setting and the how's and why's of the way it is obtained, will afford us an evening of great interest.

Friday Dec.8 — Subject: VACATIONING IN THE LAND OF THE CLIFF DWELLERS.
Speaker: Mr. Thos. A. Carney
A tour thru these ancient dwellings of man by means of colored moving pictures, accompanied by a descriptive talk by one who has visited them recently, will open a fascinating vista in archeology. Our fellow-member, Mr.Carney, is well remembered as one who "puts on" his lectures in real style; no effort is spared to perfect the presentation and, on this occasion, he hints that it will be better than ever! (Note;- Tom made an extensive tour this summer - canyons and cataracts, mountains and mesas, as well as the New York and 'Frisco Fairs, fell before his ubiquitous cameras - so we are likely to see more than cliff dwellers during this evening!)

Friday Dec.22 — NO MEETING on account of the proximity of this date to Christmas.

Friday Jan.12 — Subject: GEOMORPHOLOGY OF EUROPEAN BATTLEFIELDS.
Speaker: Dr. Edwin T. Hodge.
A discussion of the facts of geology as they affect national interests. The reasons for the rise and fall of empires do not lie entirely in the economic nor ethnologic fields. The influences of land forms in the territories concerned sway the fortunes of contending nations to a remarkable degree. A review of this phase of geology in its relation to the present European conflict will help greatly to a true appraisal of the international situation. We are privileged to have it brought before us by our own Dr.Hodge, who, as we all know, is qualified to speak with authority on the subject.

### TRIPS

Sunday Dec.10 — Tualatin Valley. Further details on this trip in next bulletin.

## NEW MEMBERS

| | | |
|---|---|---|
| Kenneth E. Hamblen | BE 8368 | 2735 S.W. Fern |
| Miss Agatha Harding | | Franklin High School |
| Miss Emily Marshall | | Franklin High School |

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A postal card received from Mrs. May R. Williams written from Victoria, BC., on November 3rd, says that her mother had passed away and according to her own wish was being buried in Victoria. Sympathy of the Society members is extended to Mrs. Williams.

******

For the second time within half a year residents of Portland area have been startled by the occurrence of an unusual geologic event, in each case, fortunately, without injury to person or property.

The first was on the morning of July 2nd, when a meteorite passed noisily by the city, and stories of its flight and of the subsequent finding of a fragment appeared in the GEOLOGICAL NEWS-LETTER. The second occurred late in the evening of November 12, when a large area of northwest Oregon, western Washington and southwest British Columbia experienced the uncanny sensation of being shaken by an earthquake.

In this issue we are pleased to publish an article by our past-president, Ray C. Treasher, which sets forth in a clear and concise manner the scientific information concerning this very recent disturbance. To this he has added a review of the fundamental facts concerning earthquakes in general.

In order to present some idea of the "unusualness" or otherwise of this earthquake, there will be published in the next two issues a list of all earthquakes which have occurred in Oregon during the past hundred years or so. The modified Mercalli scale, given at the end of Mr. Treasher's article, will be used throughout the list to designate the relative intensity of each earthquake.

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THE PORTLAND EARTHQUAKE OF NOVEMBER 12, 1939.

Ray C. Treasher.

Portland, and the Pacific Northwest, were shaken by an earthquake at 11:47 p.m., Sunday, November 12, 1939. The point of origin (epicenter) was determined to be near North Bend, Washington, on the Mount Si fault. The intensity was IV (see modified Mercalli table), and considerable damage was done in the Seattle-Tacoma area. The shocks were felt from southern British Columbia to northern Oregon; they lasted about 10 seconds, and were followed, in some instances, by minor shocks. Motion was east-west, with a fairly slow period of vibration.

Damage in the Portland area was confined to "mental anguish" of those who were conscious of the earthquake, and perhaps a few broken bric-a-brac. At Tacoma, a cornice fell from a building, and a fire was started from broken electric power wires in a lumber yard. At Olympia, skylights and window glass suffered. Seattle building inspectors are concerned with cracked, and possibly damaged, buildings. Water mains in Aberdeen and Hoquiam were broken. Damage of the types mentioned here is characteristic of earthquakes.

Human behavior also ran true to form. People rushed from buildings and collected in groups in the open air. Police and newspaper offices were swamped with telephone calls that ranged from wild demands for protection from burglars to "what was it?".

The epicenter of the earthquake was determined by the University of Washington seismological staff working under the direction of Professor G. E. Goodspeed. Reports from three stations were plotted; Victoria, B.C., reported an earthquake from the southeast at a distance of 70 miles; Gonzaga University, Spokane, an earthquake from either east or west at a distance of 200 miles; and the University of Washington record of shocks from either east or west at a distance of 50 miles. Circles of proper radius were drawn from these three cities as centers, and the most common point was in the vicinity of the Mount Si fault.

The Mount Si fault zone is traced from a point almost due north from North Bend to the town of Sultan, along the west side of Mount Si. See Sultan and Cedar Lake quadrangles, Washington. The fault zone was described by Waters 1/, an abstract of which is given here:

"The earthquake of July 18, 1932, shows that the main epicentral area forms a north-south linear tract at the base of the Cascade Range between North Bend and Sultan, and another near Everett. The North Bend-Sultan dislocation is screened by glacial debris. It brings Mesozoic and Paleozoic plutonic and metamorphic rocks of the northern Cascades against the folded Tertiary sediments of the Puget Trough, but locally, late Tertiary andesite occurs on both sides of the fault. The dip of the plane appears to be vertical."

Thus we see that the Pacific Northwest has its active fault zones, along which movement takes place from time to time. It may be of considerable comfort to Oregonians to know that the Mount Si fault zone is some 200 miles distant, and even were an earthquake of destructive intensity to iriginate at that point, it is doubtful if its intensity would be greater than IV or V in the Portland area.

?

There has been so much interest in earthquakes since the shocks of November 12th, and so much misinformation about them that this paper was hurriedly prepared to meet the News-Letter deadline, at the request of the editor. It makes no pretense at being complete, or even well written; it may be informative, and it may confuse ideas still more. The reader is referred to any standard text-book on geology, and particularly to the book, "Earthquakes", by Nicholas Hunter Heck, published by the Princeton University Press, 1936, for more complete and authoritative information on the subject of earthquakes.

Earthquakes originate from the interior of the earth at a time when some sort of movement or internal adjustment takes place, and when this movement results in the slippage of one portion of rock past another, or when this internal adjustment causes some sort of a jar or jolt. A series of waves or vibrations start through the earth by various paths; it may be likened to striking one end of a long metal bar with a hammer - and small bits of paper which are placed on the other end will be seen to dance about. These bits of paper bounce because they are energized by the vibrations coming through the iron bar.

The solid rock itself moves but little, a mere fraction of an inch. In fact, there are many cases on record where men in a mine have gone through an earthquake and knew nothing of it. Their surprise at seeing wrecked surface structures when they come off shift can be imagined. The vibrations pass through the rock at varying speeds, and in various manners, and impart their motion to objects that rest on the surface. These objects are such as buildings, bridges, people, etc. These same objects behave as the bits of paper did on the end of the iron bar which had been struck. They bounce or weave about, depending on their mass, the period of vibration of the shocks, and many other factors.

If the uppermost solid rock is concealed beneath a mantle of soil, gravel, or other unconsolidated deposits, the behavior of these unconsolidated deposits may be illustrated in the following manner: place a small quantity of iron filings or fine sand grains on a piece of paper; now hold the paper suspended in air and lightly tap the underside of it with a pencil or other light object. It will be noticed that the paper moves so little as to justify the statement that it moved not at all but the filings or sand grains dance a merry jig. So it is with these unconsolidated deposits; they tend to "dance a merry jig" when the earthquake shocks (the pencil) reach the uppermost layer of solid rock (the sheet of paper).

The direction of the vibrations when they reach the surface may affect surface structures in various ways. If the vibrations are directed vertically upward, buildings and objects will be given a vertical movement. If the vibrations are directed horizontally, there will be a back-and-forth movement, in the direction of movement. If the vibrations are directed at an angle, objects will take both horizontal and vertical movements. In the latter case, columns may bounce their cap timbers upward, and fall in the direction of horizontal movement before the cap timbers come down. Buildings will tend to sway, and each building or structure has a certain rate of vibration at which it will vibrate the best, or most. If the earthquake vibration is the same as the inherent vibration-rate of the structure, the maximum damage will result for a particular shock.

These factors concern architects and construction engineers; most of us are concerned with the fact that the "stable" earth has suddenly gone beserk and it is a terrifying sensation. There is one point in regard to personal safety which cannot be stressed too often. It concerns the tendency of people to rush out-of-doors at the first sign of a quake. It is a most natural thing to do, and yet frequently, the most disastrous. They get outside just in time to meet the probable shower of bricks from chimneys, cornices and stone window ledges from buildings, and any other falling debris. Experience has indicated that in the majority of instances, the safest procedure is to step as close as possible to the nearest inside wall, or, preferably, to the nearest inside doorway. The walls are the principal supports of any structure, - they usually fail last, and they tend to deflect falling debris.

The intensity of earthquakes is usually rated according to roman numerals from I to XII, following the modified Mercalli Intensity Scale which is given below:

## MODIFIED MERCALLI INTENSITY SCALE 2/

I. Not felt except by a few under especially favorable conditions.

II. Felt only by a few persons at rest. Delicately suspended objects may swing.

III. Felt quite noticeably under favorable circumstances, but many people do not recognize seismic nature of the disturbance and many do not notice it. Standing automobiles may rock slightly. Like passing of a truck. Duration estimated.

IV. Felt by many or most. Some awakened. Dishes, windows, doors disturbed, walls crack. Sensation like heavy truck striking building.

V. Felt by nearly everyone; many awakened. Some dishes, windows, etc. broken; a few instances of cracked plaster; unstable objects obverturned. Disturbance of trees, poles and other tall objects sometimes noticed. Pendulum clocks may stop.

VI. Felt by all; many frightened and run outdoors. Some heavy furniture moved, a few instances of fallen plaster or damaged chimneys. Damage slight.

VII. Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.

VIII. Damage slight in specially designed (brick) structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Disturbed persons driving motor cars.

IX. Damage considerable in specially designed (masonry) structures; well designed frame structures thrown out of plumb; great in substantial (masonry) buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.

X. Some well built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and water. Water splashed (slopped) over banks.

XI. Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipe lines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.

XII. Damage total. Waves seen on ground surfaces. Lines of sight and level distorted. Objects thrown into the air.

The complete, unabridged scale is more descriptive, but it is somewhat lengthy and the above table will give the reader an idea of the relative value of the various numbers. Incidently, in regard to the destruction of buildings, it has been noted that log cabins are the most secure of any buildings!!

1/ Waters, A.C., and Bradford, D.C., Active fault along western base of Cascade Range in Washington: (abstract) Geol.Society of America, Proceedings for 1933, p.308, June 1934. (abstract) Pan-American Geologist, vol.59, no.4, p.310, May 1933.

2/ Heck, Nicholas Hunter, Earthquakes: Princeton University Press, pp.55 and 56, 1936.

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Note: Since this article was written the location of the fault has been twice changed (Oregon Journal, November 18,1939). It was first changed to Darrington district, north of the Mount Si fault, and later was tentatively established on the Olympic Peninsula. These changes are based on checks with seismographic stations at Chicago, Pasadena, Pittsburgh, New York and Washington.

- R.C.T.

## GEOLOGY IN ENGINEERING

For my contribution to this series of talks I have chosen to discuss a very practical matter - namely, the intimate dependence of the works of man on an understanding of the much older works of nature or, in other words, the dependence of engineering works on geologic conditions. The amazing activity and inventiveness of man are responsible for unbelievably enormous structures - skyscrapers, bridges, dams, and numerous others of similar impressiveness. But none of them could have been made without the contribution of nature's resources, and few would be safe without careful adjustment to the conditions that nature imposes.

Man may be the greatest builder of all times, but he is by no means the first one. Most living things seem to have that urge. The ant and the bee, the gopher and the mole are all builders. But the beaver seems to have been the most resourceful primitive engineer for he learned how and where to build dams and create reservoirs and how to keep them under control. Therefore construction began millions of years before man came upon the scene.

It appears that man's first structures were simple, utilizing nature's materials as is, but, after he had learned how to make new and better products out of those furnished to his hand by nature, an entirely new era in building began- an era that may be reaching a climax in our own day. Structures built in recent years are more numerous, larger, higher, heavier, deeper, more complicated, and both more useful and more dangerous than ever before. With these changes has come greater and greater need for perfect adjustment to the natural physical conditions surrounding them and affecting their success. This development has opened up an entirely new extreme of responsibility in the borderland between engineering and geology. For this is the meeting ground of the geologist who speaks for nature and the engineer who speaks for man. They sit at the same council table, these two, poring over specifications, one interpreting the geologic conditions imposed by nature and the other working out some way to satisfy man's needs on nature's terms.

Such cooperation between the geologist and the engineer is not wholly new but it is vastly different from what it used to be in range of responsibility and effectiveness.

In former times the geologist was usually called in too late to help or not called in at all. This situation was brought to a head by failures that were charged chiefly to inadequate geologic information or disregard of critical local physical conditions.

Better results came out of certain other experiences. Among these was the well-known Catskill Aqueduct planned to furnish to the City of New York several hundred millions gallons of water per day from a distance of more than 100 miles. For the first time on record geological service was employed systematically from the beginning and was maintained to the very end through nearly 20 years of exploratory investigation, planning, designing, constructing, and putting into successful service. Alternative sites for every dam and tunnel or other major structure were carefully investigated and compared to determine their relative advantages and dangers. Every spot of uncertain character was searched. The depth at which the tunnels should be placed in the earth to avoid superficial weaknesses and other dangers was fixed with full regard for every determinable geologic condition. More than 30 different rock formations were penetrated by the 100 miles of aqueduct of that system. No limits were placed on exploratory geological investigation providing there appeared to be reasonable promise of better and more usable data.

The wide range and variety of engineering demand, together with the equally great variety of natural features and physical conditions represented on this project, gave excellent opportunity to test the value of such practical geological studies. Natural weaknesses indicated by exploration were successfully handled. Designs and treatments worked out to meet local conditions were successful. Estimates held true, and the system has worked. It was this kind of experience that afterward led to extensive adoption of similar practice on many other projects.

Such service has wide application. Every building must have suitable support. Every bridge must depend first of all upon the integrity of its supporting piers and anchors, and they in turned on their earth and rock foundations. Whatever the natural conditions are, structures must be built to stand firm. To insure this result, the geologic conditions must be determined with certainty, and nature's processes must be correctly gauged. Weaknesses or defects threatening their safety must be searched out in such ways and to such ends as only the geologist knows and then they must be met by such special design and construction as only the engineer can invent. A geological reconnaissance must be made, an exploratory program must be laid out, and the resulting data must be interpreted and translated into practical terms fitting the particular project. To make suitable field inspection, to indicate what important questions are still unsettled, to suggest how to secure more complete or more reliable data, and to determine what they mean is the task of the geologist. If he can do these things successfully and can transmit this information in usable form to the designing engineer and the construction staff, he is by that token an engineering geologist.

The dangers presented by larger and larger works throw new emphasis on better understanding of the physical conditions that surround them, and this brings the geologist into a major responsibility. Most structures can be made effective and safe by overcoming unfavorable conditions, and this is commonly accomplished by special design or method of construction or other treatment. Often it is only necessary to determine precisely what the physical facts are in order to insure results, because accumulated engineering experience may have discovered already from instances of similar character what to do.

But I must not forget to emphasize a new element in this practical field. No longer ago than 1928, when the late Calvin Coolidge, then President of the United States, appointed the Colorado River Board to report on the feasibility of building Boulder Dam, one of the mileposts in applied geology was reached. General Sibert, of the Engineering Corps of the United States Army, was named chairman, and two civilian engineers and two geologists were appointed as the other members of the Board. That doesn't sound very revolutionary, but it was new. For up to that time no board or commission charged with the duty of judging the physical feasibility of a great project had ever been made up with such even balance of engineering and geological advisory talent. There was vitally important work for both groups to do, and it worked. Since that time recognition of the geologist on such projects has been the rule rather than the exception.

This Boulder project, which had been before Congress in one form or another for several years, had finally reached an impasse in 1928 when its critics charged that the proposed dam could not be built. It was largely because of that situation that the Colorado River Board was appointed to determine whether local conditions indicated that such a structure could or could not be safely built, and, if it could, where and how. There are just such vital matters in every individual case. In this one it was necessary to determine whether Black Canyon or Boulder was the more favorable, what particular location was the best, whether the rock formations at that spot were strong enough to carry the load and thrusts of a dam more than 700 feet high, and sound enough to permit safe excavation in the canyon walls of diversion tunnels large enough to care for the river while the dam was building. It was necessary to judge the quality of more than 120 feet of sand-gravel river fill and how this material would behave under excavation. It was even more important to determine whether satisfactory conditions would be encountered in the rock floor beneath. There was question whether the river in the beginning had laid out its course on a fault zone or other earth weakness, and whether there was danger of renewed movement that could endanger the structure. Even though the canyon walls might be strong enough to support such a great dam, were they also impervious enough to prevent the water of the reservoir from leaking out and thus cheating the service it is expected to give? These questions and many others had to be answered.

The last two decades have seen a greater number of large projects requiring similar searching study than all former time - dams, reservoirs, bridges, tunnels, subways, skyscrapers, water works, highways, and a host of less pretentious works.

For example, there are bridges and bridges - such as Golden Gate with one of its piers on a submerged ledge of serpentine rock; San Francisco Bay with some of its supports on muds and silts; the George Washington over the Hudson with one pier on tilted sandstone beds and relatively incompetent shales; and the famous old Brooklyn with one pier on glacial deposits more than 100 feet above the rock floor. Each one has its own geological and engineering story which I must not take time to tell.

Then there are tunnels - hundreds of miles of tunnels - even more dependent on the nature and quality of the ground - tunnels for aqueducts, for subways, for railways, and for vehicles. Some face difficulties because they are large, some because they must be tight enough to carry water, and some simply because they penetrate caving ground, or discover too much ground water, or find the surrounding rock weakened by deformation or softened by decay. Among those now under construction are the new Delaware Aqueduct, with 100 miles of deep pressure tunnels to carry additional water to New York City; the Mono Craters tunnel piercing a barrier of volcanoes and lava flows to make additional water available to the city of Los Angeles. And the new Continental Divide tunnel in Colorado, to bring waters from the upper Colorado River through the Rocky Mountain front range to the margin of the Great Plains.

Then there are dams - hundreds of dams - both completed and now building. Recent years have witnessed a greatly increased development of Federal projects, especially under the Department of the Interior. The Bureau of Reclamation is now building Coulee Dam on the Columbia River, a masonry structure 4000 feet long and 500 feet high, the largest of its kind ever undertaken; Shasta, on the Sacramento in Northern California, almost as large; Bartlett Dam near Phoenix, Arizona;

Parker Dam on the lower Colorado, with foundations nearly twice as deep as Boulder; Imperial Dam built largely on river sand, and Marshall Ford at Austin, Texas, on limestone.

The Tennessee Valley Authority has just finished Norris Dam and Joe Wheeler and is busily engaged in building Chickamauga, and Gilbertsville, Pickwick Landing, Hiwassee, and others in the Tennessee Valley system.

Such structures in surprising number are distributed at points of vantage for flood control, or water supply, or irrigation, or power, or navigation, from the Atlantic to the Pacific Coast. Not all are of great magnitude, but all have their own peculiar problems. For each one reliable geologic information was essential to its success.

And so geology, once considered mostly a descriptive and historical science, has in recent years taken on the aspect of an applied science. Instead of being largely speculative as perhaps it used to be, geology has become factual, quantitative, and immensely practical. It became so first in mining as an aid in the search for metals; then in the recovery of fuels and the search for oil; and now in engineering in the search for more perfect adjustment of man's structures to nature's limitations and for greater safety in public works.

- Dr. Charles P. Berkey

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The above article "Geology in Engineering" by Dr. Charles P. Berkey, Newberry Professor of Geology at Columbia University and Secretary of the Geological Society of America, was the seventh of a series of eight radio addresses presented by the Geological Society of America under the theme "Frontiers of Geology".

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# GEOLOGICAL NEWS LETTER

VOL. 5 NO. 23 PORTLAND, OREGON Dec.10, 1939

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Executive Board



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THE GEOLOGICAL NEWS-LETTER

Official Publication of the

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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Portland, Oregon

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MEMBERSHIP APPLICATION

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ____________

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

______________________________
Address

______________________________
Business Address

______________ ______________
Telephone Number Occupation

I am particularly interested in the following branches of Geology: ______________
______________________________

Sponsored by: ______________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________________
Signature

## ANNOUNCEMENTS

### Lectures

ALL LECTURES ARE HELD IN AUDITORIUM OF PUBLIC SERVICE BUILDING
SIXTH AVENUE AND TAYLOR STREET.

Friday Dec.8 — Subject: VACATIONING IN THE LAND OF THE CLIFF DWELLERS.
Speaker: Mr. Thos. A. Carney
A tour thru these ancient dwellings of man by means of colored moving pictures, accompanied by a descriptive talk by one who has visited them recently, will open a fascinating vista in archeology. Our fellow-member, Mr. Carney, is well remembered as one who "puts on" his lectures in real style; no effort is spared to perfect the presentation and, on this occasion, he hints that it will be better than ever! (Note: Tom made an extensive tour this summer - canyons and cataracts, mountains and mesas, as well as the New York and 'Frisco Fairs, fell before his ubiquitous cameras - so we are likely to see more than cliff dwellers during this evening!)

Friday Dec.22 — NO MEETING on account of the proximity of this date to Christmas.

Friday Jan.12 — Subject: GEOMORPHOLOGY OF EUROPEAN BATTLEFIELDS.
Speaker: Dr. Edwin T. Hodge
A discussion of the facts of geology as they affect national interests. The reasons for the rise and fall of empires do not lie entirely in the economic nor ethnologic fields. The influences of land forms in the territories concerned sway the fortunes of contending nations to a remarkable degree. A review of this phase of geology in its relation to the present European conflict will help greatly to a true appraisal of the international situation. We are privileged to have it brought before us by our own Dr. Hodge, who, as we all know, is qualified to speak with authority on the subject.

Friday Jan.26 — Subject: CHEMICAL ASPECTS OF FLUORESCENCE IN MINERALS.
Speaker: Dr. A. H. Kunz, Professor of Chemistry, University of Oregon, Eugene, Oregon.
This is a basic and important phase of geology which has not yet been treated at any of our lectures, and its presentation on this occasion by Dr. Kunz assures us of a clear, interesting and valuable contribution to our understanding of the subject. He will begin with a review of classical atomic theory, and follow with an outline of modern ideas of atomic structure and then present an interpretation of mineral structure and fluorescence on the basis of the previously discussed modern conceptions. His talk will be illustrated by lantern slides.

### TRIPS

Sunday Dec.10 — Tualatin Valley. Lloyd Ruff, leader.
Caravan will leave S.W. Front Avenue and Yamhill Street at 9:00 a.m., going through Oswego. First stop will be at Cook to compare this gravel type with that found in the Portland area. Bull Mountain will

be visited to study the physiographic features of this part of Tualatin Valley. Proceeding down west slope of mountain a clay tile plant near Scholls. Hillsboro next stop to examine a nest of large boulders, probably residual from old lava flow. Passing through Forest Grove to Scoggins Creek quarry where a stop will be made to collect fossils. Then to Gaston and Wapato Lake, Chehalem Valley to Newberg, where caravan will disband. Mileage approximately 65 miles.

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In accordance with Article VIII Section 1 of By-laws, the following members have been appointed as a Nominating Committee:

Leo Simon, chairman
Mrs. Elizabeth Barr
A. E. Boyrie
Geary Kimbrell
Tracy Wade

**********

"The Story of Old Oregon as told by fossils" was the subject of a lecture given by A. W. Hancock to students of Hood River High School on Saturday evening, November 25th.

Thomas A. Carney gave an illustrated lecture on "Through the Land of the Cliff Dwellers" and showed colored moving pictures of the New York and San Francisco Fairs Friday night, December 1st, at the First Baptist Church.

We have had so many requests from members for a new directory, that we expect shortly after the first of the year to publish a new roster. In order that this roster may be complete and up to date, will those members who have moved, or have had a change of telephone number, please communicate with the Business Manager very soon?

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CHANGE OF ADDRESS

Mr. and Mrs. Paul W. Howell, P.O. Box 38, Madras, Oregon.

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## EARTHQUAKES IN OREGON --- 1846 - 1938.

Compiled by
Ray C. Treasher
Geologist, Oregon State Dept. of Geology & Mineral Industries.

This list of Earthquakes in Oregon --- 1846-1938, has been abstracted from a recent bulletin of the Seismological Society of American and from reports by the United States Coast and Geodetic Survey, and does not represent an original contribution. Its value, if any, is that of having the Oregon references segregated from the great mass of earthquake records. Included with the Oregon references are a few from southern Washington.

Full details, in some cases, are not given for the sake of brevity. The principal one of this nature is the "State Line Earthquake" of July 15th, 1936. The reader is referred to the catalog for complete information on these reports.

The earthquake reports for this paper are taken from three reports. The first one covers a period from 1846-1928 1/ by Townley, for the Seismological Society of America. Since 1927, the U. S. Coast and Geodetic Survey has assumed the responsibility for collecting, recording, and publishing earthquake data for the United States. This information is released in annual publications of the C. & G.S., known as United States Earthquakes 2/, for 1928 to 1936, inclusive. Reports for 1937 to September 1938 are released quarterly by the Seismological Field Survey of the C. & G.S., at San Francisco 3/.

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1/ Townley, Sidney D., and Allen, Maxwell W., "Descriptive catalog of earthquakes of the Pacific Coast of the United States 1769-1928": Seismological Society of America, Bulletin, vol.29, no.1, pp.253-258, 261, 262, 263, 267; January 1939.

2/ "United States Earthquakes": United States Coast and Geodetic Survey, Serial no.483, 1928; no.511, 1929; no.539, 1930; no.553, 1931; (1932); no.563, 1932; no.579, 1933; no.593, 1934; no.600, 1935; no.610, 1936.

3/ Abstracts of Earthquake Reports from the Pacific Coast and the Western Mountain Region: United States Coast and Geodetic Survey, Seismological Field Survey, San Francisco, California, issued quarterly; Jan.1 to Mar.30, April 1 to June 30, July 1 to Sept.30, Oct.1 to Dec.30, for 1937, and up to Sept. 30, 1938.

## EARTHQUAKES IN OREGON --- 1846-1928 (reference 1)

1846-1852. Exact date not given. In Oregon City, on Rock Creek, near Portland, explosions like those of a cannon were heard for nearly the whole of a day. At first these were about half an hour apart; then they came nearer together, until at last they were no further apart than one minute or so; finally they died away. The water in Rock Creek did not run for three days. - Verbal account of Geo. J. Ainsworth, Esq. (It is quite possible that these sounds were not due to earthquakes).

1865 November 26. (?) at sea. Between San Francisco and Portland, an earthquake.- Mining and Scientific Press. (11, 376. It is not stated that this shock was felt in Oregon).

1866 June.- B.MS.; Gold Hill News, June 2, 1866. (Jackson County).

1866 December. III. The Dalles (Wasco county). - P.

1866 December? A smart shock at The Dalles. - Mining and Scientific Press, 14,46.

1867 January 8. Daylight. X. Fort Klamath. Frightful earthquake. (Holden printed a long letter written by L. Tennyson and originally published in the Oregon Sentinel. This letter gives all the lurid details of a terrible earthquake. It is now known that there was no earthquake on January 8, 1867 at Fort Klamath and that this account came from the fertile imagination of a soldier by the name of Warren, stationed at Fort Klamath, who evidently was seeking diversion and musement during the dull winter months. No such person as L. Tennyson was ever enrolled in the United States Army).

(1872 December 14. 9:40 p.m. Portland. Duration fifteen seconds. The Dalles, four or five shocks. Umatilla, three shocks. - Amer.Jour.Sci., 3d.ser.5,262).

(1872 December 15, 9:00 a.m. The Dalles.-Amer.Jour.Sci.,3rd ser.,5,262).

1872 December 16. Eugene. One shock.-P. (Probably the same shock that was felt in the Puget Sound region at 9:17 a.m.).

1872 November 22. A little after 9 p.m. VIII. A shock was felt from Portland, Oregon, to San Francisco, Cal.; most severe at Crescent City, Cal., and Port Orford, Oregon.- C.G.R. Nearly every brick building in Crescent City was injured; chimneys were damaged there and up the coast to Port Orford, in the interior as far as Jacksonville, Oregon, and east from Crescent City as far as Happy Camp, on the Klamath.- B.MS. At sea, N. of Cape Mendocino.-C.G.R. November 22. Severe shock at Linckville, Klamath Lake. In Jackson and Josephine counties, and Trinity county, Cal., the shock was strong and lasted nearly a minute.- B.MS. Fort Klamath, Oregon.-B.MS. Red Bluff; Eureka; Albany; Roseburg.-CGR. (Amer.Jour.Sci., 3rd ser., 7, 287).

1876 August 16. 1:15 p.m. Latitude 41° 55' north, longitude 126° 25' west, off the southern part of Oregon. Heavy.- CGR. (Am.Jour.Sci., 3rd ser.15,21. It is not certain that this shock was felt in Oregon).

1877 Oct.12. 9 a.m. Cascades. (From the wording of the account it would seem that chimneys were overthrown in both this shock and the following.- Amer. Jour.Sci., 3rd ser.,15,25. Reid gives this shock as occurring on October 13 at 9 a.m.).

1877 October 12. 1:53 p.m. VIII. Portland. 1:45 p.m., Marshfield; 1:52 p.m., Cascades.- CGR. (Chimneys overthrown).-P. (In Plummer's published report it is not stated that chimneys were overthrown. See Publications of the Astronomical Society of the Pacific, 8, 79).

1877 October 26. 5-6 p.m. Latitude 43° 13' north, longitude 128° west. Severe shock.- CTR. (Amer.Jour.Sci., 3rd ser.,15,25. This is 300 to 400 miles off the southern coast of Oregon. No reports of the shock being felt on land).

1879 ? Portland. - P.

1879 ? ? There was a smart shock in Portland, and only two or three shocks have been felt since that time. - Communicated by Geo.J.Ainsworth, Esq.

1880 December 12. 8:40 p.m. Severe shock near Puget Sound. W.T., from Victoria to Portland.-CGR (VII) - P.

1882 April 30. 10:48 p.m. IV Portland. Two shocks.-CGR: P. (A few seconds apart; second shock more severe; felt in Washington and Victoria.- Amer.Jour. Sci., 3rd ser., 25, 356).

1882 May 1. 12:25 a.m. Portland - Fuchs.

1883 September 28. About midnight. Portland, two shocks.- CGR. 0h 0m 10s, Portland. Two shocks.-P.

1884 January 3. 20h 40m (8:40 p.m.) IV. Portland. A light shock.-MWR (Jan.1884, p.26). One shock.-P.

1885 October 10. Between 1h and 2h (1 a.m. and 2 a.m.) III. East Portland. Three very light shocks.- MWR (Oct.1885, p.265). 1h 30m. II.-P. See 1886 October 13. (Amer.Jour.Sci., 3rd ser.,32,14. The significance of Holden's reference to October 13, 1886, is not apparent).

1891 September 16. 8:30 p.m. Salem. The shock was brief and distinct, and was followed by a wave-like motion lasting several seconds. It was felt in all large buildings; windows rattled.

1891 November 8. About 8:00 p.m. Ashland. Following is the newspaper account: "The first time an earthquake has been felt in Ashland for years was last night about 8 o'clock, when a distinct shock, though light and lasting only a very few seconds, caused a general rattling of window panes in many buildings in town. The shock was not heavy enough to cause even timid people any alarm."

1892 February 3. 8:30 p.m. VII. Portland. A severe earthquake shock occurred here at 8:30 o'clock tonight. Brick buildings swayed and windows rattled, terrifying the inmates, who in many instances rushed into the street. The shock lasted about thirty seconds, and was probably the most severe earthquake ever felt in this city. As far as known no damage was done.
8:27 p.m. Astoria. The vibrations were from southwest to northeast. It lasted about three seconds, causing houses to shake perceptibly, but no damage was done.
8:32 p.m. Salem. The vibrations were from northeast to southwest. There were three distinct shocks. Windows rattled and buildings trembled, but no damage is reported.
8:20 p.m. Yaquina Head Lighthouse (Lincoln county). A light shock about 8:20 p.m.
8:40 p.m. Warrior Rock Lighthouse (Columbia River) a shock February 3, north to south.
(An intensity of VII for this shock is probably too high).

1892 April 17. 2:50 p.m. Portland. At 2:50 o'clock this afternoon two heavy shocks. They lasted about ten seconds each, and the vibrations were from west to east. Many persons became frightened and rushed into the street when the buildings began to tremble. No damage. The observer of U.S. Weather Bureau reports one light shock at 2:56 p.m.

1893 March 6. Umatailla. A succession of shocks were felt here to-night. One of the walls of a large stone building was thrown down by the force of the shock (VII? VIII?).

*1893 August 14. 5:07 a.m. IV. Toutle River (Cowlitz county). Mr.Fred G.Plummer reports: "Earthquake at 5:07 a.m. N.40° W., eleven miles from summit of Mount

* Reports from southern Washington.

St.Helens. One sharp shock vertical. Intensity IV. Distinct rumbling preceding for four seconds, near at hand toward the mountain". At Green River Mines, IV, lateral, rumblings.-P.

1895 February 25. 4:47 a.m., standard time. III. Portland. Three slight shocks from northward.
Portland: Three distinct shocks of earthquake were felt here early this morning. Each shock lasted about three seconds. The first occurred at 4:47. The vibrations were from north to south.- San Jose Mercury, February 26, 1895. (See also earthquakes in Washington).

*1895 February 25. 4:47 a.m. Tacoma, and points to the southward. Three shocks from S.10° W., intensity III; Green River Mines, intensity V. My "home-made" seismograph records only horizontal shocks and showed only one-twentieth of an inch. The directions noted would place center near Toutle River, where I observed a vertical shock, already reported (1893).- F.G.Plummer, Tacoma.
Tacoma; This morning's earthquake shock was plainly felt in Tacoma, on top of the hill, and at Edison, at Sumner, Puyallup, and Steilacoom. There were three light vibrations occurring just before 5 o'clock, the general trend being from north to south, though at Steilacoom the vibrations seemed to be from east to west.- San Jose Mercury, February 26, 1895. (See also Oregon).

1896 April 2. About 3:20 a.m. Portland. About 3:20 a.m. a single shock of brief duration was felt here. The shock was felt as far south as Salem.
McMinnville: The inhabitants were awakened at 3:17 this morning by an earthquake (VI). Two or three distinct shocks followed in quick succession, with a loud rumbling noise coming from the west. The earth appeared to tip toward the east.- S F.Chronicle (April 3, 1896, p.4).

1896 June 5. 10:20 p.m. Cape Blanco Lighthouse (Curry county). "Tower vibrated considerably for about thirty seconds. I could not say positively that it was caused by an earthquake".-MSS. kindly communicated by the USLH Board.

1896 August 26. Mount Hood (Wasco county). Newspaper dispatches report the narrow escape of a party of tourists on Mount Hood on the afternoon of August26 from an avalanche. The dispatches convey the impression of a volcanic eruption, but it seems entirely possible to explain the occurrence without any such assumption. A slight earthquake may have accompanied, or even caused, the avalanche. No reports have been received of any disturbance elsewhere on that day.

1897 January 26. 2:45 p.m. Newport (Lincoln county). Sharp; lasted about three seconds.

1897 December 6. 8:30 p.m. Forest Grove (Washington county) Slight.- (MWR, Dec.1897, p.542).

(1902 June 14. 8 p.m. Newport, Lincoln county. Sharp shock; no damage.- Reid's Scrapbook, 1, 15).

(1902 June 15. 1 a.m. Newport, Lincoln county. Sharp; no damage.- Reid's Scrapbook, 1, 15).

1902 December 2. 2 a.m. Kerby (Josephine county). Slight,- E.F.Meissner.

1902 December 4. Between 8 p.m. and 9 p.m. Hood River (Wasco county).- J.Hengst.

1902 December 18. 7 a.m. Fox Valley, Linn county. Two distinct shocks.- C.D.Wilson.

(1905 November 11. 2:29 p.m. Baker. A shock which was quite severe in Idaho was felt from Baker to Salt Lake City, Utah. For a fuller account see the earthquakes in Idaho.- Reid's Scrapbook, 1, 107).

(1906 April 2. 9 P.M. Ashland, Jackson county).

(1906 April 12 8:50 P.M. Ashland, Jackson county).

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* Reports from southern Washington.

1906 April 18. Paisley (Lake county). "Earthquake shocks were reported at Marshfield (Coos county) and Paisley, but no details were given". - E.A.Beals, U.S.Weather Bureau, Portland. (The great shock in California on April 18, 1906, was felt by a few people in several places in southern Oregon. According to the Report of the State Earthquake Investigation Commission, Coquille, near the coast in Coos county, was the most northerly point at which the shock was felt. Marshfield, mentioned by Beals above, is a dozen or so miles north of Coquille, but it is not mentioned in the "Report". It is also stated in the "Report" that the shock at Paisley occurred on April 19, and not on April 18. Smith states that the shock of April 18 was felt in Eugene, but in the "Report" it is recorded that reports from Eugene state that the shock was not felt there. Places mentioned in the "Report" where the shock was felt were Bandon, Kerby, Williams, Port Orford, Grants Pass, Medford, Ashland, Merrill, Drew's Valley, in addition to the places already mentioned. The shock of April 18 was felt in Klamath Falls, according to Captain O.C. Applegate of that city. As Klamath Falls is nearer the origin than Paisley, it is not impossible that the shock of April 18 could have been felt there.- RSEIC, 1, 163; BSSA, 9, 67; personal interview with and letter from Captain O. C. Applegate).

(1906 April 19. 1:30 a.m. Paisley, Lake county. Strong enough to awaken people generally. Three other shocks in the following one and a half hours.- RSEIC, 1, 163, 414).

(1906 April 23. 1:12 a.m. VI. Grants Pass. Furniture moved; several windows cracked.- Morning Oregonian, April 23, 1906).

(1906 April 29. 9 a.m. Paisley, Lake county. Milk spilt.- RSEIC, 1, 418).

1909 October 28. 10:45 p.m. Southwestern Oregon. The heavy shock experienced in Humboldt county, California, on October 28 was also felt in southwestern Oregon. It was reported from Grants Pass, Roseburg, Gold Beach, and Marshfield. For a full account see the list of California earthquakes.- Reid's Scrapbook 3, 18, 19, 40, 41.

1913 March 15. 12:40 p.m. Medford, Jackson county. Three distinct shocks.- BSSA, 3, 35; Reid's scrapbook, 3, 174.

1913 March 15. Just before 7 p.m. Roseburg, Douglas county, Dishes, etc., rattled for three seconds.- Reid's Scrapbook, 3, 174.

1913 October 14. 3 p.m. Seven Devils Region. Along the boundary line between Oregon and Idaho. Broke windows and dishes. Felt at Homestead, Baker county.- BSSA, 3, 204; Morning Oregonian, October 15, 1913.

1914 March 22. 6:30 a.m. III to IV? Portland. Jar, lasting five or ten seconds; felt by hundreds.- BSSA, 4, 45; 9, 68.

1914 September 5. 2 a.m. Portland. A shock was felt at various places in southwestern Washington on September 5 at 1:40 a.m. Smith reports it felt in Portland September 6. The probability is in favor of the later date.- BSSA, 4, 220; 9, 68.

1915 January 18. Summerville, Union county. Medium; felt in surrounding district.- BSSA, 5, 54; S.F.Chronicle, January 19, 1915.

1915 January 19. Summerville. Felt at La Grande, fifteen miles southwest.- MWR, 43,40. Probably the preceding shock. Reid has only one card, and that for January 18.

1915 May 19. 7 p.m. Portland. Reported as though localized in eastern part of Portland; rattled dishes, rocked chairs, disarranged books in cases, caused fright. Three shocks.- BSSA, 9, 68.

1915 October 2. 10:55 p.m. Baker, La Grande, Ontario. People frightened and hurriedly left hotels. This was the destructive shock which originated in Pleasant Valley, Nevada. See the Nevada list for a full account.-Reid's Scrapbook, 4, 77; BSSA, 9, 68.

1915 October 19. 11:30 p.m. Fruita, Wallowa county. One shock.-MWR,43,552.
1916 January 4. 10:40 a.m. IV. Newport, Lincoln county. Two shocks, rattled dishes.- MWR, 44, 39. (Smith says January 5).
1916 May 12. 6:26 p.m. See earthquakes in Idaho.
1916 May 28. Near Baker. Slight.- MWR, 44, 304.
1919 December 25. 10 p.m., and following hours. IV- ? Bull Run, Clackamas county. First shock awakened people; other shocks through nights.- MWR, 47, 907.
1920 April 14. 3:45 a.m. V Crater Lake, Klamath Co., Three shocks; felt at Fort Klamath.- MWR, 48, 434.
1920 November 9. 12:20 p.m. or 12:30 p.m. III? Portland. Felt by several; duration five seconds; time 12:20 p.m. At Astoria a weak shock was reported at 12:30 p.m.-MWR, 48, 681.
1920 November 28. 3:30 a.m. Northern Oregon and southern Washington. Turner, from instrumental data, located the origin of a shock at this time off the northwestern shore of Vancouver Island. Reports of a shock strong enough at Hood River to awaken sleepers and cause alarm, which was felt at Portland and possibly over a considerable portion of Oregon and Washington, judging from an ambiguous press dispatch from Portland, suggest that the shock recorded at a number of seismographic stations may have originated in northern Oregon or southern Washington. This statement in the press dispatch referred to, that the shock was pronounced at Spokane and lasted ten minutes there, seems to have been a misstatement of the fact that the shock recorded for ten minutes on the seismograph there as a pronounced earthquake.- CE 1918-1924, BAAS; Reid's Scrapbook, 4, 115; BSSA, 10, 317; MWR, 48, 681.
1920 December 15, 10:50 a.m. III. Cascadia, Linn county. Observer gave intensity as III, but said shock was felt by everyone; sound like a loud report was heard.- MWR 46,790.
1921 February 25. 12 a.m. V. Cascadia. Felt by nearly all, over an area six by twelve miles; intensity as given by observer.- MWR, 49, 110.
1921 March 4. 12 noon. II to III. Portland. Several shocks; felt by several people.- MWR, 49, 177.
*1921 September 14. About 3 a.m., 5 a.m., 5:01 a.m., and following fifteen minutes. V or VI. Dixie, Walla Walla County. Local; felt only feebly ten or fifteen miles away. Sharp jars as of vertical blow from beneath.- BSSA, 11,195.
1921 September 22 . 11:20 a.m. IV. Portland. One report gives duration of ten seconds, and another twenty seconds.-BSSA, 11,198; MWR, 49,552.
1922 January 31. 5:17 a.m. Southern Oregon. A severe shock with its epicenter at sea off Cape Mendocino, California, was felt in southern Oregon on January 31. It was reported felt in Ashland, Grants Pass, Canyonville, Roseburg, Marshfield, Medford, and Eugene. One report says that the shock was felt also in Klamath Falls. See the California list for a more complete account of the shock.- S.F.Journal, February 1, 1922; MWR, 50, 112.
1922 May 15. 9:30 a.m. III to IV. Portland.- SDGU, S.F.Chronicle, May 16, 1922.
1922 July 5. 10:06 a.m. III. Near Portland. Duration fifteen seconds.- MWR, 50, 390.
1922 October 15. 8:20 p.m. Hermiston, Umatilla county. Three shocks, of three, three and one seconds duration. Felt by several. - MWR, 50, 562.
1922 December 12. Pendleton district. Distinct.- SDGU.
1923 January 10. 8:29 p.m. VI-? Lake county. This shock recorded at a number of seismographic stations; Turner at Oxford placed the origin in northern

* Reports from southern Washington.

California, but the reports of perception point clearly to a source near or north of Goose Lake, in Oregon.
The shock was strongest in the Lakeview district; at Lakeview the main shock was of about intensity VI, and aftershocks were felt at 10:15 p.m. and 11:45 p.m. The shock was felt west as far as Klamath Falls. At Valley Falls the intensity was V, duration sixty seconds; in California the duration was thirty seconds at Cedarville, Modoc county, at Alturas plaster fell, and a report at Susanville, made from memory some time after the occurrence of a shock at this hour on January 17, probably refers to this shock, recalled by the day of the week, rather than of the month. At Susanville, about 110 miles from the Lakeview region, an intensity of III was reported.- CE 1918-1924, BAAS; BSSA, 13, 76; MWR, 51, 52.

1923 January 11. Valley Falls. V. (Hodge).

1923 January 22. 1:04 a.m. Southwestern Oregon. A severe shock was felt in northern California and southern Oregon on January 22, 1923. The origin was at sea off Cape Mendocino. For a full account see the California list.

1924 January 5. 3:15 p.m. IV-V. Stanfield, Umatilla county. Duration three to five seconds. Felt by several. Probably same shock as the following. The date seems to be uncertain.

1924 January 6. 3:10 p.m. V. Milton and Weston, Umatille CO.- MWR, 52,63.

*1924 May 26. 4:19 p.m. IV. Walla Walla. Four shocks, felt by many.- MWR, 52, 293.

*1924 September 19. 9:30 a.m. IV. Brush Prairie, Clarke County. Felt at other small places near Vancouver, southwestern Washington.-BSSA, 14, 216.

1925 March 19. Press reports say a shock was felt in Oregon on this date, but give no details.- SRC&GS.

1925 June 27. 5:21 p.m. Baker, Portland. The severe earthquake in Gallatin county, Montana, on June 27, was felt in several of the neighboring states. Baker and Portland were the only places reported in Oregon.- SRC&GS.

1925 July 1. Shortly after 11 p;m. III? Lakeview, Lake Co. Slight; felt by several.- Associated Press.

*1926 April 10. 7:28 p.m. Walla Walla. Trembling; felt by few; abrupt onset.- SRC&GS.

*1926 April 23. 5:56 a.m. IV. Walla Walla. Abrupt bumping; felt by several standing; followed by tremors.- SRC&GS.

*1926 October 16. 6:45 p.m. V-? White Salmon, Klickitat county. Abrupt; furniture and pictures moved; felt by many.- SRC&GS.

1927 April 8. 9 p.m. V. Richland, Baker county. Four shocks reported at points in Pine and Eagle valleys, eastern Baker county, on this night and the following morning.- BSSA,17, 114; SRC&GS.

1927 August 20. 12:05 p.m. Humboldt Bay, California. This severe shock was felt from Fort Seward to the Oregon border; so probably was felt in the southwest corner of Oregon. It was felt in Crescent City, but not in Gold Beach. More complete account in the California list.

* Reports from southern Washington.

EARTHQUAKES IN OREGON --- 1928-1936 (reference 2)

1928 September 4. Newport, Oregon. (44°.7 N., 124°.1 W). Slight shock felt also at other towns with 10-mile radius.
1930 July 8. 12.30, Perrydale. Slight.
1930 July 18. 18.38, Perrydale. (45°.0 N., 123°.2 W.) Also McCoy, cracked plaster, rattled windows. Crack appeared in roadbed about one-half mile west of Perrydale.
1931 August 16. 19.20. Force V at Talent, Oreg., where press reported lamp shaken from ceiling and one man thrown from chair. Also felt at Phoenix, Talbot, and Ashland.
1931 August 23. 10.01. Earthquake off Eureka, Calif.; felt at Klamath Falls, Beagle, Curtis, and Hugo, Oreg.
1931 September 3. 19.22 Central Point, Oreg. Feeble.
1931 October 1. 3.10 to 3.50 (ship's time), at sea. Steamer Admiral Farragut felt heavy tremors in lat.42° 56' N., long.124° 44' W. Sulphurous odors observed and phosphorescent light trailed in wake of propellers.
1932 January 14. 8.18. Portland, and Willamette, Oreg., IV. Also felt at Forest Grove, Hillsboro, Longview, Ridgefield, Vancouver, and Yacolt, Wash.
1933 January 17. 22:--. Burns, Oreg. Meteor fell causing shock like an earthquake.
1933 November 23. 6:25. Portland, Oreg., III. Several awakened by trembling motion lasting a few seconds.
1934 July 6. 14.50. North, Bend, Oreg. III.
1936 May 8. Early. Roseburg, Oreg. Meteor exploded, awakening many.
1936 July 15. 20.30. White Salmon, Wash. Weak foreshock of the north Oregon earthquake at 23.08.
1936 July 15. 23:08*. "State Line earthquake" near Walla Walla, Wash., and Milton, Oreg. VII-. Epicenter within a few miles of 45° 58' north, 118° 18' west. Damage about $100,000. Area affected, about 105,000 square miles.

Intensity VII in Oregon - Freewater, State Line, Umapine.
Intensity VI in Oregon - Athena, Ferndale, Milton.
Intensity V in Oregon - Arlington, Haines, Helix, Hermiston, Monument, Pilot Rock, Prineville, Umatilla.
Intensity IV in Oregon - Baker; between Courtrock, Hamilton, and Monument; Echo; Elgin; Granite; Heppner; La Grande; North Powder; Pendleton; Promise; Weston.
Intensity III and under in Oregon - Antelope, Bartlett, Bordman, Enterprise, Evans, Flora, Joseph, Paradise, Portland, Telocaset, The Dalles, Troy, Ukiah, Wallowa, Whitney, Willows.
Not felt in Oregon - Huntington, Imnaha, Lake, Lookingglass, Range, Willamette.

Intensity VI in Washington - Waitsburg.
Intensity V in Washington - Colfax, Hooper, Page, Pomeroy, Prescott, Prosser, Touchet, Walla Walla, Wallula, Wheeler.
Intensity IV in Washington - Alameda, Cedonia, Chewelah, Davenport, Dayton, Deer Park, Entiat, Ephrata, Hanford, Harrington, Irby, Kahlotus, Klickitat county (southeast section), Lakeside, Laurier, Leavenworth, Locke, Lowden, Odessa, Okanogan, Omak, Othello, Pasco, Pateros, Pullman, Ritzville, Rosalia, Spokane, Spokane Bridge, Sprague, Starbuck, Sunnyside, Twisp, Valley, Warden, Washtucna, Wauconda, Winchester.

(To be continued)

# GEOLOGICAL NEWS LETTER

VOL. 5 NO. 24 PORTLAND, OREGON Dec.25, 1939

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY




THE GEOLOGICAL NEWS-LETTER

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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MEMBERSHIP APPLICATION

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Qualifications and Dues

A member shall be at least 21 years of age, who is interested in and supports the aims and objects of the Society and who shall be recommended by the membership committee. A junior member shall be over 18 and under 21 years of age.

The annual dues are: for members $3.50 (includes husband and wife), juniors $1.00.

Date ______________

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

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Address

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Telephone Number — Occupation

I am particularly interested in the following branches of Geology: ______________
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Sponsored by: ______________________
Member

I enclose $____ for first year's dues, March 1 to March 1. (Make checks payable to the Society).

______________________
Signature

## ANNOUNCEMENTS

### Lectures

ALL LECTURES ARE HELD IN AUDITORIUM OF PUBLIC SERVICE BUILDING
SIXTH AVENUE AND TAYLOR STREET.

Friday Dec.22 — NO MEETING on account of the proximity of this date to Christmas.

Friday Jan.12 — Subject: GEOMORPHOLOGY OF EUROPEAN BATTLEFIELDS.
Speaker: Dr. Edwin T. Hodge
A discussion of the facts of geology as they affect national interests. The reasons for the rise and fall of empires do not lie entirely in the economic nor ethnologic fields. The influences of land forms in the territories concerned sway the fortunes of contending nations to a remarkable degree. A review of this phase of geology in its relation to the present European conflict will help greatly to a true appraisal of the international situation. We are privileged to have it brought before us by our own Dr. Hodge, who, as we all know, is qualified to speak with authority on the subject.

Friday Jan.26 — Subject: CHEMICAL ASPECTS OF FLUORESCENCE IN MINERALS.
Speaker: Dr. A. H. Kunz, Professor of Chemistry, University of Oregon, Eugene, Oregon.
This is a basic and important phase of geology which has not yet been treated at any of our lectures, and its presentation on this occasion by Dr. Kunz assures us of a clear, interesting and valuable contribution to our understanding of the subject. He will begin with a review of classical atomic theory, and follow with an outline of modern ideas of atomic structure and then present an interprtation of mineral structure and fluorescence on the basis of the previously discussed modern conceptions. His talk will be illustrated by latern slides.

Friday Feb.9 — Subject: EARLY MAN IN OREGON.
Speaker: Dr. L. S. Cressman, Professor of Anthropology, University of Oregon, Eugene, Oregon.
In recent years the University of Oregon, thru the Dept. of Anthropology and the Oregon State Museum, has carried out extensive research work in south-central Oregon and the evidence gathered tells a story of ancient man which, for thrill, rivals that of a good novel. It tells of early Oregon man's association with extinct Pleistocene animals; of his witnessing the cataclysms which gave birth to Crater Lake; of his presence in ringside seats at the eruptions of Newberry Craters. These facts, and others brought out by research, we are privileged to have presented to us by Dr. Cressman, under whose skillful direction the evidence was gathered and interpreted. In addition he will show two reels of motion pictures illustrating the nature of the field work.

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WE WISH THE MEMBERS OF THE SOCIETY A MERRY CHRISTMAS AND A HAPPY AND SUCCESSFUL NEW YEAR.

## NEW BULLETIN ANNOUNCED

Announcement is made of the publication of the following bulletin by the State Department of Geology and Mineral Industries:

> "Dredging of Farmland in Oregon", by F. W. Libbey, mining engineer, State Department of Geology and Mineral Industries, Bulletin no.19; 40 pp., 10 plates (map,photographs,and graphs); 1939; 40 cents.

Copies may be obtained from the Department's office, 329 S.W.Oak Street, Portland, or the State Assay Laboratories at Baker and Grants Pass, upon receipt of 40 cents to help defray cost of printing and mailing.

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Persons who have had occasion to discuss the good or detriment to the state of dredging croplands have raised such questions as: What is the value of various kinds of lands being dredged for gold in this state? What is the average amount of gold obtained from an average acre of dredge land? How much of the gold recovered goes into local wages, supplies, taxes, etc.? What percent of the land being dredged yearly in this state is waste land, meadow land, cropland, etc.? How much gold is being produced annually by the dredges in the state? What is the answer to the question of resurfacing after dredging in Oregon? Is the statement that dredging takes land out of production for future generations defensible? Is the statement that "dredge tailings look like hell" defensible? How can the costs of stripping overburden and resoiling after dredging be calculated? What are the pertinent facts connected with dredging in the John Day Valley? How can we compare the destruction of farmland by dredging with its destruction by other agencies?

These and other questions relating to dredging in this state are answered in the bulletin above referred to. The report includes a compilation of facts pertaining to dredging, an unbiased engineering analysis of these facts, and conclusions which should be of value to persons interested in dredging, not only here but whereever dredging is carried on.

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Mr. Ray C. Treasher, Geologist with headquarters at Portland since 1937, is being transferred January 1st to southwest Oregon with residence at Grants Pass. Treasher will be Field Geologist and carry on the department's regular field inspection service, with special emphasis on strictly technical and geological phases of mining problems.

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The above articles taken from "The ORE.-BIN"

## NEW MEMBERS

| | | |
|---|---|---|
| Mr. and Mrs. Wayne R. Lowell | 1315 S.W. Clay Street | BR 1970 |

## EARTHQUAKES IN OREGON -- 1846-1938.

### EARTHQUAKES IN OREGON -- 1928-1936 (reference 2).

Intensity III and under in Washington - Adams county (southern part), Asotin, Beckletin, Bluestem, Brewstor, Chattaroy, Chelan Falls, Cheney, Clayton, Freeman, Goldendale, Grand Coulee, Hartline, Kennewick, Lacrosse, Mettaline Falls, Mottinger, Mountain View, Nespelem, Newport, Northport, Oroville, Republic, Stehekin, Trinidad, Wahluke, Waukon, Wawawai, Wellpinit, Wenatchee, White Salmon, White Swan, Wilbur, Wilson Creek, Winthrop, Winton, and Yakima.

Not Felt in Washington - Blewett Pass, Chesaw, Colville, Conconully, Fishtrap, Hellgate, Lemanasky Lake, Lucerne, Milan, Millwood, Rimrock Dam, Rogersburg, Ruff, Wapato.

For detailed particulars see United States Earthquakes, 1936, pp.19-23.

1936 July 15. 23:37. Athens, Oreg., and Waitsburg, Wash. Slight aftershock.

1936 July 16. 4:30. Athens, Oreg. Slight aftershock. Lowden, Wash. Two small shocks felt.

1936 July 18. 7:10. Milton-Freewater, Oreg. Slight aftershock.

1936 July 18. 8:30. Milton-Freewater, Oreg. V. Heaviest aftershock thus far. IV at Helix and Pendleton, Oreg., and at Walla Walla, Wash.

1936 July 20. 4:10. Freewater, Oreg. "Little jiggle".

1936 July 20. 9:30. Freewater, Oreg. "Little jiggle".

1936 July 21 Morning. Umapine, Oreg. Eight aftershocks. No damage.

1936 July 30. 3:20. Freewater, Oreg. IV.

1936 July 30. 4:--. Freewater, Oreg. IV.

1936 August 4. 1:19. Helix, Oreg. V. Small objects moved. Quake not so strong as on July 15, but lasted longer. IV at Walla Walla, Wash. III at Colfax, Wash.

### EARTHQUAKES IN OREGON -- 1937 - Sept.30, 1938 (reference 3).

1937 Feb.9. 14:20. Walla Walla, Washington. Ground underneath loam over bedrock. One shock, beginning abrupt. Motion trembling, apparent northeast to southwest. Felt by many. Surface sounds due to creaking of buildings, rattling of loose objects, etc., heard by several. Disturbed objects were observed by several. Light objects moved on shelves, moved westward on north-south shelves. People not alarmed.

1937 June 4. 06:43. Walla Walla, Washington. Ground underneath loam soil, over rock. Motion trembling, beginning abrupt. One shock felt by many. Sounds due to rattling of windows, doors, and dishes, and creaking of walls and frames, heard by many. Pendulum clocks did not stop. Disturbed objects observed by some. Apparent southwest to northeast direction. Faint sounds heard at beginning of shock. Slight displacement of light objects on shelves.

1937 September 20. 08:33. Walla Walla, Washington. One light trembling shock, with abrupt onset. Felt by several. Surface sounds due to rattling of windows, doors, and dishes and creaking of walls and frames, heard by several. Awakened no one; frightened no one. No damage. Ground underneath loam over bedrock.

1937 Month of October. No felt: reported by U.S. Weather Station at North Head, Seattle, Spokane, Tatoosh Island, Walla Walla, Yakima, Washington. Oregon - Baker, Medford, Pendleton, Portland, Roseburg.

1937 Month of November. Not felt: reported by U.S.Weather Bureau Station at North Head, Seattle, Spokane, Tatoosh Island, Walla Walla, Yakima, Washington. Oregon - Baker, Medford, Pendleton, Portland, Roseburg.

1937 December 14. 01:00 (about). Dallas, Oregon. (Press). "The meteor or earthquake shock, which caused considerable comment around Dallas following reports of a disturbance on the night of December 13th, has received further confirmation from various sources. In Fall City one resident stated that the shock broke the cold water pipe leading to his bathtub. A resident near Tillamook reported that the disturbance was noted by many. One person, living three miles southeast of Sheridan, reported that he was awakened in the night by a sound as though something had fallen on the porch. Then as the sound rumbled away it seemed as though it might have been thunder. All reported that the houses shook and the windows rattled".

1938 January 3. 06:15 (approx.) Ariel Dam, Cowlitz Co., Wash. A slight shock was felt here by several families.

1938 May 9. 01:00. Walla Walla, Washington. Very slight shock felt by few. Character and exact time of shock not noted.

1938 May 24. 09:42. Walla Walla, Washington. Two slight movements with abrupt onset noted. Motion trembling. Felt by few. Apparent direction northwest-southeast. Slight interval between shocks. Ground underneath valley, with loam over rocky bed.

1938 May 28. 02:14*. (Oregon).

Allegany. Shock felt by few. Awakened few. No damage. Ground underneath sloping, soil.

Booth. Motion lasting one-half minute. Felt like a sudden jar to observer. Direction of motion felt northeast. Rattling of windows, doors, and dishes. Awakened few. No damage. Ground underneath sloping, loose.

Charleston. Motion lasting few seconds. Felt by several. Rattling of windows. Hanging objects did not swing. Awakened few; frightened no one. No damage. No damage. Ground underneath level, loose soil.

Cooston. Motion lasting few seconds. Felt by few. Rattling of windows, doors, and dishes. Hanging objects did not swing. Trees and bushes shaken moderately. Awakened few; frightened no one. No damage. Ground underneath compact.

Empire. Motion slow, lasting few minutes. Felt by several. Rattling of windows, doors, and dishes. Awakened few; frightened few. No damage.

Gardiner. Motion slow, lasting one minute. Felt by all. Rattling of windows, doors. and dishes. Trees and bushes shaken slightly. Frightened no one. No damage. Ground underneath, low marsh.

Marshfield. Two temblors felt by several. Motion slow. Direction of motion felt east to west. Moved pictures. Ground underneath marshy.

North Bend. Shock felt by many. Rattling of windows, doors, and dishes. Moved small objects and furnishings. Fall of pictures. Awakened many.

Powers. Very slight shock felt by few. Awakened few. No damage.

Reedsport. Motion rapid, lasting one minute. Felt by many. Direction of motion unknown. Rattling of windows, doors, and dishes. Awakened many; frightened no one. No damage. Ground underneath marshy.

1938 May 28. 02:15. Oregon.

Portland (East Section). One shock, beginning gradual, swaying, north-south, ending with a bump. Felt by many. Buildings shook slightly. Awakened no one; frightened no one. No damage. Ground underneath plain, clay. A slight earthquake of the same intensity reported at same time from Marshfield, Coos County, also from Eugene, Lane county, according to observer.

Westlake. Shock felt by several. Not felt by observer. Rattling of windows, doors, and dishes. Awakened few; frightened no one. No damage. Ground underneath sand.

Not felt at the following places: Arago, Broadbent, Bullards, Camas Valley, Cushman, Elkton, Florence, Langlois, McKinley, Myrtle Point, Port Orford, Siltcoos, Sitkum, Summer, Umpqua, Winchester Bay.

1938 July 22. 18:50.

Astoria, Oregon (Press). "An apparent earthquake shock rocked Astoria tonight at 6:50 o'clock, rattling windows, shaking dishes, and causing the earth to quiver, causing no damage, so far as could be determined. The shock was felt in all parts of the city, but no reports from rural districts had come in. The police station, newspaper and telephone offices were swamped with calls from citizens asking what it was all about. The last time Astoria felt an earthquake was twelve years ago, when mild tremors occurred here. From time to time in previous years there have been very mild tremors, none causing any damage."

Southwest section of Pacific County, Washington. Shock felt by many. Felt outdoors by some. Rattling of windows and dishes. Frightened many. No damage. Observer noted freshly fallen rocks from sea cliff at 7:00 p.m. Considerable alarm at Astoria,15 miles southeast, according to observer.

1938 August 11. 10:52.

Milton, Oregon. Motion rapid, lasting two seconds. Direction of motion felt east. Rattling of windows, doors, and dishes; creaking of walls and frames. Hanging objects did not swing. Trees and bushes shaken slightly. Frightened few. No damage. Ground unerneath level, compact.

1938 September 11. 22:10. Intensity I to III.

Brookings, Oregon. Shock of short duration. Felt by few. So slight no report was made, according to observer.
(This earthquake is reported among the California tremors with the reported epicenter about $40^{\circ}$ north, $124^{\circ}$ west, according to Pasadena. Felt over land area of approximately 20,000 square miles in northern California. The earthquake was felt along the coast as far north as Brookings, Oregon, and as far south as Elk, California. The instrument at Eureka did not operate. p.15 of MSA-19, July 1, 1938 - Sept.30, 1938.

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The following items are not part of the Coast and Geodetic Survey catalog, but are added to make the record complete. Official data will appear when released by the C & G.S.

1939 April 14. 11:45, Portland, Oregon. Slight tremor, felt by few in the Mt.Tabor district. Probably very local.

1939 Nov.13. 2:45.8. Portland, Oregon. Tremor, probably intensity IV or slightly less. See newspapers of Nov.13 for full details.

Lake Cushman, Washington. (Science News Letter, v.36, no.22, Nov.25, 1939) "Near Lake Cushman, in Washington, southwest of Mt.Elinor, latitude 47 degrees 33 minutes north, longitude 123 degrees 16 minutes west": This report was based on Coast & Geodetic Survey advice.

1939 November 29. about 1:15, Portland Oregon. (Oregon Journal Nov.29 1939).

Slight tremor that failed to wake most sleepers.

Wenatchee, Washington. Very small tremor, beginning at 1:14.45 and lasting for one minute. So small that probably persons at the epicenter felt only one shock. Reported by the University of Washington.

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## NEWBERRY CRATER TRIP.

Great masses of black obsidian were the spectacular landscape features seen at Newberry crater by members of the Geological Society of the Oregon Country on this year's (1939) Labor Day trip. The largest flow, which is also the youngest, is said to cover almost exactly a square mile, and is thought to be the largest in the northwest. Of greater interest geologically is the fact, according to Howel Williams, that throughout the history of the volcano there was repeated eruption of rhyolite and basalt, not only from adjacent vents, but from a common fissure, more or less simultaneously. The magmas were, with few exceptions, either extremely acid or extremely basic. The volcano seemed to have been built up entirely of basaltic lavas until it rose above 2,000 feet above its floor. Flows of rhyolite were then erupted up to a thickness of at least 200 feet. Violent explosions then covered the rhyolite with basaltic tuff and scoria.

Both Paulina and East Lakes were visited. They are located in the floor of the crater, and at one time may not have been separated. Subsequent volcanic activity has divided the crater so that between the lakes are obsidian flows and cones of white rhyolitic pumice and of black basaltic cinders. The largest of the pumice cones is about 700 feet high and occupies a large part of the neck between the two lakes.

At Paulina Lake the group made a short hike to the end of an obsidian flow where the various stages of cooling were studied. Here was seen very light fluffy volcanic froth. Large pieces of this rock were easily handled. There was froth more consolidated in various degrees to the obsidian stage. Some of it resembled a honeycomb, being a very fragile glassy cell-like formation. Some of the obsidian here was banded with grey. Two other immense masses of blocky obsidian were visited, one close to the shore of East Lake.

The group left Bend at 9 o'clock Sunday morning, Sept.3, for Newberry Crater under the leadership of Mr. Phil F. Brogan, and Mr. Emil Nordeen, president of the Deschutes Geology Club. About 30 were in the party, including several Deschutes Geology Club members. A short stop was made at the Lava Tunnel Cave state park, after which the caravan proceeded to Paulina Lake. Besides studying the obsidian, the collectors spent a little time digging into the bank at one point on the lake shore to obtain good sized fragments of Equisetum. A few Portlanders enjoyed a swim, as did some others later at East Lake. Paulina Lake is 200 to 230 feet deep, as reported by Mr. Williams. It receives some of its water from springs and there is believed to be seepage from East Lake through the porous volcanic rocks underground. It contains hot springs having temperatures of 110 degrees Fahrenheit.

A large, new, uncompleted boathouse at East Lake was, by permission, used as a lunch room at noon. Tables and benches were set up from the new lumber and the place was made into a comfortable and pleasant dining hall. At the hot springs resort here the visitors had the opportunity of tasting the mineral water and testing the temperature, said to be 120 degrees Fahrenheit. East Lake is much shallower than Paulina Lake. Its level is 40 feet higher. It has no outlet.

At each stop of the trip Mr. Brogan explained the geological features as presented by Mr. Williams in his report on the Newberry volcano. This report may be found in the Bulletin of the Geological Society of America, vol.46, published Feb.28 1935, and entitled "Newberry Volcano of Central Oregon". Copies of the Bulletin can be seen at the Central Library in Portland, and may be purchased through Mr. Tracy Wade, chairman of the Service Committee of the Geological Society of the Oregon Country.

Mr. Williams states that Newberry volcano has the form of a circular shield, with a basal diameter of approximately 20 miles. It was about the size of Mt. Shasta, the largest of the Cascade cones. On the outer slopes of the shield are more than 150 cones of basaltic cinders, almost all of which are grouped on the north and south flanks. Erosion has done little to modify the general form of the volcano except in its upper parts. The highest point of the present rim is 7,985 feet, known as Paulina peak. Chief development of the volcano is believed to have been in the Pleistocene. The cinder cones, with few exceptions, are well preserved, due to their recency, and to their extremely porous nature. Most of them are 200 to 400 feet high. The Williams investigation indicates that the floor of the caldera was much deeper than now, and was gradually raised by the eruption of lava. Also that the sinking of the floor may have been caused by removal of magmatic support.

On the return trip to Bend late in the afternoon the group stopped to see Paulina Falls, a spectacular feature of Paulina creek. The creek is the outlet to Paulina Lake, and follows a narrow and steep-walled canyon down the outer slope of the volcano. The formation at the falls is massive lava and interbedded ash.

Sunday evening a campfire gathering was held on the grounds of the South City Limit Motel, by courtesy of the owner, Mr. George Ludowitz. Mr. Ludowitz is a member of the Deschutes Geology Club. A big fire was kept burning all evening in the outdoor fireplace. Mr. Brogan presided over the informal session. Mr. Leo Simon gave a talk on the region's flora, and Dr. Francis Jones explained the differences in the chemical make-up of the acid and basic rocks of which the Newberry volcano was built. Mrs. W. C. Adams entertained with some music on a tiny harmonica. Community singing was led by Dr. Arthur C Jones, and by Prof. Ralph Coie, teacher of music in the Bend schools.

Monday morning at 8 o'clock Mr. Brogan and Mr. Nordeen met the visitors on top of Pilot Butte to study the geological features to be seen in all directions. Then Mr. Brogan placed the party in charge of Mr. Nordeen for the day. It was necessary for Mr. Brogan to return to his newspaper work on account of the outbreak of the European war. The next point of interest was Green's agate shop in Bend, where some time was spent examining the many interesting rocks on display. Then to the famed rock garden of Rasmus Pittersen, several miles north of Bend. By the use of scoria, obsidian, petrified wood, and other rocks, Mr. Pittersen has worked out some unique designs in rock gardening. Many varieties of flowers and plants have been used to give beauty and color to this attractive place.

Mr. Nordeen accompanied the Portland group to the Crooked River bridge, where a stop was made, then escorted some of the party to the Cove to see the junction of the canyons of the Deschutes and Crooked rivers. This was the end of this year's Labor Day adventure, made very enjoyable as well as profitable by the efforts of Mr. Brogan and Mr. Nordeen.. Those who made the trip from Portland feel very grateful to them for their interest and time spent in our behalf.

- E. M. Barr

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## LARCH MOUNTAIN TRIP.

Fog, quite thick in spots, prevented geological studies or view of the surrounding country from Larch mountain when members of the Geological Society of the Oregon Country visited that area on Sunday Oct.15. Some contemplated stops along the road had to be omitted because of dense fog. However, the group was able to study the general land trends and formations at numerous points. H. B. Schminky was leader, and in the absence of a professional geologist, served very creditably in that capacity. One object of this trip was to enjoy the autumn coloring which was profuse and at its best.

The first stop, on the lower slope of the mountain, was at a deep cut, where there was a great depth of soil, estimated to be around 50 feet. Examination showed that it contains some grit, but no rock. It was noted that there are no streams in the vicinity to cause rapid erosion of this soil. The road here is built on a hogback, and continuing along this ridge, the next stop was to see how a canyon drops off from both sides. One is a deep V-shaped canyon, with no stream at the bottom. Appearances indicated that the land surface was at one time of uniform elevation, with a southwest dip toward the Sandy and Willamette rivers, a long, gentle slope. A suggestion was made that the canyon may have been cut by spring melt water from the deep snows which probably fell on this surface during the glacial age.

At the junction of the road leading to the site of the Gordon Creek coal mine, Mr. Reichen gave some information about the mine, stating that a vein 2 to 4 feet thick is underlain by a second similar vein. The coal is said to be still in a somewhat "woody" stage.

Farther along, a small dike was seen, and evidences of solid rock, indicating that the road now lay upon the true slope of the volcano, which is called Larch mountain. There is no columnar structure, but the soil seems to be decayed lava, an old surface decomposing. Studying the cuts along this section, it was noted that near the top are large boulders, not extending deep into the cuts. At several places were seen large rounded boulders, somewhat exfoliated, not water worn.

Close to the summit was the first stop clear of fog, though the horizon was still engulfed. At this point was what might have been an older slope, now largely disintegrated into soil. During the process, occasional lava flows apparently followed old channels. Here is exfoliation, also angular rocks, tending to become rounded. Angular fragments, decayed breccia, are found by digging into the surface.

As soon as the cars were parked at the summit, the group hiked over to the pinnacle, where some remained to eat their lunch. Others gathered around tables under the trees, though a light mist fell for a short time. Later, all gathered around ~~a~~ campfire for some more discussion. Mr. Schminky stated that the saddle in the sharp ridge leading to the pinnacle may have been a part of the crater, now eroded away. The weather did not clear, so the much desired view from the summit was lacking.

The return was made via the old Larch mountain road, where there was plenty of autumn coloring. One stop was made to enable those who desired, to gather leaves, and a few late huckleberries. Leaving this road, a different route was taken back to the highway at Springdale. The same flat land surface was seen from a point on this road that was noted higher up on the mountain.

The botanical knowledge of Mr. Leo Simon was in demand as usual, and, as usual, freely given.

- E. M. Barr

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## MEMBERS' ACTIVITIES.

Mr. and Mrs. O. E. Stanley - Mexican and Canyon trip colored slides at Alameda Community Church, Wednesday evening, Nov. 23.

Mr. O. E. Stanley - showed his slides at a breakfast meeting of student engineers at Wagner's restaurant, Corvallis, Sunday December 3.

Mr. O. E. Stanley - at Sellwood Lions' Club, Wednesday evening at the Poll Parrot Restaurant, S.E. Milwaukie Avenue.

Mr. and Mrs. O. E. Stanley - at Business and Professional Women's dinner, Congress Hotel, December 7, 1939.

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Compiled by Florence M. Richards.

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