GEOLOGICAL NEWS LETTER

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GEOLOGICAL NEWS-LETTER
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Geological Society of the Oregon Country
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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Officers of the Executive Board, 1955 - 1956

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Mr. Albert J. Keen (1957) Mr. Leroy A. Palmer (1958) Mr. Fay W. Libbey (1957)

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Field Trips:	Mr. Murray R. Miller	Research:	Mr. Rudolph Erickson
Librarian:	Dr. James Stauffer	Service:	Miss Margaret L. Steere
Membership:	Mrs. Leslie C. Davis	Museum:	Dr. J. C. Stevens
Publicity:	Mr. H. Bruce Schminky	Public Relations:	Mr. Clarence D. Phillips
Social:	Mrs. Wm. F. Clark; Mrs. Albert J. Keen	Historian:	Miss Ada Henley

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CALENDAR FOR JANUARY 1956

Luncheon Notice

Every Thursday noon at Portland Chamber of Commerce, 824 S.W. 5th Avenue. Buffet $1.00.

Meetings

Friday Jan.13 — Library Hall, 7:30 P.M. Our own past president, A. W. Hancock, who has recently been nationally recognized on account of his fossil discoveries in the Clarno region, will discuss Recent Developments in the Clarno Fossil Beds.

Friday Jan.27 — Library Hall, 7:30 P.M. Hollis M. Dole, Director, State of Oregon Department of Geology and Mineral Industries, will give a summary of uranium-prospecting activity in Oregon. Slides will be shown.

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NO FIELD TRIP IN JANUARY

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LIBRARY NIGHT

Tuesday Jan. 17 — Library night will be held on the third Tuesday of the month in the Biology Building, Lewis and Clark College, from 7:30 P.M. to 10:00 P.M. Follow the signs to the building. Program to be arranged. In case of bad weather call one of the persons below to find out whether the meeting is canceled.

Mrs. Barr: PR 4-2459; Mrs. Clark: BE 4-7096; or Mrs. Stauffer: NE 6-3825.

FEBRUARY MEETING

Friday Feb.10 — Library Hall, 7:30 P.M. Dr. Ewart M. Baldwin, Associate Professor of Geology at the University of Oregon, will speak on "Out-of-the-way Parts of Mexico." Slides will be shown.

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JOHN DAY COUNTRY QUAD SHEETS AVAILABLE

Three topographic maps of the John Day country have just been released by the U. S. Geological Survey. These are the Picture Gorge, Kimberly, and Spray 15-minute quadrangles. The scale is one inch to the mile and the contour interval 80 feet. The maps are for sale by the U. S. Geological Survey, Federal Center, Denver, Colorado, for 20 cents each.

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LUNCHEON NOTES - December 1955

By

Leroy A. Palmer

December 8th Leroy Palmer took over as the five (?) minute speaker. He announced his talk as "Why the sea is salt" and started out by telling an old Scandinavian folk tale of a magic mill that ground out anything it was told to. Once when it was on the deck of a ship grinding out salt it got out of control and couldn't be stopped. So it overwhelmed the ship with salt, sunk it, and the mill is still down at the bottom of the ocean grinding away.

Then he advanced a more logical explanation, first discussing the saline deposits of the Great Basin. This great physiographic province lies between the Rocky Mountains and the Sierra Nevada, a vast arid region that has no exterior drainage. Within the Great Basin are a number of smaller "enclosed basins" into which streams flow but from which there is no outlet.

No natural waters are absolutely pure. All rocks are chemical combinations and react to the influence of moisture and the atmosphere, so as rain falls on a watershed it dissolves some of the minerals, largely the alkalis, of the rocks and carries them in solution to the nearest watercourse and thence to the master stream of the region. The amount of mineral thus absorbed is very small, rarely in sufficient quantity in a running stream to be detected by the taste.

Now suppose a stream terminates in one of these enclosed basins in an arid region from which there is no outlet. The streams under these conditions are usually intermittent or of very low flow during hot weather. The water accumulates in the basin and in the arid climate a great part of it is removed by evaporation. But the evaporation removes only the water, the pure H_2O, so that we have all of the minerals carried in a season's runoff remaining in only a portion of the water in which they were originally dissolved. This, of course, leads to a concentration of the minerals in the basin and when the process is repeated year after year, perhaps for thousands of years, the solution becomes saturated in time and finally supersaturated with the precipitation of various alkaline minerals in solid form.

As the oceans, which cover two-thirds of the surface of the earth, have no outlet they are a vast enclosed basin in which the minerals have been brought by the countless streams that feed them so that they now have an average content estimated at 3.44 percent minerals, 77.76 percent of the minerals being sodium chloride, or 2.77 percent of the water.

This process also accounts for the various saline lakes of the Great Basin, of which Great Salt Lake is the outstanding example, and also the saline deposits, the surfaces of which are entirely dried up and which now form a valuable commercial asset.

At our December 15th meeting we were entertained by Howard Rose who told us of a trip with Mrs. Rose through the northern part of the country to the eastern states and how they played hide-and-seek with the destructive floods of last October. Starting out in September their first experience was with some real summer weather, 102° at Ephrata, which tempered off to a mild 90° as they crossed Montana. From Montana they passed into South Dakota and the Black Hills where they viewed the wonderful Mount Rushmore monument. Beyond the Black Hills were the Big Badlands from which he recovered a large molar, tentatively identified as that of a saber tooth tiger. The monument and a scene in the Badlands were made the more realistic by some colored slides in an illuminated gimmick which was passed around and showed the objects in their beautiful colors and in three dimensions. (Continued on page 7.)

ELECTRIC STEEL FOUNDRY TRIP

By

T. Herbert Laurence

Through the courtesy of Mr. H. M. Gowing, Public Relations Manager of Electric Steel Foundry, and our own President William F. Clark, the members and guests of the Geological Society of the Oregon Country on the evening of November 8, 1955, saw the industrial application of many of the minerals they have been hearing discussed in the lecture hall and observing on field trips. For it was that evening our tour leaders and Mr. Clark showed us the various processes and equipment used in the melting and casting of steel and its alloys.

Chemically speaking, steel is a mixture of metallic iron and small percentages of nonmetallic carbon plus small percentages of metallic manganese and nonmetallic silicon. Steel alloys are the above mixture plus varying percentages of the following metals: aluminum, chromium, cobalt, copper, manganese, molybdenum, nickel, tungsten, titanium, vanadium, and zirconium. These metals are used either alone or in combination of two or more together. Steel is processed at Electric Steel Foundry in several ways, so we began our tour at the centrifugal casting and special alloys division. This department is in fact a smaller foundry within a larger one. Inasmuch as foundry practice is the art and science of shaping metals by melting them and pouring the molten metal into molds of sand, the writer will describe the various processes and equipment of that art and science.

Steel Molding Sands

The sand of the molds, into which the molten steel is poured, is a special kind. It is a mixture of silica sand and clay. These are common minerals to the geologist. Silica is used because it is very refractory, as it will not fuse together or crack into still smaller particles when it is struck by the molten steel at the temperature of approximately 3,000 degrees F. The purpose of the clay is to cause the grains of silica to adhere to one another in a plastic mass. Fire clay, because it is relatively free of impurities which are very detrimental in the foundry, is used for this purpose. Molding sands are usually squeezed in the hand to test them for plasticity. The clay content must be from 8 to 30 percent to make the sand suitable for molding.

Molding sands are both synthetic and natural, but the natural ones are considered best for ordinary use. The geologist is familiar with these also for they are: glacial deposits left by the glaciers during the glacial (Pleistocene) period, marine sediments, old lake and river beds, and wind-driven deposits or dunes. Besides being plastic, they are also permeable or porous enough to allow steam, etc., to pass through. This is necessary, because when molten steel comes in contact with the sand, the moisture in it at once becomes steam. There are also other gases generated in the mold. If these gases cannot escape the sand is said to be "tight," and the gases go into the liquid metal, causing "blowholes" in the solidified casting. These blowholes are what the geologist terms vesicles, which are seen especially in certain types of basalt.

Steel Molding

Generally speaking, the steel molder uses two types of sand when making a mold. The shape of the mold, which will be the shape of the metal after it is poured, is usually determined by a wood or metal form, called a pattern, of the casting desired. Although a very skilled molder can mold the sand the shape desired much like a sculptor carves a statue, it is rarely done in a

steel foundry. First he sieves and tucks a layer of fine-grained sand next to the pattern. Sand that hasn't been used for molding before, to which a small amount of plumbago or such has been added is used for this purpose. This is called "facing sand," as it is next to the face of the mold. Following the facing sand a coarser sand is used, called "backing sand." It is usually sand that has been used on previous molds and has been reconditioned. The backing sand is generally jolted and rammed very firmly into a frame, which is termed "drag" in the foundry. In reality it is the bottom half of a sort of box called a "flask" that holds the sand forming the mold in place. When it is filled with sand the drag is turned over, and the top half of the flask is put on top of it. The top half is termed the "cope," and it is rammed with sand in the same manner as was the drag. However, it has two or more openings or holes, the "sprue" and "riser," in it which the drag did not have. The sprue is the opening through which the molten steel is poured into the mold proper; the riser is the opening which fills up with molten steel and feeds metal back into the casting as it cools. Thus the casting will not be the wrong shape when solid.

After the cope is filled with sand it is lifted off and turned over next to the drag. The pattern is then drawn or removed from the sand. The pattern is always made slightly larger than the casting, because steel, like all common metals except antimony, contracts or shrinks on cooling from the molten state just like lavas. The amount of contraction varies with the metal and the weight of the casting poured, but in the average steel casting it is one-quarter inch per foot, hence that much is allowed for on the pattern. When the pattern has been drawn the two halves of the mold are patched if they were torn while removing the pattern. This sometimes calls for very artistic fingers on the part of the molder to restore the mold to its original contours. Following patching, if any, the mold is sprayed with molasses-water and dried with a blowtorch. This adds strength to the mold surface, and it prevents the molten steel from tearing it. Also at this time, if the casting has to have an opening or pocket in it, cores the shape of that opening or pocket are placed in the mold. The cope is then turned back over and returned to the top of the drag. The flask is then weighted down or clamped to prevent it from separating when the mold is poured. There is considerable pressure generated when the molten steel fills up the mold. The mold is now ready to be poured. Molds in a steel foundry are of two kinds: 1) green-sand and 2) dry-sand. Dry-sand molds are dried or baked by placing them in ovens at a temperature of 300 to 400 degrees F. They are usually poured with molten steel that is somewhat less in temperature than that for green-sand molds. The baking of the molds results in producing steel castings that are especially smooth, sound, and accurate.

Steel Core Making

It was mentioned above that openings or pockets in a mold are made by cores which are similar to dry-sand molds, as they too are baked in ovens. Since they are subjected to severe conditions, cores for steel castings are made of silica sand. This makes them heat resistant and keeps them from fusing to the casting. Also they must be made so that they will crush as the steel contracts on cooling. This is accomplished by first making a layer of silica sand, usually not so high grade as that for molding, with a center of cinders for large cores and a coarser sand, usually river sand, for smaller cores. Like molding sands, core sands must also have a binder to keep them firm when baked. These binders are usually dextrine, flour, and pitch for large cores, and molasses-water, glue-water, and linseed oil for small and general cores. They are usually baked at temperatures of 350 to 500 degrees F. until firm and rigid. After being baked they are coated with "steel wash" which is a slurry of silica flour and molasses-water; it is either sprayed or brushed on. Sometimes iron oxide is also added to the steel wash, that makes the cores look like odd pieces of rhyolite tuff. When the molten steel surrounds the core the sands in it give off gases just as molding sands do. Hence, they must be vented artificially. This is done by wax

strings, which are melted by the heat and leave vents, or by steel wires, which are pulled out to leave vents. Sometimes ducts are cut in the sand for this purpose. Probably the greatest difference between a mold and a core is that most cores have to be reinforced with steel rods, etc., to strengthen them as they are somewhat brittle. However, the cope of larger molds are reinforced with wood or metal bars and steel hooks called "gaggers." Also cores are usually rammed up in special forms of wood or metal called "core boxes," whereas molds are rammed up by pressing the sand against a wood or metal pattern.

Some Recent Developments

Although it may seem odd in this "machine age" when most everything has been mechanized, that the foundry industry is not also completely mechanized, but that is not so. It is true they have squeezers, jolters, etc., for molding and many other labor-saving machines in other departments, but basically much hand labor exists, such as when a complex or three-part mold must be made (and they often are). It still has to be made by hand to a very large degree. However, among the more recent developments in foundry practice and techniques are centrifugal casting and shell molding.

The centrifugal casting of steel is based on the physical law of centrifugal force. Thus centrifugal casting of steel is the pouring of molten steel into a mold which is being rapidly rotated. The rotation of the mold distributes the molten metal over its inside surface and holds it there by the action of centrifugal force. This action automatically leaves an opening through the center, so no core is required. However, the axis of this cylindrical opening must exactly coincide with that of the axis of the rotating machine which is rotating the mold within it, otherwise an eccentric opening will be made and the walls of the casting will not be uniform. These rotating machines usually rotate the molds in a horizontal position, but there are vertical ones also. Originally the mold was slid into these rotating machines and spun on its axis. More recently, however, the mold itself, in a cylindrical case or flask, is placed on rolls and rotated directly.

These molds are of the dry-sand type which are usually coated with steel wash, and are poured while spinning with molten steel from a pouring basin or cup which has a spout that extends through a face plate. The flask must also be well vented, as centrifugal molds give off gases like conventional molds do when poured with molten steel, although they are generally poured at a somewhat lower temperature. Centrifugal castings were primarily developed to fill the need for castings that were exceptionally fine-grained, sound, and uniform throughout. This type of casting is needed for suction rolls in paper mills, marine sleeves, etc. Recently they have been made for jet-aircraft tubing also.

Shell molding is the use of washed and thoroughly dried silica sand with various rosin additives for a molding compound instead of molding sand in which to cast molten steel. Because the advantages of this method of producing steel castings are that castings of very great precision, even down to thousandths of an inch, do not require any machine tool working before being put into service.

The silica sand and rosins are thoroughly mixed in a sand muller, and then pressed over special patterns in a machine designed for that purpose. This machine bakes this compound at 400 to 500 degrees F. for only a few seconds, but with great pressure to compensate for the nonpermeability of the compound in the escape of the gases. The results are that the compound

makes two matching shells, hence the name "shell molding," which together comprise the mold. They are then packed in a medium-size gravel, and are poured in the same way as a dry-sand mold with the temperature of the molten steel varying according to the kind and weight of the final castings. (To be continued in February.)

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CIRCUMNAVIGATING THE MEDITERRANEAN

By
Hazel Newhouse
Lecture - December 9, 1955

We have been very fortunate during the past year in having some very interesting travelogues in color at our Friday evening lectures and that given us December 9th by Miss Hazel Newhouse was fully up to the high standard that has been set. Although made only in part by boat, the trip might be described as a "circumnavigation" of the Mediterranean as it took us in through the Strait of Gibralter, thence to Pompeii, Rome, Egypt, the Holy Land, Greece, Austria, Italy, and back home by way of the Azores. The slides were excellent and Miss Newhouse's running description added much to our understanding of her very interesting trip.

Passing the Rock of Gibralter we were taken to Pompeii and thence to Rome and the surrounding country. We were shown some of the marvelous works of engineering erected by the Romans, the aqueducts, carried for miles on stone arches to bring water for the baths of the Romans who went for bathing in a big way. Then there were the roads, including the famous Via Appia, which were not as smooth as US 99 but have endured much longer. In the city proper we saw the seven hills, not so much as hills go to us in Portland. We spent some time in the Forum with its beautiful temples and statues and the Senate house where Cicero delivered his philippics against Cataline and Caesar fell gasping "Et tul Brute."

We saw the Colosseum with its memories of gladiators and Christians, and Miss Newhouse contrasted to us its present ruined condition with its former splendor when the walls were covered with slabs of gleaming marble.

After several scenes without particular historical interest but showing the beauties of the surrounding countryside we left Rome with some regret and sailed for Alexandria. From Alexandria to Cairo and the Nile where we visited the pyramids and the sphynx. The pyramids were shown to us in a closeup which showed the steps in which they built but which in most pictures taken at a distance appear as a smooth surface and again we marveled at the skill and infinite labor of those ancient workmen who had constructed these works with the crude implements available to them. First we had an unusual view of the sphynx taken from the rear and then the more familiar front view. It was explained to us that the broken nose was due to the fact that Napoleon's soldiers had used it for target practice. On up the Nile to Thebes and Luxor and then to the Valley of the Kings, a desolate place on the surface but concealing a wealth of history.

From Cairo a plane trip to Jerusalem looking down on the Dead Sea, lowest spot on earth, the delta of the Jordan River and the fertile and picturesque Jordan Valley. Here, away from the valley, we saw some real desert, as desolate a bit of the earth's surface as one could imagine. Jerusalem is a holy city for three sects, Christian, Jew, and Mohammedan. In our view we saw the old wall and the Mount of Olives. From Jerusalem the journey went on to Damascus and Beyreuth where we saw the famous cedars of Lebanon and thence to Athens.

At Athens we spent some time on the Acropolis in viewing what is left of the beautiful architecture and sculpture of the ancient Greeks and trying to picture what it was like in its glory. Thence we were taken through Austria and on to Venice where we saw the famous palaces and the canals that serve as streets and the Bridge of Sighs and the Rialto and then on to Naples. En route we looked down on the famous Brenner Pass, a steep defile whose strategic importance in warfare could be readily appreciated even by the layman.

A most interesting series of pictures were those of a "lost" city dated about 600 BC. The ruins showed stately buildings, the largest of which was evidently a temple. The builders of this city were unfortunate in their choice of a site as the sea invaded the land and it has now reverted to swamp with little likelihood of its ever being reclaimed.

We were shown the spot where Aeneas is supposed to have landed after being "tossed about by many vicissitudes on land and sea" and finally sailed for home. On the westward passage we passed within sight of the Azores and got several views of its cities and beautiful green slopes before returning to our own USA.

The evening was outstanding and the thanks of the Society are due Miss Newhouse for a very enjoyable and instructive entertainment.

L.A.P.

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LUNCHEON NOTES - December 1955

(Continued from page 2)

From the Badlands they passed on through Minnesota and Wisconsin, noting the geological features as they traveled. One thing that impressed them was the general flatness of the strata as compared with the tilting characteristic of the mountainous regions.

After a stop at Niagara Falls they left the main highway in order to take a trip into the Catskills and here their adventures with the floods began and for a time they were just a jump ahead of them. Having changed their route once in accordance with a warning they were routed out of their trailer at night by police and ordered to move on. Later they learned that that campsite was under several feet of water the next day.

Deciding they had dodged floods long enough they went on to New York City where they stopped long enough to see the sights and then on to Washington. Business in the capital finished they headed for home by way of Virginia and Pennsylvania. On the return trip they encountered a humidity of 100 percent in Toledo, and in the Mississippi Valley snow and winds as much as 60 miles an hour. After passing through Wyoming in pleasant sunshine they reached home in that "unusual" snow of mid-November but looking back on floods, humidity, and winds they decided that Oregon climate is not so bad after all.

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DATE OF OLD FERN FOREST ON KILAUEA VOLCANO ESTABLISHED BY ATOMIC CLOCK*

A new date in the history of Kilauea volcano, world-famous "fire mountain" of the Hawaiian Islands, has been established by scientists of the Geological Survey using the carbon-14 method for determining age of plant or animal remains.

About 2,500 years ago, it was established, an old fern forest grew on the northeast rim of Kilauea and was killed and buried under a layer of hot pumice and Pele's hair (fibrous, basaltic glass named for a mythical goddess). In excavating foundations near the Hawaiian Volcano Observatory, much charcoal from the old forest was found and sent to the Department of the Interior's carbon-dating laboratory in the Geological Survey. The approximate date the forest was destroyed was determined by measuring the amount of carbon-14 isotope in the charcoal.

Carbon-14 is a radioactive form of carbon that is manufactured constantly from nitrogen in the atmosphere undergoing continual bombardment by cosmic radiation. It is assimilated as carbon dioxide by living things all during life, providing a known percentage of "tagged atoms" whose rate of decay can be checked to determine, within limits, how long ago a given plant or animal lived. This important research tool was discovered by W. F. Libby, now a member of the United States Atomic Energy Commission. New techniques allowing for less margin of error and extending the usefulness of this "atomic clock" back as far as 25,000 B.C., were perfected by Dr. Hans Suess and Meyer Rubin of the Survey. The new date of approximately 500 B.C. for Kilauea's rim forest has made it possible to extend backward the known history of Kilauea's eruptive activity with considerable certainty. It fixes the approximate end of a major cycle of vigorous lava output and the beginning of a cycle of crater collapse that ended in 1790. The present cycle of vigorous lava output started approximately 1810-1815.

According to Howard A. Powers, Survey geologist, writing in The Volcano Letter (No. 527) Kilauea was exceedingly active several thousand years before the birth of Christ, overflowing frequently to build the broad dome of the volcano. Then for a time activity slowed down and a caldera formed. (Volcano House is on the rim of that caldera.) A steam blast eruption, perhaps similar to the one of 1924, plastered the rim with a layer of mud and boulders, on which a fern forest grew while activity in the crater remained moderately quiet.

About 500 B. C., activity returned and a lava lake was formed, with eruptive fountaining. Pele's hair and pumice fell over the countryside forming a deposit several inches thick a mile away from the crater on the windward rim, killing the forest. Downwind, in the Kau desert, pumice and glassy ash piled up more than 30 feet thick. Several small flows over the crater rim occurred.

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* From U.S. Geological Survey release, October 27, 1955.

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CALENDAR FOR FEBRUARY 1956

Luncheon Notice

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Meetings

Friday Feb.10 — Library Hall, 7:30 P.M.
Hollis M. Dole, Director, State of Oregon Department of Geology and Mineral Industries, will give a summary of uranium-prospecting activity in Oregon. Slides will be shown.

Tuesday Feb. 21 — Library Night:
Place: Biology Building, Lewis and Clark Campus.
Program:
7:30 to 8:30 Browsing among the books and maps
8:30 to 9:00 Talk-Discussion - Old and recent methods of dating the past.
9:00 to 10:00 Social hour, refreshments.
Demonstration of triboluminescence, phosphorescence, fluorescence.
Bring your minerals and lights, if you have any.

Friday Feb.24 — Library Hall, 7:30 P.M.
Dr. Ewart M. Baldwin, Associate Professor of Geology at the University of Oregon, will speak on "Out-of-the-way Parts of Mexico."
Slides will be shown.

The Annual Business Meeting of the Society will be held before Dr. Baldwin's lecture, but we have been assured that the business session will be brief in order to allow ample time for the more interesting account of the travels of the Baldwin family in the land of "manana."

Field Trip

Wednesday Feb. 29 7:00 P.M. — A conducted tour of the Department of Geology and Mineral Industries of the State of Oregon will be made.

This is an opportunity for our members and friends to become better acquainted with the work of our state geologists, to meet the friendly personnel of the Department, and to inspect the laboratories and equipment used by Director Hollis M. Dole and his assistants.

Meet at Department of Geology and Mineral Industries, 1069 State Office Building, 1400 S.W. Fifth Avenue, Portland, at 7:00 P.M., February 29.

Murray R. Miller, Chairman.

ANNUAL BANQUET

Friday Mar.9 — Mt. Tabor Presbyterian Church, 6:30 P.M.
Tickets - $2.25
For reservations call Mr. Leo Simon, CA 3-0300

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PERSONAL ITEMS

In the annual Christmas bird census by the Oregon Audubon Society Team No. 8, led by Leo Simon, reported the greatest number of birds for one group with fifty-five species of birds. A total of 67,123 individual birds was reported by the society on this, its 30th annual bird count.

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Dr. Arthur C. Jones was named Citizen of the Week by the Junior Chamber of Commerce for the week beginning Friday, January 27. The citation reads: Dr. Arthur C. Jones, Portland Rehabilitation Center. Dr. Jones has been Medical Director of the Portland Rehabilitation Center since its founding in 1948. It is the purpose of the Center to help handicapped persons lead useful and self-sustaining lives. Dr. Jones' devoted service has done much to alleviate the suffering of his fellow man.

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Ralph S. Mason was elected vice president of Oregon Technical Council, and Kenneth N. Phillips was elected director at the annual meeting of the Council in January. The Council is taking steps to plan for financial support of the Oregon Museum campaign.

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Leo Simon was elected president of the Oregon Mycological Society in January, and James Galt was elected treasurer. Both are members of G.S.O.C. Leo Simon was also elected treasurer of Commercial Photographers Association of Oregon at the January meeting of that group.

Phil F. Brogan of Bend has been named Pacific Northwest Director of the American Meteor Society, it has been announced by Dr. Charles P. Olivier of the University of Pennsylvania, AMS President.

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The appointment was made to fill the vacancy created by the recent death of Dr. J. Hugh Pruett of Eugene, regional AMS director for many years. Brogan for more than a decade served as Dr. Pruett's assistant director of the AMS in Oregon and aided in charting many of the spectacular fireballs that blazed through Pacific Northwest skies.

Dr. Olivier said Brogan's territory will include, Oregon, Washington, Montana, Idaho, and northern California. Brogan will have the assistance of John H. Eaton, member of Central Oregon College staff in Bend, in "riding herd" on northwest meteors.

Brogan, a member of the Oregon Academy of Science, is well known in Oregon as a science writer who is particularly interested in geology and paleontology. However, his "first love" in the field of science was astronomy.

Directors will be named in the various states of the region to assist not only in tracing fireballs, but in the study of other phenomena dealing with meteoric astronomy.

Primary objective of the American Meteor Society is to encourage the careful observation of meteors and their theoretical study.

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ELECTRIC STEEL FOUNDRY TRIP - November 8, 1956

(Continued from January 1956 issue)

By T. Herbert Laurence

Electric Steel or Melting of Steel by Electricity

Steel at Electric Steel Foundry is melted by electric furnaces, thus the name "Electric Steel." Most of these furnaces are what is termed the "Three-Electrode Direct-Arc" type. They are somewhat cylindrical, roughly resembling the old-fashioned teakettle, with their pouring spouts protruding out in front. On the opposite or back side is a charging door. The bottom is semi-oval shaped, and the entire furnace, except the top, is made of boiler-plate. The top is also somewhat oval or dome-shaped, and it is built up out of silica bricks, because they are very refractory. Also the top may be removed as one large piece by an electric hoist on a crane when necessary, such as when charging large pieces of secondary material that were too large to go into the charging chute and furnace door. The inside walls are likewise lined with very refractory minerals, such as ganister and magnesite, and the hearth is also covered with these same minerals. The entire furnace stands above a pit, so it may be tilted either forward or backward. The three carbon electrodes pass through the top of the furnace. They, by either direct contact or by electric arcs, melt the charge, part of which is usually secondary materials and part of primary or virgin metals. When they are melted along with certain fluxes, which become slags, the final product is either plain carbon, or alloy molten steel, depending on the materials used. In foundry parlance this process is termed "a heat," and when the heat is finished it is "tapped," which means that the molten steel is poured from the furnace by tilting it forward. A highly preheated ladle receives the hot metal, and an electric crane transports it to the molding floor. It is then usually transferred to smaller ladles and the molds poured.

Electric steel is melted by two processes of several steps or operations each. Two different processes are used to accomplish certain results by the chemistry involved in each process. They are called "Acid" and "Basic" depending on the type slag used for the steel being melted. Acid electric steel is used for the largest majority of plain carbon and alloy steel castings, except high manganese steel and occasionally chrome and nickel steels. High manganese, or manganese steel, as it is commonly called, is made by the Basic process. The operations in making plain carbon steel by the Acid process briefly are: 1) selecting and putting together the various secondary materials, such as boiler-plate remnants, old machinery parts, foundry returns (sprues, gates, and risers), etc. Primary metals are generally not used for plain carbon steel castings. This step is termed "standardizing" and "compounding" the charge. 2) The top of the furnace with the electrodes is lifted off, and the large pieces of the charge along with some of the smaller pieces is placed on the furnace hearth. The balance of the charge may be put in now while the top is off, or it may be added through the charging door. The top is then replaced to its proper sitting. 3) The electrical power is then turned on and is gradually stepped up until the desired voltage is reached. This is referred to as "high tap." It is used to reduce the charge materials to a molten form. 4) The power is temporarily turned off, and a few shovelfuls of silica sand are added for a flux. It will become the slag for this process. 5) The power is again put on, but not at such a high voltage. This is "low tap," and it renders the fused materials of the charge and flux to a more liquid and viscid form. Or the heat turns the silica sand to a slag. This slag is very important in the chemistry or reactions that are taking place inside the furnace for it is removing from the molten steel harmful impurities, which are largely phosphorus, carried into

the molten steel from the original secondary charge materials. 6) When in the judgment of the melter, and he must exercise very good judgment, the slag has removed most of the impurities (the phosphorus and some of the sulphur) which he determines by the color and appearance of the slag, he takes a test sample from the heat which he casts into two one-pound specimens. One is sent to laboratory for analysis, and the other he keeps and breaks to observe its fracture and sharpness of break. From them he can determine the carbon content of the steel. Here also he must use good judgment because, if to him the carbon is too high, which is usually the case, he must add several pounds of iron oxide in powder form and "boils" it into the molten steel. This is done by immersing the electrodes in the bath with the power on, causing it to bubble strongly for a short time. 7) At the end of the boiling-in of the iron oxide, he adds more silica sand for more slag to remove the balance of the sulphur and other impurities. 8) When this is done, he compares his carbon determination with the laboratory analyses which how have been returned to him. If they both agree, which they usually do, he takes the temperature of the molten steel with an instrument called a pyrometer, although an experienced melter can closely tell the temperatures of molten steel by sight only. If the temperature is correct, as it generally is, the melter rakes out the slag which would also remove the deoxidizer (ferromanganese) that he adds next. The silica slag, which is an active acid, has a strong affinity for manganese, hence the Acid process cannot be used for high-manganese steel, since too much of it would be lost in the slag. The ferromanganese, in turn, has a strong affinity for the oxygen, etc., in the molten steel, hence it is called a deoxidizer. Some of it remains as a small percentage in the final steel where it is desired, because it imparts beneficial properties. 9) The heat is then tapped into a highly preheated ladle. When about one-third full ferrosilicon is added as a supplementary deoxidizer, and the balance of the molten steel, which is about 2,950° F., is then transported to the molding floor. As it is transferred to smaller ladles it is deoxidized the final time with usually pure aluminum and then into the molds. Alloy steels by the Acid process would be made the same way, as a good carbon steel is the base for an alloy steel. The alloying metal or metals, except nickel and sometimes copper, are usually added to the furnace just a few minutes before tapping, or in the ladle with time allowed for them to diffuse thoroughly. Nickel, as it does not oxidize, is put in with the charge. Copper is also sometimes added in this manner, but more often it is added to steel by using secondary materials that have the correct percentage of copper in them already.

The operations in making plain carbon steel and high-manganese steel by the Basic process are much the same as those for the Acid process, except a basic slag is used which is largely lime. Generally it is put into the furnace as limestone which the heat converts to lime. This slag also removes the phosphorus, sulphur, etc., but doesn't remove the manganese. It must be understood that where a basic slag is used a basic lining and hearth are necessary, as with an acid slag an acid lining and hearth are needed. Otherwise the slags would destroy the linings and hearths. Thus if silica sand, which is an active acid at high temperatures, is used the lining and hearth must be made of ganister or what the geologist calls quartzite. And if limestone,to which some fluorspar (fluorite) is usually added, is used the lining and hearth must be made of magnesite with the joints filled in with chromite that is both a refractory and an ore of chromium.

Carbon Steels and Other Alloys

Carbon steels are essentially of two types: plain carbon and high silicon. Plain carbon steel differs from cast iron in that the carbon in it is all combined carbon. While in cast iron the carbon occurs in two forms: 1) as free graphitic carbon, which may be seen as dark shiny flakes in the fracture of any piece of broken cast iron. 2) As combined carbon or iron carbide also called cementite, it is dispersed through the lighter area, which is free iron or ferrite, in

layers. These alternate layers of ferrite and cementite together are called pearlite. Thus hardness of steel is proportional to the carbon content, and is classed into three kinds: 1) low carbon with .05 to .30 percent carbon; medium carbon with .30 to.60 percent carbon; and high carbon with more than .60 percent carbon. High-silicon steels are those with a good carbon steel base plus greater percentages of silicon than found in ordinary steels, which is usually a small percentage remaining from the deoxidizing operation during tapping. In electric-furnace operation it is added to the ladle in the form of ferrosilicon. It has an important effect on the electrical properties of steel. It makes them magnetize very readily, hence they lose very little electrical energy. Because of this they are used for electrical equipment castings.

Alloy steels are much superior to plain carbon steels in most of their essential properties, and vary widely among themselves, as well as differing in the percentage of the alloying metal used either alone or combined with one or more others. All alloy steels have to have a good carbon steel base. The most well-known alloy steel is high manganese steel. It usually has 10 percent or more of manganese with generally 1.25 percent carbon. It makes a steel of high tensile strength and ductility, but impossible to machine, except by grinding. High-manganese steel is made by adding either ferromanganese or spiegeleisen to the molten steel, usually in the ladle.

Nickel, unlike manganese, is not readily oxidized, so it will not be lost in the slag. Thus it may be put in with the charge, but is usually added to steel by including secondary material that contains nickel. Common nickel steel has from 3 to 5 percent nickel with .15 to .45 percent carbon. It has considerably more tensile strength than ordinary carbon steel with just slightly less ductility. There are some nickel steels for special purposes that contain more than 30 percent nickel, such as invar with 38 percent and platinite with 46 percent.

Chromium is readily oxidized, so it would be lost in the slag if added to the charge. It is added to the molten steel in the form of ferrochrome, which is made from the ore, chromite. Chrome steel usually has from .5 to 1.5 percent chromium with 1 percent carbon. It is harder and more resistant to wear than regular steel, hence it is used for tools and similar products.

Another chromium steel is stainless steel in which the chromium is combined with nickel. Stainless steels usually contain from 12 to 18 percent chromium and 8 to 20 percent nickel with .05 to .40 percent carbon. It is not attacked by organic acids and is very resistant to mineral ones. Thus it is used where corrosion is a factor. Because of its pleasing appearance it is used for architectural purposes also.

Vanadium in the form of ferrovanadium is a powerful deoxidizer with much greater action than either manganese or silicon. Thus when used in this manner it must be added after all the other elements, otherwise the loss would be very great. Alone it tends to produce a fine-grain steel, however, it is generally used in combination with other metals as in very small percentages it increases the hardness, tensile strength, and resistance to shock and vibration in steel. Being usually combined with chromium and also sometimes nickel. Most vanadium steels are from .40 to 2.0 percent chromium, 1 to 4 percent nickel, .15 to .25 percent vanadium, and .10 to .60 percent carbon.

Molybdenum is added to molten steel in the form of ferromolybdenum in electric-furnace operation generally, although the salt, calcium-molybdate, is also used. It is likewise recoverable in secondary material that contains molybdenum. However, it is seldom used alone,

but in combination usually with chromium or nickel or both. It increases hardness in depth, toughness, and eliminates brittleness. Molybdenum steels are usually .15 to .25 percent molybdenum, .80 to 1.10 percent chromium, .50 to .80 percent manganese, and .25 to .55 percent carbon; or .20 to .30 percent molybdenum, 1.5 to 2.0 percent nickel, .30 to .70 percent manganese, and .12 to .22 percent carbon.

Tungsten is used with steel as ferrotungsten. The very high melting point of this alloyer causes it to dissolve into steel instead of melting into it. Tungsten in steel gives it the property of retaining its cutting edge and temper even at dull-red heat. Hence, it is used for high-speed cutting tools, and generally combined with chromium and other metals. Thus tungsten steels are from 13.0 to 19.0 percent tungsten, 3.0 to 5.0 percent chromium, .90 to 2.0 percent vanadium, and .60 to .80 percent carbon. Some also have a percentage of cobalt for even still better cutting properties. Likewise molybdenum is used as part of the tungsten, such as 1.40 percent molybdenum in Motung.

Copper is added to steel sometimes in the form of copper ingot added to the charge like nickel. However, it is a better practice to add it about 20 minutes before tapping. Copper steel is claimed to be rust resisting, and used in quantities of less than one-half of one percent. Also resistance to corrosion is increased by adding .40 percent copper and .05 percent molybdenum, but the carbon must be kept very low. Others also claim that copper is used more advantageously if used along with a percentage of manganese, so it will not "hot short" the steel, especially tool steels.

Aluminum is generally considered and used as a final deoxidizer with all steel-making processes. It is a very active one especially in low-carbon steels, and is used on the basis of 2 to 5 ounces per ton. The addition is made to the ladle and even sometimes to the molds in the form of shot or small rods, which is almost pure aluminum. However, some steel metallurgists prefer to use "Alsifer" which is an alloy of 20 percent aluminum, 40 percent silicon, and 40 percent iron. They claim it goes into solution better than pure aluminum does. Aluminum (pure) is also used to control the grain size of steel. In molten steel the aluminum is changed to alumina (Al_2O_3) and, as fine particles suspended in the steel, acts as centers of crystallization. The result is a fine-grained steel with certain desired physical properties.

Titanium and zirconium are usually added to steel as ferrotitanium and ferrozirconium. Titanium prevents stainless steels from deteriorization if subjected to temperatures of 1,300° F. It is also used as a deoxidizer, and in both cases it is added to the ladle.

Zirconium is also a deoxidizer, and it is a "scavenger" too, because it has the ability to eliminate particles of slag, etc. The recent research on this metal will doubtless expand its properties and enlarge its uses considerably.

HEAT TREATMENT OF STEEL CASTINGS

Although many steel castings have in the past and some still are used "as cast," that is without any further treatment being given them. Recently, however, more and more demands have been made of steel. So it has become a general practice to apply "heat treatment" to both plain carbon and alloy steel castings. Heat treatment of castings usually includes "annealing," "normalizing," and "quenching," etc. Thus it may be said that heat treatment is the application of heat to a steel casting, followed by cooling at a specified rate, for the purpose of obtaining certain physical conditions in the steel casting so heated and cooled. The treatments naturally vary according to the type of castings, their chemical composition, physical properties, ultimate use, etc.

Annealing means heating a casting to a temperature above the critical range, and holding it at that temperature for a sufficient time to insure complete penetration. Followed by a slow cooling in the same heat treating furnace. This treatment breaks up the "as cast" structure and promotes freedom from internal stresses and better machinability.

Normalizing differs from annealing only in that the casting is removed from the heat-treating furnace and is allowed to cool in still air. This results in a finer structure and greater strength, but a lower ductility. Thus sometimes the casting is reheated for a time below the critical range, and is slowly cooled in the heat-treating furnace. This results in restoring a higher ductility.

Quenching is where the casting is heated to a predetermined temperature above the critical range and held there long enough to insure complete penetration. Then quenched to atmospheric temperature in either water or oil depending on the type of casting under consideration. Except for special steel castings, this operation is rarely given just alone. It is usually followed by reheating to some lower temperature, generally below the critical range, and cooled slowly in the heat-treating furnace. This treatment gives the maximum refinement of structure with the greatest strength and toughness. However, very good judgment must be exercised before quenching any and all castings, as often they are of such size and shape that they are apt to crack if not properly handled. Only experience is the best guide for this process.

Thus it is seen that steel founding is an art as well as a science, and the success of the molder and melter (metallurgist) is gained by study and practice with close observation of details. Many of those details are very interesting, especially those of metallography, but they are an article in themselves so they cannot be included in this one.

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GEMSTONE PAMPHLETS AVAILABLE

A news release from the U.S. Bureau of Mines reports that amateur rock hounds throughout the 48 states picked up more than half a million dollars worth of gem stones last year. Some 50,000 persons combed ridges and valleys, streams and beaches for stone to cut and polish. The Bureau believes that these thousands of treasure hunters should be encouraged, for their searching not only results in a profitable industry, but increases the chance of uncovering significant deposits of strategic minerals.

For the benefit of persons interest in gem stones, the Bureau of Mines has published two pamphlets priced at 10 cents each. They are sold only by the Superintendent of Documents, Government Printing Office, Washington 25, D.C. The two publications are as follows:

1. "Gem stones," a chapter from the Bureau of Mines Bulletin 556, Mineral Facts and Problems. (Discusses properties and classification of gem stones, geologic occurrence and geographic distribution, gem stone cutting, and uses.)

2. "Gem stones," a chapter from the 1953 Minerals Yearbook. (Lists gems discovered in the United States in 1953 and their localities.)

M. L. Steere

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TO WASHINGTON WITH THE HANCOCKS
LIBRARY TALK BY LON HANCOCK, JANUARY 13, 1956

Friday, January 13, 1956, was no bad luck day for those of our members who went to the Public Library to hear Lon Hancock tell of the trip that Mrs. Hancock and he made to Washington, D.C., to attend the annual meeting of the American Federation of Mineral Societies, to which Mrs. Hancock had been chosen as delegate from the Northwest. It was a characteristic Lon-Hancock talk, interesting, informative, and spiced with humor. There were no slides or other illustrations but they were not needed.

The trip was made by bus as affording a better opportunity for sightseeing and studying the country traversed. Leaving Portland we were taken by way of Bend and thence through the canyon that marks the course of a "lost river" that once drained the Harney Valley and flowed to a confluence with the Deschutes. On this part of the trip we passed the famous "one-man town," Millican.

Idaho was mostly lava beds which can become monotonous, even to a geologist but at Ogden there was a break while the bus made a round trip to Salt Lake City. Resuming the journey from Ogden the trail led up Weber Canyon past the Devil's Slide. Here great basalt columns have split off from the edge of a flow and toppled to the talus slope below where they are roughly aligned so as to present from a distance the appearance of a plane surface. Beyond the Devil's Slide the road went by way of picturesque Echo Canyon into the Green River Basin, world famous as the happy hunting grounds of the dinosaurs in aeons past and thence into Wyoming where we observed the Sinclair Oil Company's refinery at Rock Springs and iron mines of the M. A. Hanna Company, evidence that we were getting into a country where minerals, and hence geology, played an important part.

Crossing Wyoming our speaker endeavored to enlighten one of the passengers who couldn't see anything outside of the window but "rocks, greasewood, and sagebrush" and before he realized it he found himself the center of an interested audience consisting of all of the passengers who could get near enough to hear. Knowing Lon, we are sure they heard something worth listening to.

From Wyoming the route crossed the Great Central Plain and approached Chicago where they had their first sight of Lake Michigan, water as far as the eye could reach, so that one could almost imagine that he was on the ocean shore. Here an unusual topographic feature was noted. Although there is a great body of water the drainage is not to it but away from it. During the Pleistocene a great glacier from the north invaded this area which had a southwesterly and southerly drainage and scooped out the great basin that is now Lake Michigan. When the ice receded the remnants of the original drainage were restored, separated from the lake by only a fringe of morainal material.

From Chicago the bus sped eastward through such industrial centers as Gary, Cleveland, Pittsburgh, Johnstown, and at Toledo our travelers had the pleasure of a brief visit with one of their families. From Pennsylvania they went on through Virginia and Maryland, reaching Washington at 3:30 A.M., but so thrilled by the view of the city from their hotel window that they forgot about going to bed.

Having some time before the convention they took advantage of it to do some sightseeing, the Smithsonian, Arlington Cemetery, the Tomb of the Unknown Soldier, Robert E. Lee home,

and other interesting localities. But Lon did not let these side interests distract him from his avocation and, finding a place along the Potomac where the torrential rains accompanying Hurricane Diane had washed away the top soil, he prodded about until he unearthed some fossils which he brought back and exhibited to us.

The convention was very interesting and afforded an opportunity for reunion with many old friends, including Dr. Roland Brown, paleobotanist and good friend of our society. The exhibits were outstanding and among them they noted particularly two magnificent opals, one of them valued at $200,000 but the other much less pretentious and carrying a value of only $50,000. The banquet was held on the "minus fourth" floor of the Shoreham Hotel, that is in the fourth sub-basement. While they were in Washington, their Philadelphia family came to see them and they returned via that city. There they visited the museum and planetarium, where they listened to a lecture on satellites, and made a trip to Valley Forge where there are restorations of the old huts occupied by Washington's soldiers during the direful winter of 1777-78. After a side trip to New York and Atlantic City, with the usual sightseeing, they returned to Philadelphia and headed westward.

Traversing Pennsylvania, Ohio, Indiana, and Illinois, they passed through, or rather over, the Carboniferous Forest, that tangled mass of vegetation of Pennsylvanian age which gave us the great coal measures of these states. The speaker noted the many coal mines, many of them surface operations, that can be observed from the highway and said that it is estimated that a billion dollars worth of energy has been taken from this area. He likened the Carboniferous Forest in its original state to the present day Everglades but stated that it had an extent of 300 by 1000 miles whereas the Everglades are about 60 by 100 miles.

On westward - entering Missouri at St. Louis and across the plains states to Denver and then into the mountains. Here they saw evidences of Colorado's one-time glory as a gold and silver producing state and crossing the divide at an elevation of 11,900 feet, they beheld the new era. Following the Colorado River to Grand Junction, the "uranium capital," they passed miles and miles of cliffs of oil shale and two ore-processing mills, one for uranium and one for vanadium ores.

From Grand Junction they were soon in Utah and definitely on their way home. Lon closed his talk with an account of his pleasant bus acquaintance with a gorgeous blonde, to whom he showed the usual courtesies due a fellow traveler and who seemed very willing to accept them not withstanding Mrs. Hancock's presence and, after elaborating on the instance a bit, stated that when he asked her age she coyly admitted that she was "goin' on three."

L.A.P.

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NEWS LETTER BINDING

Raymond L. Baldwin requests that all members wishing their News Letters bound will get them to him at an early meeting or Thursday luncheon so that he can take them all to the bindery at one time. He predicts prompt service for the first load, but is not willing to state how long it will take to get later bundles processed.

Take out all staples, remove the yellow covers, include the index, and mark package with your name. and hurry, HURRY, HURRY.

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LUNCHEON NOTES - February 9, 1956

Word must have gotten about that Al Keen was to be our speaker on February 9th, as we had the best attendance in weeks, twenty-three sitting down to enjoy Mrs. Quick's hospitality. We were glad to welcome Don Walker, returned from doing his duty in Germany by our Uncle. Don expects to be with us regularly from now on.

Al's talk was on amber and was not only interesting in itself but was highlighted by some very interesting specimens, most unusual of which was one showing a spider more than an inch long imbedded in it and as perfect as when alive.

Amber is a fossil resin which apparently has some characteristic which attracts insects, as many pieces have been found with insects entrapped in them - reminds one of the tar pits at La Brea, California.

It was known at least as early as 600 B.C. and was given the name "electron" by the Greeks and, because of the ease with which it becomes statically charged, this name has been passed on to us in "electricity."

It first came to notice in modern times when pieces were found along the shore of the Baltic Sea in East Prussia and were sometimes brought up in the nets of the fishermen. The industry seemed to be of sufficient promise that in 1870 the German government leased the rights to recover amber for a 25-year period. The lessees had geological studies made and as a result sank a shaft on the seashore. This shaft penetrated a surface layer of marl and sand and then passed through a layer of lignite interstratified with light sand and gray clay; then entered a layer of greensand 50 to 60 feet thick. These strata are of Miocene age and all contain amber, but it is most abundant in four to five feet of "blue earth" in the greensand. There is evidence of a dense forest in this area during the Miocene with a great variety of trees including conifers from which the amber was derived. The blue earth extends under the sea bottom from which amber has been eroded by wave action and washed onto the beach, thus giving rise to the first discoveries.

Hundreds of insects have been found imbedded in the amber and 152 different varieties of flies have been identified. Tufts of fur and feathers have been found, showing that the resin attracted larger animals which apparently escaped but at least one small lizard was not so lucky, as he remained to tell the tale - mutely.

Amber is a hydrocarbon and will burn as was demonstrated when the speaker ignited a piece for us. The specimens, which included one of the blue earth, were of great interest, especially the one mentioned that showed the perfectly preserved spider.

L.A.P.

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GEOLOGICAL NEWS LETTER

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Society Objectives

To provide facilities for members of the Society to study geology, particularly the geology of the Oregon Country; the establishment and maintenance of a library and museum of geological works, maps, and specimens; the encouragement of geological study among amateurs; the support and promotion of geologic investigation in the Oregon Country; the designation, preservation, and interpretation of important geological features of the Oregon Country; the development of the mental capacities of its members in the study of geology; and the promotion of better acquaintance and closer association among those engaged in the above objectives.

Persons desiring to become members should contact the Membership Chairman, Mrs. Leslie C. Davis, 7704 S.E. Taylor Street, Phone AL 3-6723. Regular annual dues (single or family memberships) are $5.00 for residents of Multnomah and adjacent counties; $2.50 for others; and $2.00 for Junior Members. Make remittances payable to the GEOLOGICAL SOCIETY OF THE OREGON COUNTRY.

Society Activities

(See "Calendar of the Month")

Evening Meetings: Formal lectures or informal round-table discussions on geological subjects, on the second and fourth Fridays of each month at Public Library Hall, S.W. Tenth Ave. and Yamhill St.

Field Trips: Usually one field trip is scheduled for each month.

Library Browse Nights: Once a month. Lewis and Clark College.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.00 per plate.

Publication: The Geological News Letter, issued once each month, is the official publication.

CALENDAR FOR MARCH 1956

Luncheon Notice

Buffet luncheon every Thursday noon at the Portland Chamber of Commerce, 824 S.W. Fifth Avenue, upstairs. One dollar.

Meetings

ANNUAL BANQUET

Friday Mar.9 — Mt. Tabor Presbyterian Church, Southeast Belmont Street at 55th Avenue, 6:30 p.m. Tickets - $2.25. For reservations call Mr. Leo Simon, CA 3-0300. Ralph S. Mason, Mining Engineer, State of Oregon Department of Geology and Mineral Industries, will be the principal speaker.

Tuesday Mar.20 — LIBRARY NIGHT
Place: Biology Building, Lewis and Clark campus.
Program: 7:30 to 8:30 Browsing among the books and maps.
8:30 to 9:00 Discussion.
9:00 to 10:00 Social hour and refreshments.

Friday Mar.23 — Library Hall, 7:30 P.M.
Lloyd L. Ruff will present an illustrated lecture on the Geology of Idaho, touching on matters of the possible locations for dams from the geological as well as the engineering angles.

Friday Apr.13 — Library Hall, 7:30 P.M.
Orrin E. Stanley will show colored slides of the high Canadian Rockies and other geological features that he has chosen for their scenic attraction. He may introduce some slides that have little or no geological significance, and may close his show with the tail of the yellow cat.

Sunday Mar.25 — FIELD TRIP - see page 31.

NEW MEMBERS - February 1956

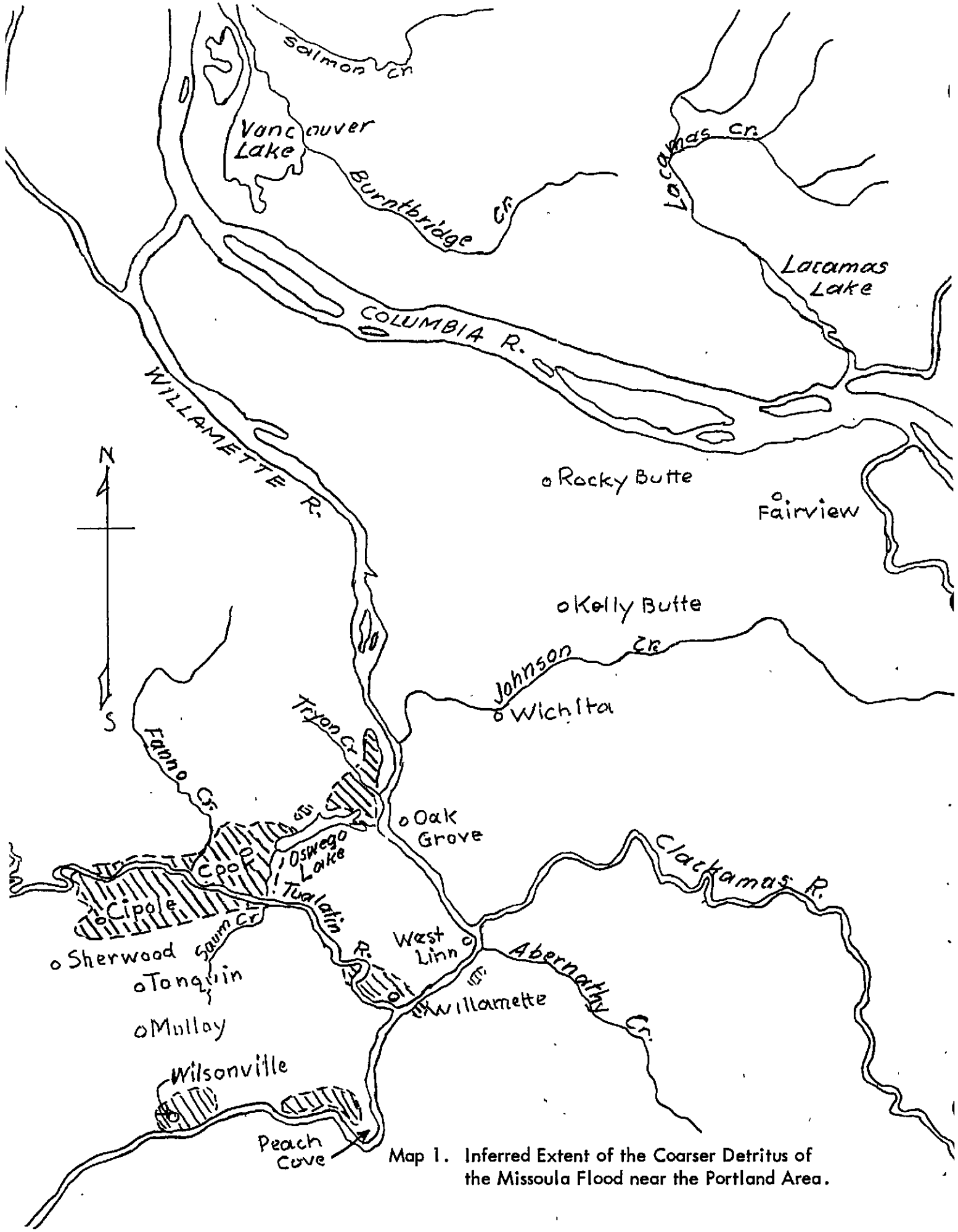
		Phone
Applegren, Mr. & Mrs. Wilson	R.F.D. #3 - Box 166, Hood River, Oregon	5924
Errett, Mr. & Mrs. Sanford	2707 N. Halleck Street	BU 9-6044
Leonard, Robert W.	Rte. 1, Box 382, West Linn, Oregon	O.C. 2189
Shank, Dave L.	1020 S.E. Pine Street Zone 14,	BE 6-9148
Clark, Floyd W.	1802 S.E. 6th Avenue " 14,	BE 4-3596

CHANGE OF ADDRESS

Kern, Mr. & Mrs. Emery R.	152 S.E. Kelly Street, Gresham, Oregon	
Walsted, Mr. & Mrs. John P.	Rte. 1, Box 606, Monmouth, Oregon	Mon. 371
Williamson, Dr. & Mrs. K. J.	1607 Walnut Street, La Grande, Oregon	
Van Dermark, Miss Phyllis	9100 S.W. Garden Home Road, Zone 1,	CH 4-3830
Mix, Miss Adeline E.	1969 S.W. Park Avenue, Apt. 208	CA 3-9320

* * * * * * * * *

DUES ARE DUE!



Map 1. Inferred Extent of the Coarser Detritus of the Missoula Flood near the Portland Area.

LATE PLEISTOCENE FLOOD DEPOSITS IN THE PORTLAND AREA

By
Dr. James Stauffer*

Reasonable objections to the theory that a late Pleistocene flood swept down the Columbia River and spread over the Portland area with devastating effects disappeared with the publication in 1933 of Allison's paper on the "New Version of the Spokane Flood" and with the accumulation of corroboratory evidence since then. Contrary to the belief of Bretz that the flood was responsible for the thick cover of sands and gravels in the Portland area, Allison showed that most of these, as well as similar deposits near Umatilla, Hood River, White Salmon, Lyle, and Carson, are older than the flood, and that only erosional features and scattered areas of fresher sands, gravels, and coarser materials are explicable in terms of the flood. Lowry and Baldwin believe the older deposit, variously known as the "Portland Gravels," and the "Portland Delta Gravels," was built by the Columbia River into a body of water that gradually flooded the Willamette Valley as a consequence of a eustatic rise in sea level accompanying the melting of glacial ice during Wisconsin deglaciation, and that the present elevation of this deposit is due to subsequent uplift. The younger erosional and depositional features, Allison suggested, could have resulted from flood waters released from an ice jam initiated by landslides in the Eagle Creek Formation in the vicinity of Stevenson, Washington. Since it is now recognized that the flood probably occurred after the Spokane Stage of glaciation, the older term, "Spokane Flood," may be considered a misnomer. Also the weight of evidence against the theory of the damming of the lower Columbia River, plus the finding by Pardee of evidence for unusual currents in glacial lake Missoula in Montana, led to the theory that the flood was due to the release of an unusually large body of water in the upper Columbia; therefore the name, "Missoula Flood," is now preferred by some. These flood waters, it is claimed, had an elevation of 2100 feet before reaching the Wallula Gateway; between the Gateway and The Dalles they may have attained 1600 feet and in the Portland area they fanned out at an elevation of about 500 feet. Some estimates are a little more conservative than these but at any rate there is general agreement that it was a flood of major proportions.

Both the Portland Gravels and the younger flood deposits contain erratic fragments of plutonic and metamorphic rocks similar to types found in the upper Columbia basin. Most of these were ice rafted into the area although some may have been tree rafted, similar to those of recent origin along the Columbia described by Sargent. Some of the erratics in the flood deposits are highly weathered and are probably redeposited from the Portland gravels, but most of them are relatively unweathered and doubtless were borne by icebergs that came down with the flood. Between the Wallula Gateway and The Dalles, erratics have been found at around 1100 feet altitude; in the Willamette valley they occur up to 400 feet. The picture we have, therefore, is that of a rumbling torrent of muddy water, carrying huge icebergs and debris of all sorts, plunging through the Columbia gorge, fanning out in the Portland area, rushing relentlessly up the Willamette and into its tributaries against the natural flow of these rivers, spending its energies and then surging out leaving a scene of havoc that thousands of years have not obliterated.

The present paper is an attempt to map and describe some of these flood deposits and to speculate on the effects of the flood in altering the drainage of the area. Following are the most conspicuous erosional and depositional features in and near the Portland area:

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* Professor of Biology and Geology, Lewis and Clark College.

Erosional Features

1. Lacamas Lake area in Washington
2. Portland City area
3. West Linn, Oregon City, and Oak Grove areas
4. Oswego and Riverdale areas
5. Tonquin area
6. Area north of Peach Cove

Depositional Features

7. Portland City area
8. Areas east and north of Oswego Lake
9. Area west of Oswego Lake
10. Wilsonville area
11. Oregon City Park area
12. Lower Tualatin Valley
13. Peach Cove

Map 1 (opposite page 21) shows the location of these features. No doubt there are many more; however, these alone are sufficient to indicate the nature of one of the most catastrophic events of late Pleistocene times. Let us discuss each feature separately.

Erosional Features

1. Flood waters swept through the Lacamas Lake channel in Washington, scouring out a wide depression 25 to 50 feet deep and several miles long northwest of the lake. Rushing toward Vancouver Lake and Salmon Creek, the waters cut "deep distributary erosional channels" in the 300-foot terrace.

2. Surging across the Portland area, flood waters cut a broad depression about ten miles long from Fairview to Wichita. A deposit of fine gravel and sand at Wichita was interpreted by Allison as having been left by the flood. The depressions to the west of Rocky Butte were scoured out of the 300-foot terrace by waters swirling around the butte and concentrating their energies there. Sullivan Gulch was probably largely formed by erosion from water draining out of these depressions. Flood-scoured depressions also occur west and north of Kelly Butte.

3. Numerous places once covered by a residual soil of Columbia River basalt, Boring lava, or Troutdale Formation have been stripped down to bare rock. One of many such places may be observed south of the West Linn High School, an area that lay in the path of flood waters as they funneled through the Oregon City Gorge. This typical scabland, extending southwest from West Linn to the Tualatin Valley, shows such features as depressions, quarried areas, completely denuded areas, and areas with little soil and bearing a growth of scrubby trees and shrubs. Just across the Willamette River from West Linn, between the Clackamas River and Abernathy Creek, is a low area that contains a number of fairly large depressions. It has been suggested that these were caused by the scouring action of a giant flood eddy formed in this cove, although it is possible that they are old meander scars. In Oregon City there are a good many places that have been stripped down to bare rock. Scabbing is also evident in the Oak Grove region a few miles north of Oregon City. Here the long ridge between the Willamette River and Kellogg Creek is composed of Troutdale Formation underlain by Columbia River basalt. Growths of scrub oak prevail along this ridge and, where new housing projects are under construction, Troutdale

gravels may be seen at the surface. Evidently the old residual soil must have been entirely stripped away by the flood.

4. The northeast end of Oswego Lake was originally a depression occupied by an intermittent pond that was not directly connected to the lake. It is believed this may be due to flood scouring in a Pre-Boring river bed. That flood waters, rushing across the Fairview-Wichita region, found the Oswego Lake gap a natural pathway is attested to by numerous scabbed areas around the lake. Denudation is evident in the Lakebay region, lying between the two eastern embayments of the lake. Several long, narrow depressions, characterized by a pond, swampy areas, and stripped areas, cut across the Oswego golf course from the northeast to the Southwest. These are in a direct line with the Fairview-Wichita channel. The golf course channels lead to Twin Point and Diamond Head on the north side of Oswego Lake. Here, as well as in nearby areas, the top soil has been almost entirely washed away and growths of scrub oak, madronas, and various shrubs alternate with rocky treeless areas. Just west of Diamond Head is a pond, now connected to the lake by a narrow passage, that was a swampy depression before the lake level was raised by damming. This was doubtless formed by the action of flood waters cutting across the present golf course and plunging down into the lake channel. Other depressions occur a short distance to the west near the Oswego Riding Academy. Denudation is also evident in places on the south and west sides of the lake, although the latter is mostly covered by flood sediments. In the Riverdale area a strip extending from that place to Dunthorpe has been partially denuded. It appears that material removed from here was carried to the Tryon Creek and Oswego region.

5. The Tonquin scabland is characterized by numerous depressions, surfaces stripped of soil, some with scarcely any or no covering of vegetation, and a number of channels from which rock has been quarried by a mighty force. The impressive channel just west of Tonquin and Mulloy has been named "The Tonquin Floodway" by Hodge, who recognized that this area was once the scene of a great flood. Until recently, however, there has been some doubt as to the direction from which the flood waters came into this area, some imagining that they entered from the south. That this is not the case is indicated by depositional features that will be discussed below.

6. Up the Willamette River, just north of Peach Cove, is an area of scrub oak growing in a very thin soil (Map 3 on page 29). Nearby, at a lower elevation, two elongated ponds, now virtually swamps, may be seen. These features were noted and interpreted by Rudolph Erickson. They will be discussed later in connection with the deposits at Peach Cove.

Depositional Features

A great many types of flood sediments occur, ranging from poorly to well-sorted ones. The deposits range in thickness from a few feet up to about 100 feet and show both vertical and horizontal sorting of materials. Most of the sediments have been derived from the following older rocks:

a. Portland gravels and sands.
b. Boring lava boulders, cobbles, and pebbles.
c. Troutdale formation gravel and sand.
d. Columbia River basalt boulders, cobbles, and pebbles.
e. Plutonic and metamorphic erratics from the upper Columbia basin.
f. Pieces of rock of unknown origin, some of which are probably from the Eagle Creek formation.

In general the materials have not been transported very far; in most instances a deposit can be traced in origin to an adjacent scabland, so that it is possible to readily determine the direction of each of the various flood paths through the region.

7. Not many sediments in the Portland city area have been definitely earmarked as flood deposits. Those west of Mt. Scott at Wichita have already been noted. Poorly sorted gravels near Rocky Butte are probably of flood origin; others have been reported along the base line north of Gresham. There was doubtless a widespread shifting of Portland gravels and sands from one place to another in the city. Moreover, the mantle of silt that blankets much of the area dropped from the waters as the flood abated. In contrast with the older Portland sands, those of the flood are considered to be looser and to slide more freely, although this is not always a reliable criterion. Down river from Portland, flood deposits have been reported near Scappoose and Deer Island; up river they are known from a number of localities, but it is not proposed to discuss these or scabland features along the Columbia River in this paper.

8. In the process of enlarging the Riverdale School playground some time ago, many large residual boulders, that do not appear to be in place, were uncovered. With them is the largest erratic the author has seen in the vicinity of Portland. Measuring about 6 by 4 by 3 feet, it is a porphyry containing large feldspar phenocrysts. These boulders are considered to be part of a flood deposit extending from this area to Oswego. Lower Tryon Creek is a deep, narrow cut through this flood deposit. Flood sediments may be seen at a good many places east and north of Oswego Lake. The following are typical:

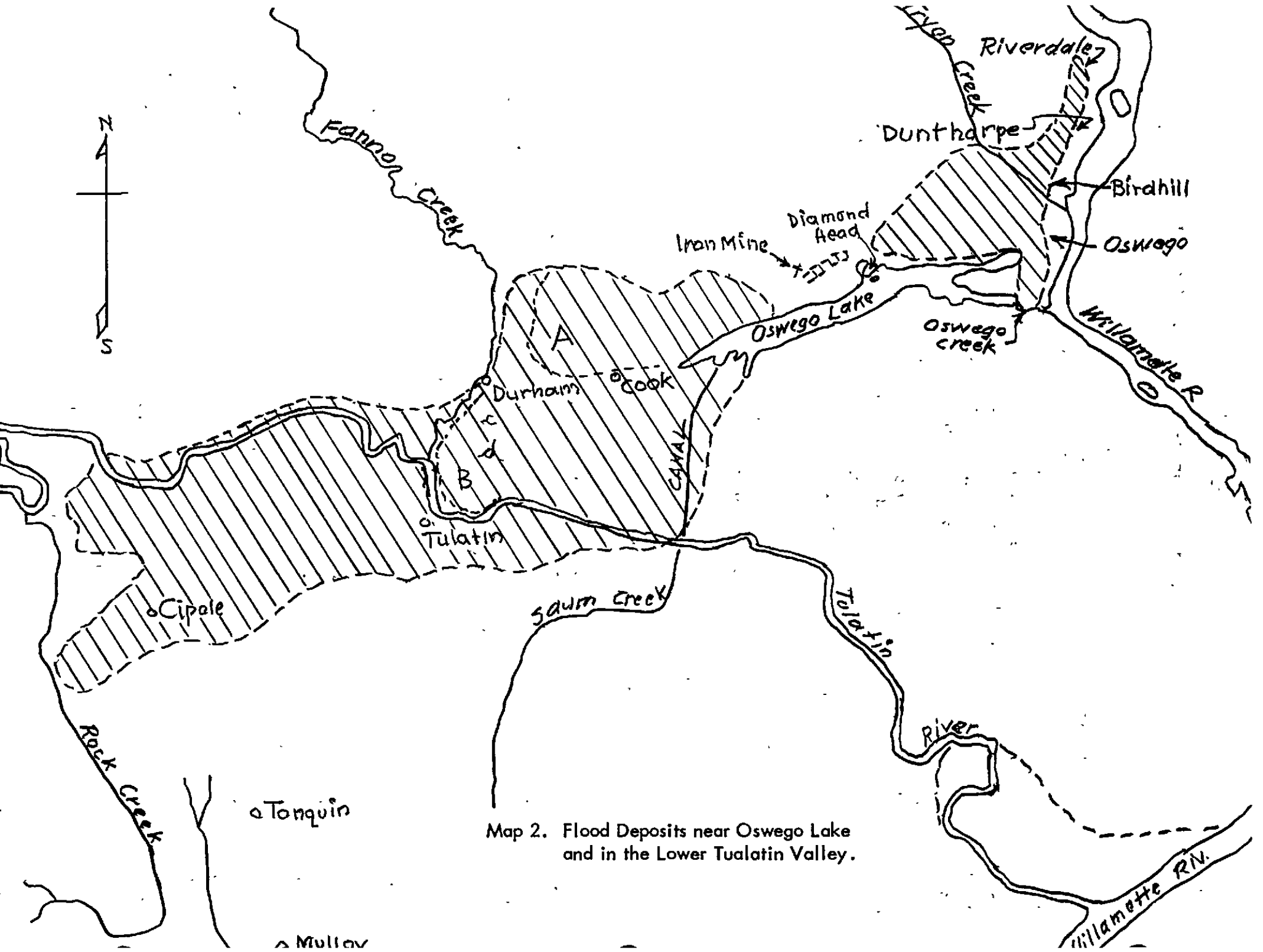
a. Just south of Tryon Creek at the northern entrance to Oswego.
b. On the east side of State Street just before reaching the Grade School.
c. Along the road leading from State Street around the south side of the Oswego Cement plant.
d. On the sides of Oswego Creek canyon and near the Oswego City Park at the junction of the creek with the Willamette River.
e. In the Forest Hills area and on both sides of Tryon Creek.
f. In the Birdhill and Dunthorpe areas.

The sediments composing these deposits vary from boulders and cobbles of different sizes through gravels and sand to silt. The deposit at the north entrance to Oswego offers the best section; it shows a gradation from around ten to twelve feet of a coarse mixture at the bottom to twelve to sixteen feet of sands, with five to six feet of silt on top. Excavations for basements reveal that this silt covers the older residential part of Oswego as well as the newer Forest Hills section and that, at least in the latter, it is underlain by a thick layer of micaceous sand that is probably reworked from the Portland gravels. A micaceous sand outcrops a short distance down Tryon Creek canyon beyond Tenth Street and is also found across the canyon to the north at a new cut, that was made for the completion of Terwilliger Boulevard Extension, as well as in Birdhill. Coarse material may also be seen in Birdhill above Boring lava along Highway 43. Excavation for a new house in Dunthorpe has recently revealed a top layer of silt resting on six to eight feet of sand, with coarser material - some of which is water-worn pebbles - below. It seems evident that this entire deposit is a lateral one made as flood waters swept up the Willamette and through the Oswego Lake channel, and that it once completely filled lower Tryon Creek canyon. Indeed it appears probable that the Willamette was temporarily choked with sediment near this region. Another lateral deposit of coarse materials lies north of the lake along Iron Mountain Boulevard. At the other localities east of the lake, boulders, cobbles, and gravels are the principal flood sediments. A discussion of the significance of these is reserved until later. Map 2 (opposite page 27) shows the above deposits as well as those west of the lake and in the lower Tualatin Valley.

9. The most extensive Missoula Flood deposit in the vicinity of Portland extends from the northwest end of Oswego Lake to some distance beyond Cipole. At "A", Map 2 (opposite page 27), there is an exposure of mostly angular rocks, sands, and silt that is similar to the Oswego deposit, and that was originally classified as Troutdale Formation by Treasher. It may be seen by walking out the railroad tracks beyond Cook Station. This deposit forms a sort of flat-topped dome around 250 feet in elevation, the southern border of which is an embankment that extends between Upper and Lower Drives in Lake Grove and curves around to the north as shown by the dotted line on the map. This may be interpreted as having been made by flood waters surging through the depressed area bordering the lake on the north. A greater surge through the lake channel proper swept flood debris to area "B," which is also a sort of low half-dome that drops sharply into the Tualatin River and Fanno Creek. The top of this dome has an elevation of about 200 feet. The steep embankment, indicated by the dotted line, marks the limit of the bouldery material but sands and fine gravels were carried farther to the west. The Tigard Sand and Gravel Company has scooped out several large, deep pits in deposit B near Durham. The following evidence obtained from these pits proves that the flood came from the east and passed through the Oswego Lake Gap.

a. Torrential bedding planes slope toward the west and southwest.
b. Numerous fragments of limonite are present, the only known nearby source of which is the Oswego Iron mine locality within the Oswego Lake Gap.
c. Numerous pieces of opal found in the pits are similar to opal found in place at Diamond Head.
d. Quartzite pebbles have been found within the pits. These must have been derived directly or indirectly from the Troutdale Formation, the nearest source being the area east of Oswego Lake.

The sizes of rocks from the gravel pits are truly impressive and furnish the most convincing proof of the energy of the flood. Basalt and breccia boulders larger than a car, portions of huge basalt columns, and a number of large erratics, all of which must have been transported several miles, are mixed with an assortment of smaller materials in almost utter confusion. Here and there one can see that deposition was so rapid that finer materials are completely lacking in the spaces between steeply inclined layers of tightly packed cobbles and boulders. One of the noteworthy features in the deposit is the presence of globular masses of clayey material, some of which are several feet in diameter. These are clearly not decomposed boulders. Because of their rather poor cohesiveness it appears highly improbable they could have been transported intact by the flood waters for any great distance. It is likely they are chunks of clay that have been scooped up a short distance to the east and rolled along to their present resting place. The thickness of the deposit at the site of the pit near the office of the gravel company is about 35 feet; in a pit a short distance to the south the thickness reaches around 75 feet (see Map 2, "C" and "D"). This is a significant fact that will be discussed later. Beneath the flood deposit is a blue clay which is probably the pre-flood residual soil. The border of the coarse Durham deposit may be observed by walking north up the railroad tracks from Tualatin toward Durham. The river here skirts around a steep bluff in which angular rocks may be seen. Paralleling the railroad tracks on the west side is an abandoned river bed which was likely the post-flood course of the Tualatin before it assumed its present position. To the west of the bluff finer sediments prevail. At Cipole there is a sand pit in an east-west elongated hill. Fine gravels are found here from which it is possible to pick up small fragments of limonite, opal, and granitic rocks similar to those found in the Durham pits. North of Cipole, along the north side of Highway 99W, there is an embankment of sand which is doubtless part of the same deposit. The inferred extent of coarse flood detritus west of Oswego Lake is indicated on Map 2. Here, as elsewhere, a foot or more of silt blankets the coarse materials and it is probable it covers large areas of the Tualatin valley into which the coarse sediments were not carried.



Map 2. Flood Deposits near Oswego Lake and in the Lower Tualatin Valley.

10. Recently a hitherto unreported flood deposit was discovered on the north side of the Willamette River near the bridge on the new Salem highway. This material is at present being removed for gravel so that it is possible to observe some excellent sections of it. In general it resembles the deposit at Durham, although no boulders as large as those at that locality were observed. Limonite and quartzite were not found but erratics are present. Most important is the fact that the torrentially bedded materials incline toward the south, revealing clearly that they were stripped from the Tonquin area by flood waters and transported to this place. It has been suggested that the work done in transporting these sediments was due to a back surge of water that had pushed up into the Tualatin Valley, but it is probable that both direct attact as well as back surge were responsible. Here again, even at this distant locality, one is impressed by the amount and nature of the debris that has been piled up and can imagine the fury of the waters. One might expect that the Willamette would have been blocked at this point, and indeed it may temporarily have been for it now swings in a gentle arc around the bulge of flood deposit.

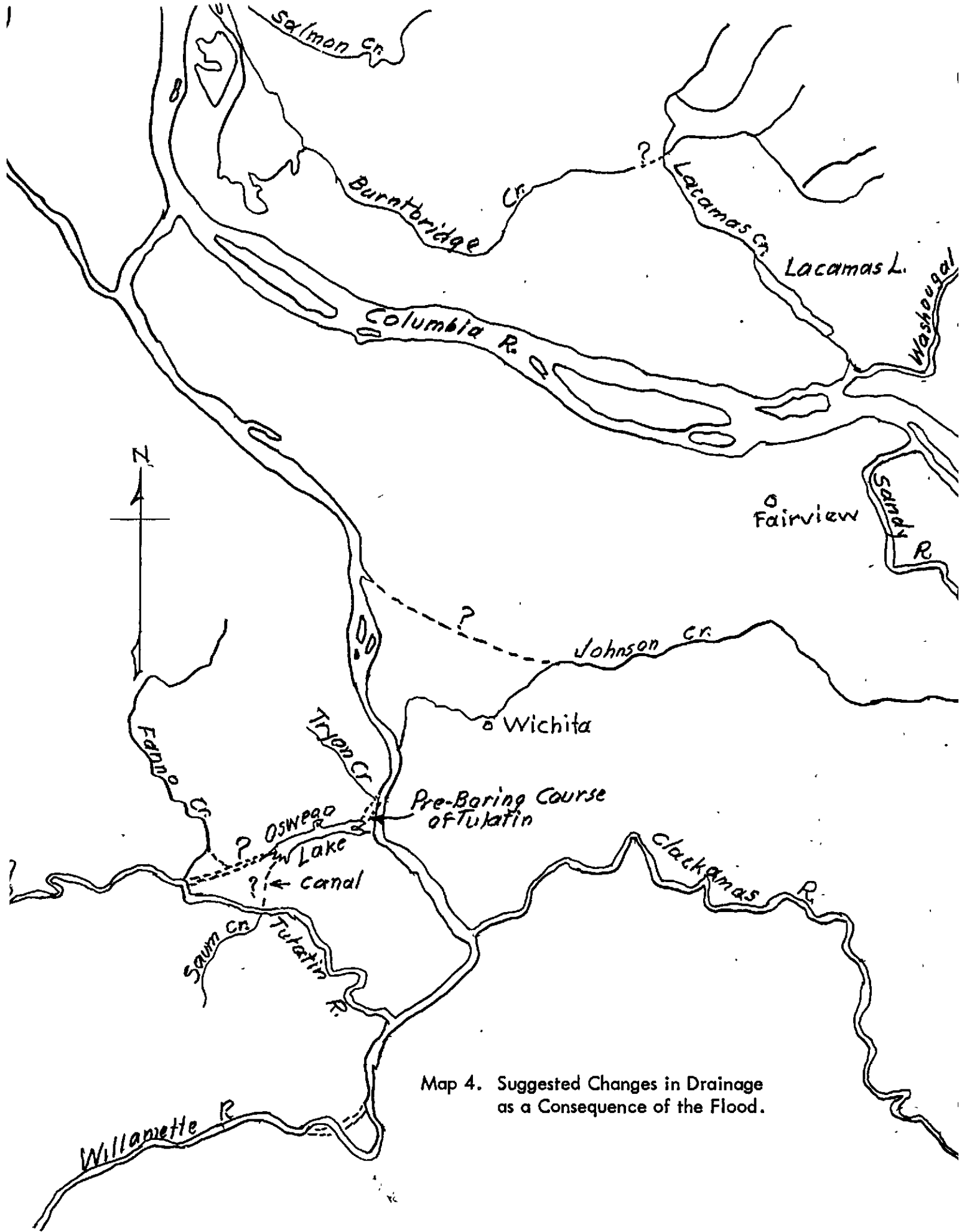
11. In the Oregon City Park area in the southern part of that city a chaotic mass of large boulders of gray basalt, torn from cliffs immediately to the north, presents mute evidence of the force of the waters that ripped through this region. The writer is indebted to Murray Miller for pointing out this locality and also the scabland at West Linn.

12. The Tualatin River has an unusual course near the town of Willamette. Just before reaching Field's Bridge it makes a large U turn, and then, after passing the bridge, flows through a canyon on the south side of the valley. Studies show that the mouth of the valley is filled with a sediment that is coarser near the Willamette River and grades into fine gravel and sand up the valley. In the process of enlarging the baseball field near the mouth of the Tualatin a couple of years ago, large boulders, some of which are erratics, were uncovered. On the other hand, up the river a loose, coarse sand and fine gravel may be observed in the road embankments near Field's Bridge. Since this deposit shows bedding planes that are inclined to the northwest it is inferred that it is part of the flood deposit that once completely filled the lower part of the Tualatin Valley, compelling the river to cut its way across and through it. Needless to say much of the sediment came from the scablands that extend from the valley to West Linn.

13. In the northwest part of Peach Cove there is a fairly high cuestalike ridge with a gentle slope to the east and a very steep slope to the river on the west. It is composed in large part of angular materials that evidently were not transported far. A number of erratics of various sizes and kinds are scattered about. The historical implications of this ridge will be discussed in the next section. It is believed the Peach Cove deposit may be continuous with one a mile upstream at the north end of the Canby Ferry. Here the high embankment along the river is composed of fine gravels and sand. This is possibly the last significant deposit made by waters surging up the Willamette.

Impaired Drainage

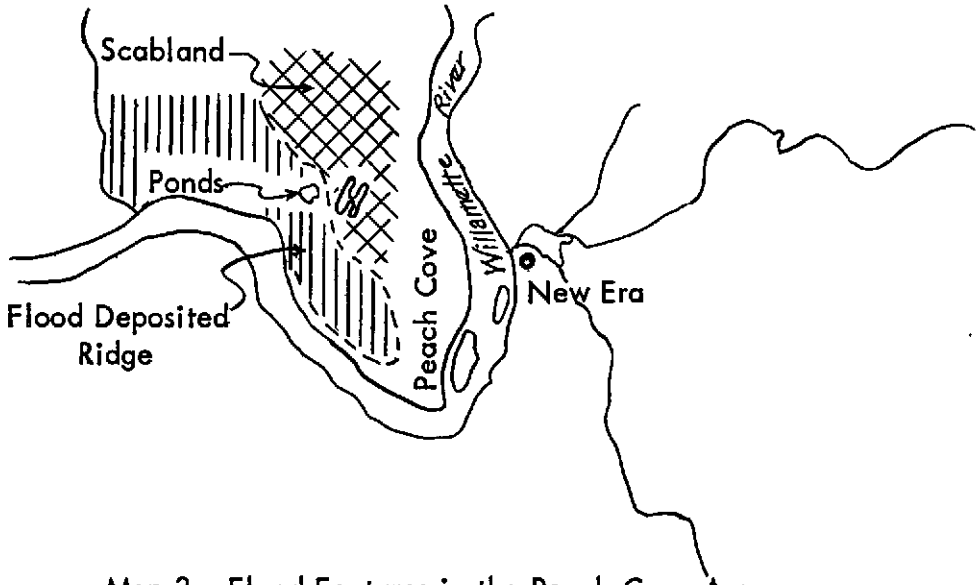
That a flood of such proportions should interfere with the drainage would be expected; however, except in a few instances, convincing proof of change is difficult to obtain. The following are mostly suggestions; additional studies need to be made to settle the various issues. The changes indicated are postulated: (see page 29)



Map 4. Suggested Changes in Drainage as a Consequence of the Flood.

A. Map 3 (below) shows that the Willamette River makes a large U-shaped bend around Peach Cove. In itself this is not particularly significant, but when it is considered relative to other facts known about this area an interesting bit of physiographic history comes to view. The following facts may be enumerated:

a. The existence of the already mentioned scabbed area (Map 3).
b. The cuestalike ridge composed of angular materials and containing erratics.
c. The U-shaped bend of the river around Peach Cove.



Map 3. Flood Features in the Peach Cove Area.

The history, as worked out by Erickson, appears clear. Formerly the Willamette cut across what is now the cove. Flood waters, channeled through the gap south of Oregon City, stripped soil and rocks from the area indicated as scabland on Map 3 and deposited them as a ridge that blocked the river and compelled it to make the large U-shaped detour. The flood-scoured channels, now intermittent ponds, are particularly impressive. At first glance it appears that they represent part of the old river bed, but closer study reveals that toward the north they are separated from the river by higher land. A small round pond west of these and on top of the ridge is probably due to slumping. It resembles kettle lakes the author has seen in glaciated areas of the north central states, and one is tempted to believe that a large iceberg may have become stranded at this point and that deposition around it, followed by melting of the ice, left a depression that subsequently filled with water. A somewhat similar but deeper pond is located in the northwestern part of the town of Tualatin.

B. Lacamas Creek (Map 4 on opposite page) flows in a westerly direction from the Cascade Mountains until it reaches a point a short distance west of Proebstel, where it makes an abrupt turn to the southeast and then flows through the previously mentioned flood-made depression northwest of Lacamas Lake. It is suggested that, before the flood, Lacamas Creek may have flowed in a westerly direction through Burntbridge Creek valley to the Columbia, and that the cutting of the depression by the flood formed a lower outlet for its waters.

C. Johnson Creek, before the flood, may have emptied into the Willamette River several miles north of its present junction. The anomalous nature of its course from Lents Junction to

Milwaukie and the barbed nature of its junction suggest this. It is postulated that its course was altered by the formation of the Fairview-Wichita flood channel.

D. As already mentioned, Tryon Creek was probably dammed by flood debris but did not alter its course. Its present lower course is in a deep canyon cut through sedimentary materials. There is some evidence that in Pre-Boring times Tryon Creek occupied a canyon slightly north of its present one and that its course was altered by a flow of Boring lava.

E. The Tualatin River and Fanno Creek appear to have altered their courses as a consequence of the flood. The following changes are suggested:

a. Prior to the flood the Tualatin River flowed through the Oswego Lake gap. There are several reasons for believing this was the situation. First, the greater thickness of the flood deposits at "d" (75 feet) compared with that at "c" (35 feet) on Map 2 (opposite page 27) may be interpreted as being due to the filling of the old river bed. Moreover near Cook, in a direct line with "d" and Oswego Lake, there are rather deep, swampy depressions, through which railroad embankments have been built, that are believed to represent the old Tualatin River bed, incompletely filled with flood detritus.

b. Flood deposits filled Oswego Creek canyon, the pre-flood outlet of the Tualatin. Evidence of this is the gravelly and bouldery materials found beneath the roots of large trees growing along the side of the canyon near the dam. At the same time sediments were deposited by the flood west of the Oswego Lake gap, filling in the old river bed and forming a high embankment north of Tualatin that effectively blocked the course of the river.

c. The consequence of these events was that the Tualatin River was forced to change its course and flow through an already existing partly structural and partly erosional valley which it still occupies. Erickson believes the Tualatin eroded its present valley first, was diverted and cut the Oswego Lake gap, and was then forced back into its older valley by flood deposits. This may have been the case; however, an alternative theory is possible, namely that the Tualatin originally flowed through the present Oswego district, cut the gap as late and post-Pliocene deformation occurred and was subsequently diverted by the flood into its present valley, which was a syncline occupied by a smaller stream.

d. Fanno Creek, which once joined the Tualatin River near Cook, was forced to detour around the previously mentioned low domes of flood sediment.

e. Saum Creek once joined the Tualatin near the west end of the lake. Saum Creek now has a barbed junction with the Tualatin. Its mouth is directly opposite the beginning of the canal and part of its original bed is now occupied by the canal that feeds water from the Tualatin River into Oswego Lake.

f. After the flood a lake formed in the gap cut by the Tualatin. Fed by small streams the lake would rise high enough in winter to spill over the flood deposit damming it and in time to cut through it, lowering the lake level. Before the present dam was built, the lake, known as Sucker Lake, was about half its present size, the west end being mostly mud flat and swamp. The present outlet occupies only the southern margin of the old mouth of the Tualatin.

A successful theory should be in accord with the known facts; moreover it should be possible to postulate consequences of the theory and to look for and find them. Inasmuch as this has been accomplished, it is now clearly evident that the flood theory, proposed by Bretz,

modified by Allison and corroborated by widespread field observations, may be spoken of as an historical fact; and it is likely numerous other anomalies of erosion, deposition, and drainage in the Portland area and elsewhere that were caused by the flood will be discovered. It is to be hoped that eventually the date of the flood may be determined by radio-carbon analysis.

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Bretz, J. H.
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1952 Tualatin, a fickle jade: Geol. News Letter, vol. 18, no. 5, pp. 50-51, May 1952.

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MARCH FIELD TRIP

Sunday, March 25, 1956 -

Field trip to prospective building site of the Oregon Museum of Science and Industry. Meet at 2:00 p.m. at entrance to the new zoo on Canyon Road - roughly 1 mile west of Vista Bridge. Dr. Samuel Diack, President of Museum, will show us around. We shall take the opportunity also to study the geology of the Portland hills returning by way of Cornell Road.

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GEARY KIMBRELL

Geary Kimbrell, who passed away February 26th, was a charter member of our society. He was chairman of the committee on design for an emblem to be worn by society members. A five-year free membership was offered as a prize to the member submitting the best design. He also made the first car marker to be used in our caravans. This was a red hand-painted pick on a 3 by 5-inch card to be displayed in the rear window of each car. He also served on banquet and picnic committees, and submitted articles to the News Letter.

His active work in the society ceased in 1948, when he retired as bridge engineer for the City of Portland because of ill health. He was a life member of the American Society of Civil Engineers and a member of the Professional Engineers of Oregon.

Funeral services were conducted February 29th, and burial was at the Rose City Cemetery. Three society members were pall bearers: E. C. Johnson, active; Orrin E. Stanley and H. B. Schminky, honorary.

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PICK EMBLEMS

Society members wishing to purchase pick emblems may do so from Karl J. Klein, jeweler, Room 700 Jackson Tower Building. Prices run from $2.00 to $2.50 plus 10 percent tax for stud or pin type.

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PERSONAL ITEMS

Mr. and Mrs. Edward D. Bushby were co-chairmen of a one-day training institute for discussion group leaders and organizers for the Great Decisions of 1956 program which is sponsored by the World Affairs Council of Oregon.

The Great Decisions program opened Sunday, February 26, and will be continued for eight Sundays in half-page articles in the Sunday Oregonian. Ballots are printed each week making it easy for you to express your opinion on world affairs in what seems to be a more effective manner than an over-the-fence talk with a neighbor.

* * *

In the Oregon Journal's "50 Years Ago" column of February 20, 1956, we are told:

> "The Oregon Iron and Steel Company has sold the Willamette meteorite found near Oregon City a number of years ago to the Smithsonian Institution for $20,000. Its estimated weight is 15 tons."

It was mentioned at the luncheon meeting that there is considerable doubt as to the strict accuracy of the above statement, but who are we to pick a quarrel with the Journal? And since this is the last issue of this sheet for which the present editor is responsible it is not his desire to unload a feud upon his successor. If he wishes to feud, let him start one himself, is our policy. Best wishes to him.

Ed.

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GEOLOGICAL NEWS LETTER

OFFICIAL PUBLICATION OF THE

PORTLAND, OREGON

GEOLOGICAL NEWS-LETTER
Official Publication of the
Geological Society of the Oregon Country
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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Officers of the Executive Board, 1955 - 1956

			Zone	Phone
President:	Mr. Wm. F. Clark	3613 S.E. 9th Avenue	2	BE 4-7096
Vice-Pres:	Mr. Edward D. Bushby	2626 S.W. Ravensview Drive	1	CA8-3021
Secretary:	Mrs. Leo F. Simon	7006 S.E. 21st Avenue	2	BE 6-0549
Treasurer:	Mr. Robert F. Wilbur	2020 S.E. Salmon Street	15	BE 5-7284

Directors: Mr. Raymond L. Baldwin (1956) Dr. Francis G. Gilchrist (1956)
Mr. Albert J. Keen (1957) Mr. Leroy A. Palmer (1958) Mr. Fay W. Libbey (1957)

Staff of Geological News Letter

Editor:	Mr. Orrin E. Stanley	2601 S.E. 49th Avenue	6	BE 5-1250
Asst. Editor:	Mrs. Lillian F. Owen	5933 S.E. Lafayette Street	6	PR 4-9729
Assoc. Editors:	Mrs. Rudolph Erickson	249 S.W. Glenmorrie Drive, Oswego		NE6-1873
	Mr. Ray S. Golden	3223 S.E. 19th Avenue	2	BE 4-3921
	Miss Margaret L. Steere	2064 S.E. 72nd Avenue	16	PR 4-6382
	Miss Emily Moltzner	Board of Trade Building	4	CA2-2420
Library Editor:	Dr. Francis G. Gilchrist	0644 S.W. Palatine Hill	1	NE6-4792
Business Manager:	Mr. Edward A. Kelham	14018 S.E. Linden Lane	22	OL4-2196

Committee Chairmen

Program:	Mr. Raymond L. Baldwin	Display:	Mr. Earl W. Minar
Field Trips:	Mr. Murray R. Miller	Research:	Mr. Rudolph Erickson
Librarian:	Dr. James Stauffer	Service:	Miss Margaret L. Steere
Membership:	Mrs. Leslie C. Davis	Museum:	Dr. J. C. Stevens
Publicity:	Mr. H. Bruce Schminky	Public Relations:	Mr. Clarence D. Phillips
Social:	Mrs. Wm. F. Clark; Mrs. Albert J. Keen	Historian:	Miss Ada Henley

Society Objectives

To provide facilities for members of the Society to study geology, particularly the geology of the Oregon Country; the establishment and maintenance of a library and museum of geological works, maps, and specimens; the encouragement of geological study among amateurs; the support and promotion of geologic investigation in the Oregon Country; the designation, preservation, and interpretation of important geological features of the Oregon Country; the development of the mental capacities of its members in the study of geology; and the promotion of better acquaintance and closer association among those engaged in the above objectives.

Persons desiring to become members should contact the Membership Chairman, Mrs. Leslie C. Davis, 7704 S.E. Taylor Street, Phone AL 3-6723. Regular annual dues (single or family memberships) are $5.00 for residents of Multnomah and adjacent counties; $2.50 for others; and $2.00 for Junior Members. Make remittances payable to the GEOLOGICAL SOCIETY OF THE OREGON COUNTRY.

Society Activities

(See "Calendar of the Month")

Evening Meetings: Formal lectures or informal round-table discussions on geological subjects, on the second and fourth Fridays of each month at Public Library Hall, S.W. Tenth Ave. and Yamhill St.

Field Trips: Usually one field trip is scheduled for each month.

Library Browse Nights: Once a month. Lewis and Clark College.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.00 per plate.

Publication: The Geological News Letter, issued once each month, is the official publication.

CALENDAR FOR APRIL 1956

Buffet luncheon each Thursday, April 5, 12, 19, 26, at Portland Chamber of Commerce, 824 S.W. 5th Avenue, second floor, $1.

Friday Apr.13 — Library Hall, 7:30 P.M. Orrin E. Stanley will show colored slides of the high Canadian Rockies and other geological features that he has chosen for their scenic attraction. He may introduce some slides that have little or no geological significance and may close the show with the tail of the yellow cat.

Sunday Apr.15 — Field Trip led by Dr. James Stauffer to study flood features in the area southwest of Portland. Meet at the Riverdale School at 1:30 P.M. Drive out Mccadam toward Oswego; turn right at the first traffic light beyond the Sellwood Bridge, turn left at the next corner and continue on to the school.

Tuesday Apr. 17 — Library night at the Biology Building, Lewis and Clark College. Two and a half hours, 7:30 to 10:00, browsing in library, discussion, social hour, and refreshments.

Friday Apr.27 — Library Hall, 7:30 P.M. Herbert G. Schlicker, Geologist, State Department of Geology and Mineral Industries. Subject: "Land Slides."

Friday May 11 — Library Hall, 7:30 P.M. Lon Hancock will bring us up to date on the excavation of Eocene mammal fossils at Clarno.

Sat.-Sun. May 12-13 — Two-day field trip to Cove State Park, the diatomite plant near Terrebonne and Smith Rocks. (Further details in May News Letter.)

Sat.-Sun. June 16-17 — Field trip to Saddle Mountain for study of geology and flora of the region. (Details later.)

AIME PACIFIC NORTHWEST REGIONAL CONFERENCE

The 1956 Pacific Northwest Regional Conference of the American Institute of Mining and Metallurgical Engineers will be held at the Olympic Hotel in Seattle May 3, 4, and 5. The conference is sponsored by the Portland, North Pacific, and Columbia sections of AIME and rotates between the three cities. Portland will be the host city in 1957.

Distinguished mining engineers, geologists, and metallurgists from all over the United States and adjacent parts of Canada will attend and many will take part in the program. There will be several papers dealing with various phases of geology as well as papers on treatment of minerals and utilization of their products.

The miners are a hospitable bunch and anyone attending can be assured of a good time as well as assimilating some valuable information.

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DUES ARE DUE as of March 1, 1956. According to the By-laws: "Any member delinquent in his dues shall not receive the publications of the Society." J. Simon, Sec.

FROM THE EDITOR

Looking back through such copies of the News Letter as I have accumulated in my comparatively brief membership in our society and viewing the accomplishments of my predecessors I confess that it is with some trepidation that I assume my duties as editor of our publication.

In striving to make 1956 a successful year for the News Letter I must ask the cooperation of all of our members. We have plenty of talent aside from the professionals in our membership. An amateur is one who pursues a subject because of his interest, he is not necessarily a tyro, and we have several amateurs who are as proficient in geology as many professionals.

All contributions will be welcomed and will receive careful consideration. As we are a geological society it is asked that articles, other than news items, relate to geology or subjects closely allied to it, e.g., mineralogy, paleontology, physiography, etc. Anthropology would not be too far afield as the anthropologist must work closely with the geologist. Articles need not be elaborate or highly technical. Close at home subjects can be made very interesting; a luncheon talk that stands out in my memory is the one that Ed Kelham gave on "The Geology of My Back Yard."

Of course manuscript should be typed and double spaced.

L.A.P.

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GEM AND MINERAL SHOW

The Oregon Agate and Mineral Society has arranged a Gem and Mineral Show to be held at the Oregonian Hostess House April 19th through the 22nd. This is being held to aid the building fund of the Oregon Museum of Science and Industry. No admission will be charged but donations of any size will be accepted. Tumbled gem stones, various publications, and other material will be for sale. All expenses of putting on this show are being paid by the above society and all donations will go 100 percent to the Science Center building fund.

Hours are as follows:	Thursday, April 19 . . .	11:00 A.M. to 9:00 P.M.
	Friday " 20 . . .	11:00 A.M. to 9:00 P.M.
	Saturday " 21 . . .	10:00 A.M. to 9:00 P.M.
	Sunday " 22 . . .	10:00 A.M. to 6:00 P.M.

All members of the Geological Society of the Oregon Country and their friends are invited to attend. Displays of minerals, crystals, fossils, cut and polished material of many different kinds, jewelry, etc., will be exhibited. Demonstrations showing how to cut and polish material will also be held.

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NEW MEMBERS - March 1956

	Zone	Phone
Brown, Mrs. Virginia, and Michael Brown, 10 N.E. 76th Avenue	16	AL 3-3309

CHANGE OF ADDRESS

Griffith, Mr. and Mrs. Norman N.	1733 S.W. Westover Drive	19	CA 3-3594
Lilly, Mr. and Mrs. Elwin R.	2125 N.E. Hancock	12	AT 2-7838

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OUR ANNUAL BANQUET

The Geological Society of the Oregon Country is a unique organization. Its purpose is serious and its membership outstanding, but there is nothing of the highbrow about it. We have members of national and international reputation, officers of national scientific societies, and doctors of one kind or another are a dime a dozen among our members, but when we get together all are GESOCkers first and other things second; and to quote Kipling, "We meet upon the level and we part upon the square."

The highlight of the year is the annual banquet when our new officers take over. Here we have some sound sense and some good technical instruction but we don't forget the old adage, "A little nonsense now and then, is relished by the best of men" and we have our fun, too.

Our 1956 banquet in the reception hall of Mt. Tabor Presbyterian Church on March 9th was in the best tradition of the society. The ladies of the Dorcas Society provided the usual excellent dinner with the piece de resistance a choice of "Sheets of Muscovite with Pegmatite and Volcanic Scoria" or "Fire Brick," which in layman's language is turkey with dressing or salmon loaf.

With the dinner safely stowed away Bruce Schminky took over as master of ceremonies and his opening paragraph is worth quoting:

> "One score and one year ago, our founders brought forth in this city a new Society, conceived in the belief that all men are interested in the wonders of Nature.
>
> "It was altogether fitting and proper that they did this, for no country can better intrigue the mind of man than the land of the River Oregon. The rugged mountains, crowned here and there with snow-clad volcanoes towering to still greater heights above them; the spectacular gorges and canyons that cut through or into them; the vast lava beds; the jewels called lakes, and the rivers that rush and tumble away from them; that great ocean shoreline, which almost seems to change before our eyes from the destructive force of each crashing wave, are all too obvious for any one, with open eyes, to behold without some wonder as to their reason for being.
>
> "We are now engaged in charting the course of that Society through adulthood. The crew is the same, but new officers will direct their efforts. It remains for each of us to rededicate ourselves to the good of that Society, so that it shall not perish from the earth."

Bruce then conducted us through the usual steps of such a meeting, the swan song of the retiring president and the lark song of the new incumbent, the geological talk of the evening, with the last act a bit of hilarity in which a cast of the members presented "A Meeting of the Jonesport Literary Society" featuring Mrs. Simon in "The Charge of the Light Brigade" and the "Jones Boys" in barbershop harmonies.

We give Mr. Clark's and Dr. Gilchrist's talks in this issue but space limitation requires that we hold Ralph Mason's "Only a Stone's Throw" until later.

L.A.P.

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IT'S A NEW YEAR

By

William F. Clark, Retiring President

Last year, I am afraid, I had not been reading my News Letter as carefully as every member should and I didn't know who had been appointed for the nominating committee. So, I was taken quite unawares when Bruce Schminky placed a hand on my shoulder and, in a manner of confiding in me, said "You know Bill, in order to get the most out of this life you can't always take, you must give as well as take." And, it might have been that I felt proud that Bruce had so taken me into his confidence, that I said, "You are right, Bruce, you sure are right." Bruce then said, "I am glad that you agree with me, Bill, because you have been taking from this Society for about five years now and we have decided to let you give a little. We have decided to let you take your turn as president." He left me, not only in a state of shock but with a feeling of loss, because I had always felt that Bruce, like another gentleman I had heard of, was an honorable man.

From that minute I became a dedicated Gesocer. I had two objectives. I was going to read my News Letter more carefully and I was going to, somehow, get by until March 9, 1956, and turn the gavel over to some other soul, who had been selected to give a little.

At first I thought that turning over the gavel would give me a feeling of - well - you know the feeling, when the dentist holds up that tooth for your admiration and you realize that it didn't hurt a bit.

But it is not quite that way. I am afraid that not being President is going to be a real let-down. Sure, I have given a little but it has been an experience that I have enjoyed very much. I feel that I have made some real friends. This is especially true of the people who have served on committees. Of course, we were friends at the beginning of the year or they wouldn't have consented to serve, or at least I don't think they would have consented to serve. But now after a year of working together - sharing disappointments as well as successes - we have found a friendship that, I am sure, will continue for a long time.

I shall always have a greater appreciation of programs now that I know how much planning and worry goes into them. I think that this has been a year of consistently fine programs, and believe me, Ray Baldwin earned every one of them for us. As I used to do, you folks took these programs for granted. You know only of the ones he caught, but Ray and I know of some of the beauties that got off the hook just as he was landing them.

From now on I shall have a greater appreciation of our trips. I never realized what responsibility a person accepts when he agrees to lead a trip. This last year I have had the opportunity of watching Murray Miller organize a few trips. Each one of these trips was first plannned for geologic interest. Then each one was scouted at least once. If I remember correctly, Murray had to make three scouting trips down to Detroit Dam. That was a joint trip with the Salem Society. Murray had to get permission to take us into the platy andesite quarry, had to arrange rest stops, a place for such a large group to each lunch and, because we were the host group, he, with the help of Mrs. Miller and Mrs. Simon, provided hot coffee, tea, and fruit juice. And, of course, he had to persuade "Andesite Andy Corcoran," of the State Department of Geology and Mineral Industries, to go along and explain the geology to us. We accepted this trip to Detroit Dam as just another one of the many fine trips that Murray provided for us, but only Murray knows how many trips he has scouted and found unsuitable to take us on.

When I realized the responsibility and hard work that Ray and Murray were willing to accept, it made me a little ashamed to think that I had tried so hard to get out of serving as President.

I would like to have you know just what each chairman has done for the Society during the past year but that would take a long time. I do want you to know that Margaret Steere, Ada Henley, Rudy Erickson, and Ed Kelham have been on the job all year, as well as our News Letter staff headed by Orrin Stanley and Mrs. Owen. Some of you folks may not know that it was Clarence Phillips who persuaded the Board of the Library Association to give us the better hours for our meetings in Library Hall.

Speaking of library -- our average attendance at the library nights at Lewis and Clark College this last year was, according to figures supplied by our hostesses, about 22 people. Dr. Stauffer was our librarian, but when I think of library night, I always think of Dr. Stauffer and Dr. Gilchrist, because it was their combined efforts that made these meetings so worthwhile. I think some credit for the popularity of our library nights should go to our Social committee. They served "coffee and" at each meeting. The Social committee not only served refreshments on library nights -- they were responsible for the food at our annual picnic, and also for arranging this banquet. And, they were on the job the night Dr. and Mrs. Jones entertained the Salem and Portland societies at the Portland Rehabilitation Center.

Although Mrs. Barr's name has not appeared on the cover of the News Letter, she has been the active chairman of the telephone committee, this past year. Mrs. Barr has served as telephone committee chairman for so many years, I am afraid we are beginning to take this service for granted. I really hope not because I know how much time Mrs. Clark spent at the telephone, last summer, when she was pinch hitting, during Mrs. Barr's illness. Another faithful Gesocer is our membership chairman, Mrs. Davis.

According to our membership chairman and our social committee, a majority of our guests this last year, became interested in the Society through the fine publicity Bruce Schminky has obtained for us in the newspapers.

From what I have been saying, you might think that it was only the committees that worked, this past year. That would be wrong because there were lots of others who either offered their help or willingly accepted a job when asked. Well, like our library-night picnic at Lewis and Clark College was arranged by Mrs. Stauffer. Phil and Mrs. Brogan made a long trip over to Clarno to tell us about some of the people of early Oregon -- Ed and May Bushby and the Simons were always 'there' when needed and, then, there is Ray Golden. What would this Society do without Ray Golden. Or John Walsted, "the foremost paleontologist of Suver, Oregon," who led the historic raid on Peterson Butte.

I am going to ask anyone who served the Society, in any way, this past year to please stand.

And now that it's a new year, I want you to know that I have really enjoyed serving as President of this Society and that it is with a warm feeling of friendship that I turn this gavel and our autographed copy of Dr. Condon's Two Islands over to our new President, Dr. Francis G. Gilchrist -- my best wishes, Francis.

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PORTLAND MOVES FORWARD IN EDUCATION AND SCIENCE

By
Dr. Francis G. Gilchrist
Incoming President

Portland is becoming a great educational center. More than 100,000 young people from 4 to 19 years of age attend school in our area. The present is a period of tremendous growth in the physical plant of our elementary and secondary school system. Our colleges, Portland State and the local private colleges, have also been largely increasing their facilities. Up on the hill the Medical and Dental Schools are also in process of great expansion.

Now Portland is not the center of Oregon. It is however the metropolis of a large and growing population which extends northward into Washington as well as southward in Oregon. Indeed, it is the natural outlet of that great inland empire, the Columbia Basin. Recognizing this fact our Society refers in its name to "the Oregon Country," the historic designation of the entire Pacific Northwest.

One of the challenges in the field of education as Portland expands, is in science education. This has lagged here as elsewhere. Why a field so rich and exhilarating as science has not called forth more interest in old and young is not easy to explain. But at any rate it is here that the Geology Society can and should make its contribution. We are not just a society of collectors. We are interested in understanding, appreciating, and wisely using the resources of our natural environment. All our activities: lectures, field trips, publications, and research programs are directed to this end.

One of the channels through which our Society can serve the cause of science is the Oregon Museum of Science and Industry. The Geological Society has always been interested in the Museum. Today the Museum is at the threshold of a new development. A "science center" is to be built adjacent to the new Portland Zoo. The present need is for funds. More than $75,000 is on hand; but a total of $200,000 is sought for. It would appear that between us our Society could raise perhaps $1,000. Soon the need will be for developing the exhibits. Here again our Society can be of service.

I have visualized that some day there will be a "geological garden" adjacent to the new Museum, representing vistas of Oregon's geological ages past. For example a Clarno vista will be planted to trees and shrubs representing the families (if not the species) of the plants whose leaves and nuts we find in the Eocene beds of the Clarno hills; and there will be statues of the mammals of that day. Inside the museum would be actual fossil leaves and bones to document the exhibits in the garden. And so on for the other floras and faunas of ancient Oregon.

It is by all of us actively interested and working together that these goals can be realized.

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NEW REPORT ON TAKILMA-WALDO COPPER DISTRICT

Preliminary Investigation of the Takilma-Waldo Copper District, Josephine County, Oregon, by R. J. Hundhausen, formerly mining engineer, U.S. Bureau of Mines, published as a Report of Investigations of the U.S. Bureau of Mines, No. 5187, is a publication of 22 pages covering the above district which is credited with ore production worth $1,700,000, principally between 1904 and 1919. There has been almost no activity at all since 1933.

In the course of the above examination the surface was sampled over an area 600 feet wide and three miles long by 3600 shallow auger holes and six diamond drill holes. There is a discussion of the general geology of the district with descriptions of six mines, a relief map, geologic map, and 13 plates showing various features in detail.

R.I. 5187 may be obtained without charge by addressing Publications Distribution Section, U.S. Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pennsylvania.

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SUMMARY OF OPERATION
FISCAL YEAR MARCH 1/55/56

	Expenses	Receipts	Cost	Budgeted	Percent of $655 Approx. Cost
News Letter	$ 240.36	$ 2.50	$ 237.86	45%	36%
Postage, Stat'y, Print.	34.88	none	34.88	10	5
Mt'gs., trips, lectures	52.64	5.00	47.64	10	7
Library	30.30	6.45	23.85	5	3½
Ann. Banquet (3/11/55)	318.47	312.75	5.72	none	
Replacement fund for multilith. In savings account.	100.00	---	100.00	15	15
Misc: Ann. picnic $11.80, flowers $5.00, Treas. bond $5.00, Camp Hancock $15.00	36.80	none	36.80	15	5½
Dues rec'd, 1/13-12/10	_____	711.00	_____	—	—
Total	$813.45	$ 1,037.70	$ 486.75	100%	72%

Percentages were budgeted to various projects by Executive Committee on basis of membership receipts as of 6/13/55, being $655.00.

Special Library Book Fund, mineral-identification cards, and auto-cards, being self-supporting projects, are omitted from the above tabulation.

At close of the fiscal year our Library Book Fund showed a balance of $34.03. In addition to the $100.00 in Savings Account at 3 percent interest, our checking account showed a balance on hand of $910.56.

/S/ R. F. Wilbur
Treasurer

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FIELD TRIP, FEBRUARY 29, 1956

The "field" of our February 29th field trip was the office of the State Department of Geology and Mineral Industries with Hollis Dole, Director, and his various aides doing a fine job as hosts and hostesses.

Each of the many offices that contributes toward making the functioning of the department a success was represented by the person responsible for it and in many cases they gave demonstrations as to how the work was carried on. In mineralogy, Herb Schlicker was there with his petrographic microscope and thin sections of rocks; Irv Ewen presided over the mapping room. R. E. Stewart explained his work in micropaleontology and we saw the News Letter in production under the able guidance, both mental and physical, of Mrs. Owen.

But Tom Matthews and Laurie Hoagland stole the show and the spectroscopic and chemical laboratories played to standing room only. Tom demonstrated his spectrographic methods for qualitative and approximate quantitative tests while "Hoagie," with his assistant George Rice, showed us how it is done when more accurate determination is necessary. The laboratory is equipped for fire assay of ores containing gold, silver, or lead, and for chemical analysis of other metals.

Refreshments were served by the ladies of the staff and were of a tastiness in keeping with the rest of the program. With a milling crowd, such as this was, one could not estimate the attendance but the rooms were well filled and it was the consensus that "a fine time was had by all."

L.A.P.

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FIELD TRIP THROUGH PORTLAND WEST HILLS, MARCH 25, 1956

The caravan met at the entrance to the new zoo site where the Science Center of the Oregon Museum of Science and Industry is to be built, and here Dr. Gilchrist took over as conductor. The following is based largely on the log of the trip which he furnished to each member of the party.

The Portland Hills are a NW-SE trending anticline, the core of which is Columbia River basalt. Eastward is the broad Portland Basin, a syncline in which the basalt is deeply buried under gravels and westward is the similar Tualatin Basin. The great extrusions of basalt occurred in the mid-Miocene and the deformation that produced the hills and basins in the Pliocene. The deformation was accompanied by deposition of the Troutdale gravels and sands but most of these have been eroded from the area visited on the field trip. During Pliocene and Pleistocene local volcanoes emitted the viscous Boring lavas which covered much of the southwest slope and the higher portions of the hills with tongues flowing northeastward down old stream channels now occupied by West Burnside Street, Canyon Road, and the east end of Bertha Boulevard. The origin of the Portland Hills silt which covers most of the hills is a matter of considerable discussion. It has been held to be a late phase of the Troutdale which was elevated with the hills, residual from the basalt or aeolian from an undetermined locality. The presence of the micaceous layers in the upper portion would indicate that at least a part of it was transported.

At the museum site Dr. Gilchrist was assisted by Mr. Ed Miller of The Oregonian who is actively interested in promoting the museum and zoo. The site is in the Portland Hills silt which

has slumped from the hills to the north and crowded the stream in the canyon to the south against a wall of Columbia River basalt.

The next stop was at the Sylvan Brick Company where Mr. John E. Kreitzer acted as host for the company. After a tour of the kilns he took us to the clay pits which are in a lower zone of the silts. Then on to Skyline Boulevard where we noted a change in the silts, the upper phase being distinctly micaceous, with a stop at the "Willamette Stone." This is not a geological feature but a monument set in 1851 from which all of the public land surveys in Oregon and Washington start. Its location is 45° 44' 33.551" N. Lat., and 122° 31' 10.831" W. Long. We stopped briefly for a view of the Tualatin Valley and again at NW 53rd Drive to study a contact of the basalt and silt, and at a tunnel on Cornell Road were observed some structural features in the basalt and some outliers of the overlying Troutdale gravels. This concluded our observations in the field.

Unfortunately the heavy rains of the past winter have smeared the fine silts about rather promiscuously so had obscured some of the features we had expected to study. The cold rain of the day itself limited the attendance but the 15 or so who had the hardihood to come out felt that the trip made any time spent or discomfort experienced well worth the while.

L.A.P.

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PRE-COLUMBIAN SETTLEMENTS

All the accumulating evidence of Norse settlers in North America before Columbus is highly questionable. This is the conclusion of Dr. Johannes Brondsted, director of the Danish National Museum at Copenhagen, in the Annual Report of the Smithsonian Institution, recently published.

The field now is in such a chaotic condition with conflicting claims, questions of authenticity of relics, and charges of fraud, the Danish expert says, that about the only hopeful approach now open is a comprehensive expedition of archeologists with the good Scandinavian background to explore the most likely areas along the Atlantic coast. These are quite considerable, stretching from Virginia to Labrador, and the expedition would require an airplane. Danish scientists have gotten excellent results in exploring the Greenland coast from the air for traces of ancient Viking settlements.

The Icelandic sagas leave no doubt, he says, that several Viking expeditions from Greenland landed on the Atlantic coast, and it is not improbable that some settled there or wandered away among the Indians. But they left very doubtful physical evidence, if any. All efforts to determine the sites of Vinland, Markland, etc., mentioned in the sagas from hints in the texts have proved fruitless.

Three major bits of evidence have been presented, Dr. Brondsted says, and examination of these both by himself and other Scandinavian experts is the basis of the report.

First is the so-called Beardmore find--a rusted fragment of an iron sword and two other iron objects found near Toronto and now in the Royal Ontario Museum. Without any doubt these are genuine Viking objects, he says, but the question is how they happened to be where they were discovered in 1930. If the story told by the finder was true, they would be convincing evidence that Vikings from Greenland had penetrated that far into the continent. Unfortunately, there is

some question of deliberate fraud--that the objects were taken from some grave in Scandinavia and "planted." It seems impossible at this time to arrive at any valid conclusions.

Second is the Newport Tower--the picturesque ruin of a small cylindrical stone tower near Newport, R.I. It has at least the superficial appearance of a medieval structure and has been studied over and over again. Volumes have been written on it. The fact remains, Dr. Brondsted says, that none of the studies meet the requirements of modern archeology, and the whole subject must be re-examined before a valid conclusion can be made. His own opinion from a careful study of all the evidence thus far presented, he says, is that the structure was an English watchtower or lighthouse erected about the year 1640.

Third is the so-called Kensington Stone, a stone slab found near Kensington, Minn., which bears a lengthy runic description, allegedly telling of the fate of a party of Norse explorers expecting destruction from hostile Indians. It bears the date "1362." Here again there is some question of deliberate fraud.

There probably has been more controversy over this relic than over any of the others. It has been attacked and defended by geologists, historians, linguists, and experts on runic carving. There is little agreement in any of these fields.

Dr. Brondsted has submitted the text of the inscription to three of the foremost Danish runic scholars. All agreed, although for somewhat different reasons, that this could not have been genuine--or if genuine, could not have been made in 1362. The question remains open but, the Danish expert says, a very strong case has been made against the authenticity of the stone.

What is essential, he says, is to find ruins of a genuine Norse settlement or Norse grave on the continent.

A systematic search for anything of this sort, he says, never has been made by competent archeologists familiar with Scandinavian archeology, although there may have been many searches by amateurs. Isolated relics, such as have been brought foreward to date, never will be of much value, he believes. (From the Smithsonian Institution, January 26, 1955.)

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LUNCHEON NOTES

On December 29, 1955, instead of a 5-minute speaker, Leo Simon read us a letter from John and Lilla Leach who took time out on their round-the-world trip to keep us up to date on their interesting experiences. On their tour they had visited Hawaii, Japan, The Philippines, Hong Kong, Thailand, Singapore, Java, and Bali. Two letters were enclosed, one each from the latter two islands. Hawaii seemed like a paradise with its beautiful weather, scenery, and flowers and the joyous people whose love of life is expressed in their attitude toward those with whom they come in contact. They found Japan beautiful and verdant and the people very cultured and courteous. In Tokyo are excellent hotels and fine stores and shops. The countryside is interesting and the mountains beautiful. The magnificent shrines alone would need volumes for their adequate description if one would do them justice. The country has made remarkable progress in removing evidences of the disastrous destruction of the war. Manila, which suffered terribly from the war, has not yet recovered fully. Aside from war casualties a million people died there during the occupation. The Filipinos are greatly interested in education, and Manila has three large universities with enrollments from 18,000 to 23,000 besides several smaller universities and colleges. While there John saw an exhibition of the national sport of cockfighting

but decided one was enough. Hong Kong and Kowloon are twin cities on opposite sides of a bay. Two and a half million people living here give the area the densest population in the world with the attendant poverty and squalor that could be expected. The harbor is one of the busiest, teeming with craft of all sizes from ocean liners to rowboats. In Indonesia they found an unstable government that had been functioning in a wavering manner since a revolution had overturned the Dutch colonial government ten years ago. There are 24 political parties and an election was held on October 14 but at the date of the letter, December 1, the votes had not been counted. Bali is primitive. The climate is hot and sultry with frequent rains, some of them very hard. Some of the natives dress in modern style, some neatly, others poorly, but many of them wear only a sarong or even less. The country is very fertile but backward with a high percentage of illiteracy. There are many ruins of fine ancient temples all over the island, a reminder of ancient grandeur but moss covered and with people, chickens, and goats living indiscriminately amidst the former beauty. Here they saw what they characterized as the finest native dances they had seen anywhere except those of the Warm Springs Indian Boy Scout group. So here we leave the Leaches in Indonesia with the hope that in the not distant future we may listen to a more personal account of their travels.

On January 26th we had no regular speaker assigned but in the desultory conversation accompanying the luncheon someone, we don't remember who, got the bright idea of asking Leo Simon about the annual bird census which was taken during the holiday season. This started Leo going and before we realized it we were listening to one of the most interesting talks, entirely impromptu, that has been presented at any of our luncheon meetings. It did not stop with the bird census but went on to take in habits and habitats of our feathered friends, new species that have come to our locality, and old species that have wholly, or almost wholly, disappeared. Even the game laws came in for discussion. Unfortunately your scribe did not realize what was going on until Leo's talk had progressed too far for him to catch up on his notes and, anyway, he was around the corner when the ornithological brains were being handed out so it is to be regretted that we can not present an adequate report on this very interesting and informative session.

After his return from duty in Europe it didn't take long for Dick Walker to get into the swing of the Geological Society as on February 16th, his second meeting, he took over as our speaker. Apparently he took the so-called five-minute limit seriously as he finished his talk while the rest of us were eagerly awaiting more. The talk was on the Jurassic limestones of Northern Bavaria and Southern Wurtemburg. This area is underlaid by limestone with a shallow soil covering, only six inches to two feet, making agriculture impractical. There are some forested areas but these are under government control so they do not furnish a livlihood for the people. The inhabitants are peasants who are friendly but poorly educated as the school system was interrupted during the war and was not restored until 1948-49. The limestone is worked in numerous quarries by hand methods. Most of it is crushed and very little is used as dimension stone. Fossils are abundant but the interest in scientific matters has fallen so low that no interest is taken in them or any effort made to recover or preserve them. Two fossils, an ammonite and a stem, unidentified, were passed around the table.

February 23rd Miss Ada Henley was our speaker with an interesting commentary on "Wild America," the recent book by Roger Torrey Peterson and James Fisher. The speaker read several excerpts from the book which gave the writers' observations on a trip which, starting in the New England states, followed the perimeter of the United States with a side trip to the Pribilof Islands off the coast of Alaska. (To be continued.)

L.A.P.

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SOME OUT-OF-THE-WAY PLACES IN MEXICO

Talk By Dr. Ewart M. Baldwin

On February 24th we had another interesting travelogue with our own Ewart M. Baldwin as guide and lecturer. His subject was "Some Out-of-the-Way Places in Mexico." The colored slides gave a graphic representation of the places visited and were enhanced by Dr. Baldwin's running description that accompanied their showing.

First we saw great saguaro forests as we drove through Sinaloa en route to Mazatlan on the coast where we had several views of this city and its scenic surroundings. Leaving Mazatlan we went inland passing many fields of sugar cane, an important product of this part of the country, and reached Guadalajara, a picturesque city where we saw several views illustrating local features such as the manufacture of pottery and a boy with an immense (it seemed to us) iguana.

From Guadalajara we drove up the beautiful valley of the Rio Grande de Santiago, passing the falls where Lake Chapala spills over to form the headwaters of the river, and on to Manzanillo and its view of Colima's double cones which have been in eruption within the last half century or so. The bay at Manzanillo is favored as a resort and many beautiful homes have been built about its shores. Turning inland were more fields of sugar cane and groves of papaya and crossing Michoacan we were in sight of Paricutin, the newest volcano being only a dozen years old, which appeared from nowhere and grew to a height of 1500 feet in eight months.

Then on to Mexico City with towering Popocateptl in the distance. This picturesque and historic city could well take up several issues of the News Letter if we had the space. Touching on it briefly it was originally built on an island in a lake but the lake has receded so that the docks are now out of water but some of the old canals that penetrated the city are still in use and are lined with market boats. Fishing is carried on, chiefly with butterfly nets and most of the catch consists of minnows and small whitefish. Here are the carvings of the plumed serpent and the famous floating gardens. We witnessed a bull fight and were in time for the ceremony of the Blessing of the Animals where old and young brought their animals to the priest to be blest.

From Mexico City the tour took us south to Oaxaca with its picturesque street markets and Monte Alban and its ancient ruins looking down on it. Twenty-seven miles from Oaxaca is the church of San Domingo, considered the finest in all Mexico. As built it was ornamented with beautiful iron work and above the door was a facade in gold leaf representing the tree of life but the gold leaf of the facade was stripped off by French soldiers during the brief regime of Emperor Maximilian.

Acapulco is noted for its fine climate and its beach which have made it famous as a resort and it is the site of many fine homes. When Juarez, after overthrowing Maximilian, confiscated the property of the Church, a convent in Acapulco "went underground" and actually continued in operation until 1938 without being detected. Vera Cruz, which we visited on our way southward, is not attractive as a tourist spot because of the frequent rains and the "northers" but the nearby valley is favored with delightful climate and beautiful scenery.

The good roads stop at the Guatemalan border and there the Baldwins turned back leaving us with a feeling that even if we had never seen Mexico we had learned a great deal about it. During this interesting account the geology was not overlooked and the scenic views were interspersed with others illustrating the geological features of the area being depicted. L.A.P.

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GEOLOGICAL NEWS LETTER

OFFICIAL PUBLICATION OF THE

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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Society Objectives

To provide facilities for members of the Society to study geology, particularly the geology of the Oregon Country; the establishment and maintenance of a library and museum of geological works, maps, and specimens; the encouragement of geological study among amateurs; the support and promotion of geologic investigation in the Oregon Country; the designation, preservation, and interpretation of important geological features of the Oregon Country; the development of the mental capacities of its members in the study of geology; and the promotion of better acquaintance and closer association among those engaged in the above objectives.

Persons desiring to become members should contact the Membership Chairman, Mrs. Ruth Harrison, 1879 S.W. 10th Avenue, Phone CA 3-0255. Regular annual dues (single or family memberships) are $5 for residents of Multnomah and adjacent counties; $2.50 for others; and $2 for Junior Members. Make remittances payable to the GEOLOGICAL SOCIETY OF THE OREGON COUNTRY.

(Society Activities)

(See "Calendar of the Month")

Evening Meetings: Formal lectures or informal round-table discussions on geological subjects, on the second and fourth Fridays of each month at Public Library Hall, S.W. 10th Ave. and Yamhill.

Field Trips: Usually one field trip is scheduled for each month.

Library Night: Once a month. Lewis and Clark College.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.00 per plate.

Publication: The Geological News Letter, issued once each month, is the official publication.

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CALENDAR FOR MAY AND EARLY JUNE

Buffet luncheon every Thursday noon at the Portland Chamber of Commerce, 824 S.W. Fifth Avenue. One dollar.

Meetings

Friday May 11 — Library Hall, 7:30 P.M.
Lon Hancock will bring us up to date on the excavation of Eocene mamall fossils at Clarno.

Sat.-Sun. May 12-13 — Field trip to the Smith Rock-Cove State Park. Members will assemble at Cove State Park May 12, 1:00 P.M. A trip will be arranged for Saturday afternoon and there will be a bonfire Saturday evening. A trip will be made on Sunday under the leadership of Phil Brogan. The plan is to visit a fossil leaf deposit on the Smith Rocks, the diatomaceous earth plant at Terrebonne, go around the Cove rim and to Round Mountain. There is a small charge for camping at Cove State Park. Water, fuel, etc., are available. Noncampers will find motels at Madras or Redmond. Total mileage for the trip will approximate 400 miles. Inquire at Madras for route to Cove State Park and come early to Cove State Park on Saturday if possible as some fishermen may be there if the Crooked River is clear.

Tuesday May 15 — Library Night. But first a BASKET PICNIC at Lewis and Clark College, 6:00 P.M. Bring your own lunch to the picnic area near the swimming pool. Coffee will be provided and there will be a fire for those who wish to roast meat. If weather is unfavorable we shall eat in the geology laboratory nearby.

7:30 to 10:00 p.m. at Library. Browsing, Discussion, Demonstration, Refreshments and Special Feature: Movie - Wild Flowers of the West.

Friday May 25 — Library Hall, 7:30 P.M.
Mrs. Bella E. Johnson of the Salem Geological Society will talk on "Meteorites and the Great Meteor Crater of Arizona." Mrs. Johnson and her husband were for some years residents in charge of the meteor crater.

Friday June 8 — Library Hall, 7:30 P.M.
Mr. Frank Hjort, superintendent of the Fort Vancouver National Monument, will speak and show an excellent film on "The 1950 Eruption of Mauna Loa."

Sat.-Sun. June 9-10 — Field trip to Saddle Mountain. (Note change of date from announcement in April News Letter.)

Drive out Sunset Highway to Saddle Mountain State Park entrance (about 70 miles northwest of Portland). Turn right, drive about 6 miles to camp sites.

Saturday, leave park at 2:00 P.M. for drive to Cannon Beach, Ecola Park, and Lewis and Clark camp site. Camp for the night and camp fire.

Sunday, 9:00 A.M. Start up Saddle Mountain trail (about 4 miles to top). Many wild flowers along trail. Spectacular lava dikes that look like cordwood piled high as a house and other geological features; wonderful views of surrounding country. Round trip about 200 miles. The Society visited this area last in 1936.

Leo F. Simon, Leader. CA 3-0300 or BE 6-0549.

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CHANGE OF ADDRESS

James, Mr. & Mrs. Don — 7138 S.W. 54th Avenue, Zone 19, CH 4-4401.

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FROM THE EDITOR

With this issue of the News Letter Mrs. Lillian F. Owen is promoted from the position of Assistant Editor (she insists that more properly her title should be "printer's devil") to that of Associate Editor and, to be consistent, her salary is increased 50 percent.

With the same stroke of the pen your editor appoints each member of the Society an Assistant Editor. You have talent. Let's not be like the wicked and slothful servant who hid his talent in the earth. Dig it up and let it gain other talents for our Society.

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MEMBERS AND FRIENDS OF GSOC

"Dr. and Mrs. Francis Gilchrist report that their son, Alden, recently won third prize in the Phelan Award in California. The Bach Choir under the direction of Waldemar Jacobsen produced his composition the "Cantata" which was based on the Book of Job and Psalms.

"Following this Alden received word he won the 'Prix de Paris' competition which will give him two years of study in Paris. He plans to leave in September." (From the First Church Spire, a bimonthly publication of the First Presbyterian Church.) A.H.

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At the April 18th meeting of the Professional Engineers of Oregon, Ralph Mason, in collaboration with Ralph A. Watson, geologist for the Great Northern Railway, gave the featured talk, the subject being "Acres of Diamonds."

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Jack A. Wolfe was one of seven Portland boys named to the Fall Term Dean's List for scholarship achievement at Harvard. The news is of interest to us as Jack is a former junior member of our society and attended Camp Hancock in different years. He is now at Harvard on a Westinghouse science scholarship.

***

The Sons of the American Revolution know good things when they see them. The Portland chapter of this society has a luncheon meeting once a month with a carefully chosen speaker.

At the March meeting Hollis M. Dole spoke on oil possibilities in Oregon and discussed briefly uranium possibilities in the State. At the April meeting Lon Hancock was the speaker with a talk on Eocene fossils which he illustrated with pictures and specimens.

The best compliment that we can pay these speakers is to say that they came up in every way to what we have come to expect from Hollis and Lon.

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RARE AMMONITE FOUND

A rare fossil, Engonoceras Wilkinsoni, an ammonite found in the Cretaceous beds in Central Oregon about 2 miles northeast of Mitchell in Wheeler County, is discussed in considerable detail in the March 1956 issue of Journal of Paleontology by Earl L. Packard of Stanford University. The discovery was made by Loren B. McIntyre, a student at Oregon State College. The discovery is noteworthy because it represents the only known occurrence of this genus in the Pacific Coast region of North America and only the second from the vast Indio-Pacific Cretaceous province, the other being found in Japan. The Oregon specimen was found in a 2-foot lens of calcareous sandstone in massive conglomerate under conditions that indicate shallow water environment.

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ONLY A STONE'S THROW

By

Ralph S. Mason*

Following is an abstract of the principal address at our annual banquet on March 9th. Space limitations require that it be considerably condensed but an effort has been made to maintain the sense and the continuity although it has not been possible to introduce many of the "tie-ins" that explain the aptness of the title and show that we may be "only a stone's throw" from explanations of many of our unsolved mysteries.

Interior of the earth. Man has sunk mine shafts 10,000 feet deep and has drilled a well more than four miles into the earth. Eventually he will go farther, in spite of difficulties that increase with depth, but we see no liklihood that he will ever do more than prick the skin of our planet. Astronomers, geophysicists, and seismologists have reached conclusions about the interior of the earth and these have been confirmed to some extent by visitors from outer space. Earth scientists have concluded that the core of the earth is nickel-iron surrounding which are outer shells of different minerals, one of them peridotite. Meteorites of nickel-iron, and to a lesser extent of peridotite, have reached the earth and it is supposed that they have been caused by the disruption of planetary bodies similar to our own in composition.

The pogo-stick problem. Why does the earth's surface bob up and down? In recent years a hole 4,000 feet deep was drilled on Eniwetok Atoll and confirmed a theory advanced more than a century ago by a young divinity student named Charles Darwin. The theory was that beneath the lagoon a mountain was sinking and that coral reefs were building up on it at the same rate as it was sinking. The oldest corals taken from the drill hole were estimated of an age of 40,000,000 years which would indicate that they were Eocene or late Oligocene.

Submarine canyons. At several localities along the continental margins are submarine canyons extending from shallow depths into the ocean floor. In some cases it is evident that these canyons are extensions of streams that still exist but this does not explain the many which have no landward counterpart. Many of these are steep walled, narrow, winding, and of considerable length. The can not be dismissed by simply saying they indicate large streams of which all evidences have been obliterated. In 1929 Atlantic cable service was interrupted by the breaking of six cables off the coast of Nova Scotia, the breaks occurring over a distance of 300 miles and intermittently during a period of 13 hours. Studies reached a conclusion that there must have been a vast movement of ooze over the ocean bottom covering a width of 100 miles and at an estimated speed of 56 miles per hour. Such theory could explain the gouging out of deep canyons in the ocean bottom but we must seek confirmation before we can accept it as conclusive.

Isostasy. This theory assumes that continental blocks float on a denser substratum and as these blocks are eroded they float higher while the weight of the eroded material depresses the continental shelf and affords more space for deposition. These forces of erosion and deposition are actuated by the sun. Isostasy does not fully explain crustal movements, but it does suggest that solar energy can be transferred to the vertical movements involved.

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* Mining Engineer, State of Oregon Department of Geology and Mineral Industries.

The Ice Age. Some theories hold that the Pleistocene Ice Age was caused by a lessening of the radiant energy of the sun while others attribute it to an increase in that energy and still others say that it was due to the sudden appearance of high land masses that collected snow and ice on a continental scale. A more recent theory holds that the crust of the earth is slowly creeping over its central core and in this process large land masses would in time pass over both North and South poles and there would be glaciation on a continental scale when that condition existed. As of today there is no land at the North Pole so ice does not accumulate there while at the South Pole there is a tremendous concentration of ice gripping a continent as large as the United States plus all of Europe. Looking backward the evidence indicates that glacial activity at either pole is linked with this condition, whether there was an ocean basin or a land mass there.

The convectional theory. Whence comes the tremendous force to move the crust of the earth and produce the great folds and faults that we see? Such energy could logically be supplied by heat at depth which would cause an upwelling of subsurface material that would be transmitted to the crust and cause the shifting about that we have noted. The convectional theory has been advanced as explaining such phenomena and recent research in radioactivity makes it appear plausible. This assumes that there could be a sufficient concentration of radioactive minerals at great depth to generate, by the slow process of radioactive decay, sufficient heat to produce the effects noted. When the convection currents thus set in motion subsided due to the decrease of decay in the radioactive elements such activity would decrease until there was a sufficient regeneration of heat to set it in motion again. This would account for the cyclical nature of the disturbances of the crust and, if this theory is correct, it might be applied on a larger scale to explain continental drift.

Continental drift. In 1910 Wegener proposed the startling theory that the land surface of the earth was originally in two supercontinents that broke up and drifted apart, eventually forming the land mass of the earth as we now know it. The classic example cited in support is the correspondence of the west coast of Africa with the east coast of South America and in later study weight has been added by the fact that there is such a close matching of the fossils and geological formations of the two continents as could hardly be accounted for otherwise.

Fossil magnetism. This strange sounding phenomenon was discovered while examining rock drill cores with a delicate electrical device which detects tiny magnetic charges and their orientation. In this case it was found that there were other magnetic alignments than the principal ones sought, the others being weaker but still measurable and at an angle to the major alignment. Furthermore these secondary alignments varied with the geological formations in which they were found, that is with the age of the rocks. It is assumed that this "fossil magnetism" must refer to conditions that existed when the rock was formed. When a grain of magnetite settles to the bottom of an ocean basin it becomes oriented with respect to the earth's magnetic field. Compaction of the sediments locks them and their magnetic orientation in place. If this assumption is correct it can only mean that at the time the rocks were forming the magnetic poles were not in their present positions. It is believed that the magnetic currents of the earth are generated by a differential movement between the nickel-iron core and the crust, comparable to the stator and rotor of an electric generator. If the crust is slipping over the core at an angle to the axis of rotation this migration of the magnetic pole is explainable but about this we can only say that we don't know. Some researchers have postulated there have been reversals of the earth's magnetic field and that the poles have exchanged places, perhaps due to a change in relative speeds of the crust and the core.

The problem of the Pacific. We will discuss one more theory, perhaps the most startling of all. The rocks underlying the Pacific Basin are much thinner than those underlying the other ocean basins, and the shores are remarkable for their volcanic and seismic activity. From this and other evidence some scientists have deduced the theory that the moon was torn as a mass from the Pacific Basin and that crustal adjustments are still going on to compensate for this gigantic disturbance. Such a theory seems far fetched, but it may help to explain continental drift and when we solve it perhaps the solution of our other perplexing riddles is only a stone's throw away.

L.A.P.

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TALES FROM THE LUNCHEON TABLE

Emma and the General

Shortly after the close of the Civil War some soldiers on leave from Fort Douglas, the army post at Salt Lake City, wandered up to the head of Little Cottonwood Canyon and made the first important mineral discovery in Utah, which they located and named the Emma. The ore from the Emma was sensational, the usual stampede followed, other claims were located, and a busy mining camp grew up. As the altitude was approximately 9,000 feet, it was appropriately named Alta.

Other mines were developed but the Emma led them all and its fame spread abroad as shipment after shipment yielded fabulous returns until the gross production mounted to five-million dollars. But in those days mining was not done on the scientific basis that it is now; ore was taken out as fast as found without developing ahead, and geology was all right as a hobby for the highbrows but had no place in the practical business of mining. So it is not surprising that the time came when the operators found their main ore body cut off by a fault and no more ore available for extraction. Such efforts as were made to find the displaced ore body were unsuccessful so the owners carefully bulkheaded off that portion of the mine and thought things over.

At that time the ambassador to the Court of Saint James was one Robert Schenk, whose chief qualifications as a diplomat were that he had held a general's commission in the Civil War and was influential politically. The general was a sociable soul and one of his first acts as ambassador was to instruct his newly found British friends in the great American game of draw poker - somewhat to his own profit it is to be supposed.

This was the setting when the owners of the Emma showed up in London and enlisted the aid of the general in finding a solution to their problem, which involved unloading a mine which, according to authenticated records, had produced five-million dollars and presumably was good for many times that amount. Just what devious methods were used we can't say at this time but the upshot was that with the ambassador's influence behind them the promotors negotiated the sale for five-million dollars to a syndicate that was organized for that purpose.

The English organized a company and sent their own men to Utah to superintend the reaping of the riches from their investment. It has been said that the officers of the company, instead of being on the ground looking after their stockholders' interest, preferred the more social atmosphere of Salt Lake City to the rarified air of Alta and spent most of their time in enjoying themselves in the Mormon metropolis. Out of the congenial crew thus gathered together grew the Alta Club, still Salt Lake's swankiest social club.

Inevitably the bubble burst and the time came when the disillusioned investors realized that they had poured their millions into what was literally no more than a hole in the ground. When the facts came out the storm broke about General Schenk's head and he was recalled to face a Congressional investigation. The report of that investigation fills a volume of 800 pages and the conclusion reached was that the ambassador's conduct was "unfortunate, ill-advised, and imcompatible with his official position," no doubt a great satisfaction to the credulous investors!

One by one Alta's mines played out and the camp became as dead as the traditional doornail. Thirty years later an attempt was made to revive it and some of its mines reopened but not with much success. Now its claim to fame is of a different nature as its steep slopes afford ideal ski runs; enthusiasts come from all over the country to try them out and some of the outstanding meets are held looking down on the big dump that marked the tunnel of the Emma mine.

My first mining experience was in Alta during the attempted revival of the old mines. John Stilwell, one-time shift boss in the Emma, kept the general store and was postmaster. One day in reminiscing to me he chuckled "General Schenck gave the Englishmen two experiences. He taught 'em how to play poker and he sold 'em the Emma mine. I don't know which cost 'em the most."

L.A.P.

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LUNCHEON TALKS

(Continued from February 23 luncheon talk by Ada Henley): One selection had to do with the Salton Sink in Southern California, an arid region designated by the early Spanish explorers as the "Valley of Torture." This name was apt until about the turn of the century the waters of the Colorado River were turned into this basin. Truly then the desert blossomed as the rose and from that time on the valley of torture became Imperial Valley, one of the garden spots of the earth. The valley settled rapidly and prospered but Nature is often inclined to resent Man's invasion of her domains and in 1905 a flood on the Gila River, a principal tributary of the Colorado, met one on the main river and disaster followed. The headworks on the main irrigating canal were washed out and the river poured uncontrolled into the valley. For two years Man, with money as his ally, fought Nature in her desperate attempt to reclaim her own and make the Salton Sink the sea that it once was. After eighteen months Man seemed to have won the battle but then the river broke through again and the battle was on once more; but in six months the tide was turned finally and Imperial Valley was saved to become one of the wealthiest agricultural regions anywhere.

From Imperial Valley we jumped to Avery Island in Louisiana, a portion of a large tract of marshy land that was a part of one of those generous land grants ceded centuries ago by the Spanish kings.

A part of the grant came into the possession of a man named Avery who on one occasion had as a visitor a former lord mayor of London. This guest told Mr. Avery how an Indian Rajah had created a bird refuge. This gave Avery an idea and he started a place designed especially for the shelter and propagation of egrets. This enterprise, started in a very modest way in 1892, with four birds, expanded and in forty years was supporting a colony of 22,000 nests. These are only two of the highlights of the very interesting talk and reading that we had. All of it was very much worth while.

March 8th Orrin Stanley pleading a lack of knowledge of geology which many of us were inclined to doubt, entertained us with an account of some of his experiences in photography, of his knowledge of which no one has any doubt.

Going back to his very first experience when at the age of four his head was clamped into a "headrest" to hold it still while a picture was made of the promising member of the Stanley family he passed on to 1896 when, the ink still damp on his diploma, he became assistant engineer of Mason City, Iowa, (the "chief engineer" and he comprising the entire staff) at a salary of fifty dollars a month.

Even then the urge was upon him and his associate was similarly moved so they pooled the savings from their generous salaries (the two were the same) to buy a twelve-dollar camera that used either plates or films and entered into an agreement that each could use it until he had exposed a roll of film, but in course of time Orrin parlayed his resources until he was in a position to buy out the co-owner and became possessed of full title to the instrument.

There were many interesting anecdotes; the troubles with the films that curled up to the size of a lead pencil after developing if not thumbtacked to a board while drying, the picture of himself that was dubbed "Rain in the Face" because he tacked it to the board with the emulsion side down, the dunking that he got going onto the ice to photograph a snake lying in the winter sun, and many others.

When he went to Mexico on railroad work in 1899, he graduated from a box camera to an FPK - folding pocket kodak to you - which added much to the interest of his work, and he closed his talk by telling how he missed getting a picture of some Mexican bathing beauties by supposing Mexican sign language and Americano sign language had the same meaning.

To enhance the interest of the talk there was a collection of cameras dating back to the earliest days of amateur photography and several albums of photographs that the speaker had accumulated over the years.

SILICON. Hollis M. Dole. March 22. - Silicon is obtained by reducing silica in the form of quartz with hog fuel in an electric furnace. The furnace product is collected and refined by treatment with alkaline minerals or silicon chloride which gives a final product of 99.4 percent silicon. Ferrosilicon is made by fusing quartz with steel scrap.

Silicon has its principal uses as an alloy of steel, copper, and aluminum. In steel it increases tensile strength and corrosion resistance. In copper it acts as a deoxidizer in the melt and increases its fluidity and reduces the heat and electrical conductivity of the alloy. Its action as an alloy with aluminum is essentially the same as with copper. Samples of elemental silicon, alumino silicon, and ferrosilicon were passed around to illustrate the talk.

OPERATIONS AT THE ALBANY STATION, U.S. Bureau of Mines, Dr. John P. Walsted, March 29, 1956. - On this day the Society welcomed Dr. Walstead, fresh out of Providence Hospital after his second trying experience there in recent months. As we were without a scheduled speaker for the meeting, Dr. Walstead took over at the request of the chairman and gave us an enlightening talk on some of the work at the Albany Station of the U.S. Bureau of Mines.

First he stated emphatically that he wished to spike a rumor that the Albany Station will be closed down and abandoned, which had its inception in the fact that activities at the zir-

conium plant were discontinued recently. This was in accordance with a pre-arranged plan which was not carried out as intended and the zirconium plant is now being reactivated.

The speaker, explaining that he is essentially an "iron man," called attention to the vital part that iron plays in our civilization and allayed our fears to some extent as to a possible shortage of iron ore in anything like the near future. We were told of one undeveloped deposit in Alaska in which billions of tons can be estimated as "in sight." The deposit is low in phosphorus and sulphur but would require some beneficiation to improve the iron content. Elsewhere in Alaska is a smaller deposit but of very high quality. We also learned of a large deposit in Stevens County, Washington, but which presents a difficulty in that it contains sulphur and copper. Dr. Walstead spoke of research being carried on to use manganese as a substitute for nickel and chromium in the manufacture of stainless steel and brought out many other points of interest which we shall have to pass over for the time.

REVOLUTION IN THE STEEL INDUSTRY. Fay W. Libbey. April 12. - The tremendous increase in steel production in recent years almost amounts to a revolution and makes it necessary for the steel companies to seek new deposits of iron ore. For years the industry has depended on the ores of the Lake Superior region, about 85 percent coming from this source, the greater part from the Mesabi Range in Minnesota. The Mesabi ores are Bessemer type, being high in iron and low in phosphorus, and furthermore are cheaply mined by open pit methods. It has been realized for a long time that great as the Mesabi deposits are they are not inexhaustible and that the time would come when other deposits must be found.

For many years attention has been directed toward the immense bodies of taconite which are closely associated with Lake Superior ores and research was commenced on these as much as forty years ago but the problems were such as to make it seem almost impossible to produce a commercial product. Taconite is a very hard ferruginous chert containing 25 to 30 percent iron in very fine grains of magnetite. The extreme hardness that made drilling very expensive was finally overcome by "jet piercing" by which jets of oxy-acetylene flame melt a hole in the rock in which to place the blasting charge. When broken down, the ore is fine ground and concentrated magnetically to give a product containing 64 percent iron which is baked with a suitable binder to give a hard lump that is amenable to blast furnace treatment. While the process of mining and treating is expensive this is offset to some extent by the fact that the product is of higher grade than run of mine ore with a saving in blast furnace costs. Increase in the imports of foreign ores have been necessary in recent years, more than half of these coming from the newly developed deposits of Venezuela and Labrador.

L.A.P.

HISTORY OF THE MESABI MINES. H. Bruce Schminky. April 19, 1956. - Bruce Schminky gave a talk on the discovery of the Mesabi iron mines of Minnesota. Search for iron began during the Civil War by a company founded by Senator Alexander Ramsey and Jay Cooke. Peter Mitchell did much prospecting for the Mesaba Iron Company. A company started by Charlemagne Tower brought in the first producing mine in the Vermillion Range, and built the first railroad to carry ore to Lake Superior. Munro Longyear, the Merritt brothers, Henry W. Oliver, and Andrew Carnegie were some of the famous names that entered the picture by 1892. Because the Soo canal is a vital link in the journey of the ore from mine to mill, its history was given a quick summary. E. and T. Fairbanks, the scale manufacturers, were the builders of this project. It took 22½ months and $1 million to bring it to completion on April 19, 1855. Ninety-six million tons of iron ore now travel from the mines of Lake Superior through this canal each year.

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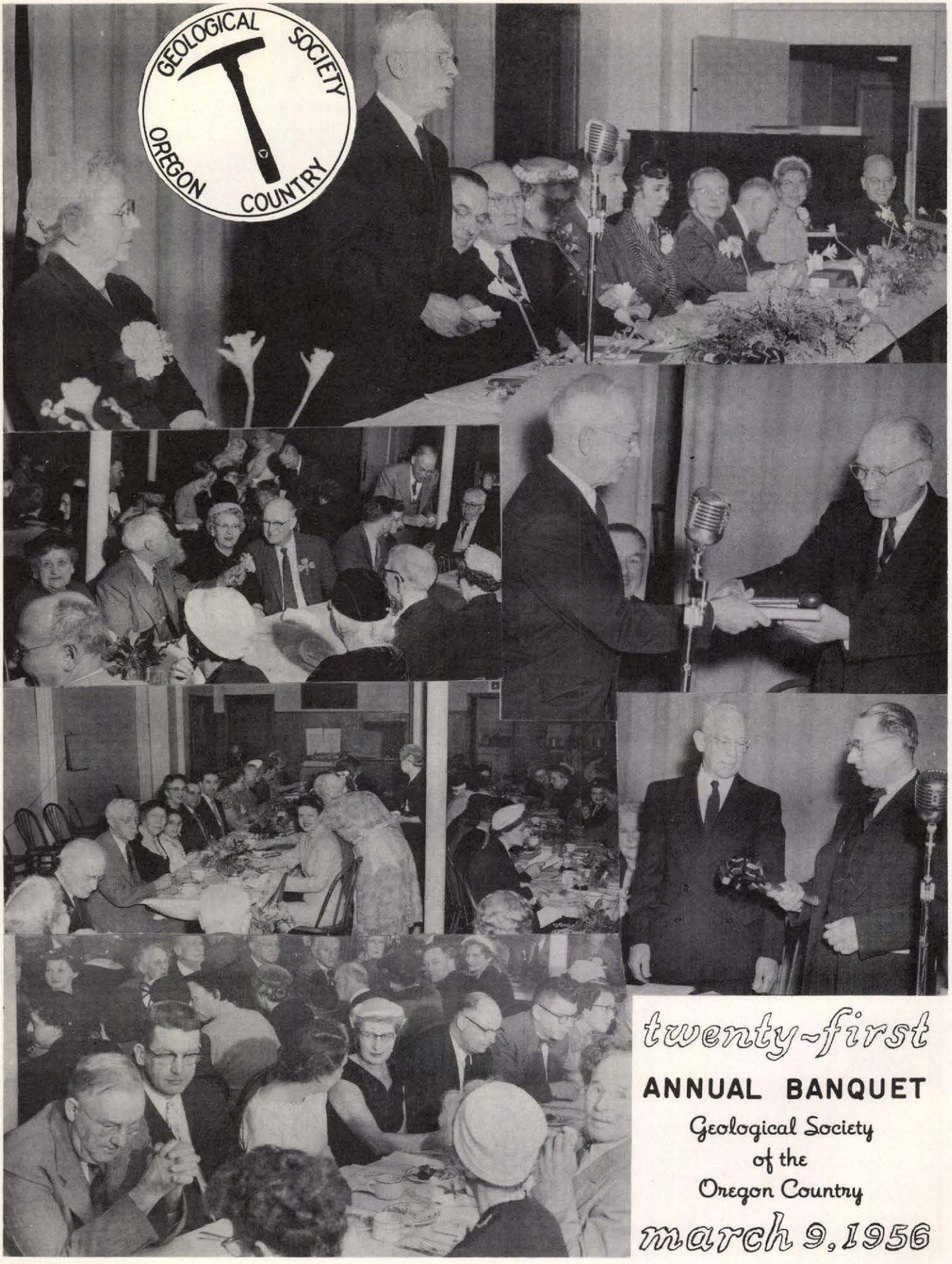
twenty-first

ANNUAL BANQUET

Geological Society
of the
Oregon Country

march 9, 1956



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ANNUAL BANQUET

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PHOTOS
E. BUSHBY

MENU

DINNER NO. 1

SHEETS OF MUSCOVITE with PEGMATITE
VOLCANIC SCORIA
or
FIRE BRICK

ARGILLACEOUS HEMATITE

MOUNDS OF ULEXITE EPIDOTE CRYSTALS

RUBIES IN GNEISS

MUD FLOW or WILLAMETTE RIVER WATER

* * *

DINNER NO. 2

TURKEY with DRESSING
GIBLET GRAVY
or
SALMON LOAF

CRANBERRY SALAD

MASHED POTATOES STRING BEANS

CHERRY PIE

COFFEE or TEA

* * *

PROGRAM

Twenty-first Annual Banquet

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Mr. H. Bruce Schminky
Master of Ceremonies

"WE'RE HERE FOR FUN" . . . . . EVERYBODY

DINNER

* * * * * * * *

"IT'S A NEW YEAR" . . . . . WILLIAM F. CLARK

PORTLAND MOVES FORWARD IN
EDUCATION AND SCIENCE . . FRANCIS G. GILCHRIST

PRESENTATION OF FELLOWSHIP CERTIFICATE

INTERMISSION

"A HUNDRED MILLION" . . . . . EVERYBODY

"ONLY A STONE'S THROW". . . . RALPH S. MASON

A MEETING OF THE JONESPORT
LITERARY SOCIETY

"GOODBYE, ROCK HUNTERS, GOODBYE" - EVERYBODY

* * *

BANQUET COMMITTEE

CAMELLIA CORSAGES:
Mrs. Ben F. Smith

ENTERTAINMENT:
Music – Mrs. A. W. Hancock
Dr. Arthur C. Jones

Skit – Mr. Raymond L. Baldwin

GIFTS:
Mr. and Mrs. H. Bruce Schminky

HOSPITALITY:
Miss Joanne Aungst
Mr. and Mrs. Raymond L. Baldwin

INTERPRETER (menu):
Miss Margaret L. Steere

PHOTOGRAPHY:
Mr. Edward D. Bushby

TICKETS:
Mr. and Mrs. Leo F. Simon

BANQUET ARRANGEMENTS:
Social Committee –

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Mrs. Franklin M. Brown
Mrs. William F. Clark
Mrs. Leslie Davis
Mrs. Ray S. Golden
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Mrs. Elwin Lilly

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* * *

WE'RE HERE FOR FUN
(Auld Lang Syne)

We're here for fun, right from the start
Pray drop your dignity.
Just laugh and sing with all your heart,
And show your loyalty.

Chorus:

May other banquets be forgot,
Let this one be the best,
Join in the songs
We sing to-night,
Be happy with the rest.

It's twelve long months since last we met,
To feast, to laugh, to sing,
To reminisce, lest we forget
The joys these meetings bring.

The things we've seen, we've loved, we've shared,
From mountains to the sea,
We've gathered rocks from hills and vales,
To learn geology.

And so to-night with spirits high,
The welcome mat we spread,
Let's plan to climb to greater heights,
In months that lie ahead.

'The Hancocks'

* * *

A fire-mist and a planet;
A crystal and a cell;
A jellyfish and a saurian,
Then caves where cave men dwell;
Then a sense of law and beauty
And a face turned from the sod;
Some call this evolution,
While others call it God.

from the writings of
William Herbert Carruth

* *

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GOOD NIGHT

twenty-first

ANNUAL BANQUET

Geological Society
of the
Oregon Country

march 9, 1956

GEOLOGICAL NEWS LETTER

OFFICIAL PUBLICATION OF THE

Vol. 22, No 6 **PORTLAND, OREGON** June 1956

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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Publicity:	Mr. H. Bruce Schminky	Historian:	Miss Ada Henley

Society Objectives

To provide facilities for members of the Society to study geology, particularly the geology of the Oregon Country; the establishment and maintenance of a library and museum of geological works, maps, and specimens; the encouragement of geological study among amateurs; the support and promotion of geologic investigation in the Oregon Country; the designation, preservation, and interpretation of important geological features of the Oregon Country; the development of the mental capacities of its members in the study of geology; and the promotion of better acquaintance and closer association among those engaged in the above objectives.

Persons desiring to become members should contact the Membership Chairman, Mrs. Ruth Harrison, 1879 S.W. 10th Avenue, Phone CA 3-0255. Regular annual dues (single or family memberships) are $5 for residents of Multnomah and adjacent counties; $2.50 for others; and $2 for Junior Members. Make remittances payable to the GEOLOGICAL SOCIETY OF THE OREGON COUNTRY.

(Society Activities)

(See "Calendar of the Month")

Evening Meetings: Formal lectures or informal round-table discussions on geological subjects, on the second and fourth Fridays of each month at Public Library Hall, S.W. 10th Ave. and Yamhill.

Field Trips: Usually one field trip is scheduled for each month.

Library Night: Once a month. Lewis and Clark College.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.00 per plate.

Publication: The Geological News Letter, issued once each month, is the official publication.

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CALENDAR FOR JUNE AND EARLY JULY

Buffet luncheon every Thursday noon at the Portland Chamber of Commerce, 824 S.W. Fifth Avenue, Second Floor. One Dollar.

ATTENTION! Library nights will be discontinued until September 18.

Meetings

Friday June 8 — Public Library, Room A, 7:30 P.M. Mr. Frank Hjort, Superintendent of the Fort Vancouver National Monument will speak and show an outstanding film on "The 1950 Eruption of Mauna Loa."

Sat. - Sun. June 9-10 — Field Trip to Saddle Mountain. Drive out Sunset Highway to Saddle Mountain Park entrance (about 70 miles northwest of Portland). Turn right, drive about 6 miles to camp sites. Saturday, leave park at 2:00 P.M. for drive to Cannon Beach, Ecola Park and Lewis and Clark camp site. (En route visit the largest fir tree in North America). Camp for the night and camp fire.

Sunday, 9:00 A.M., start up Saddle Mountain trail (about 4 miles to top). Many wild flowers along trail. Spectacular lava dikes that look like cordwood piled high as a house and other geological features; wonderful view of surrounding country. Round trip about 200 miles. The society visited this area last in 1936. Leo F. Simon, Leader, CA 3-0300 or BE 6-0549.

Friday June 22 — Public Library, Room A, 7:30 P.M. Highlights of the Cove Park and Saddle Mountain field trips, with showing of colored slides taken by members on the trips. Important! Watch for notice in the newspapers. There is a possibility that a well-known paleobotanist may be present to address our meeting.

Friday July 13 — Public Library, Room A, 7:30 P.M. Showing of outstanding moving pictures of mining operations for nickel and uranium.

Sunday July 1 — Joint field trip with Salem Geological Society. Meet in front of Highway Building (first as you come in from the north) in Capitol Mall. Leader of trip: Reynolds W. Ohmart.

Trip will be through the west portion of the hills south of Salem, then across the river for picnic lunch on the campus of the Oregon College of Education at Monmouth. From Monmouth the route will be north on the West Side Highway with several stops ending in the vicinity of Amity. Object of the trip is to present landscape of the Salem and Eola hills and to discuss probable geological happenings that gave rise to present conditions.

Friday Aug. 3 — ANNUAL PICNIC. Our annual picnic again will be held on the first Friday evening of August in the crater of the Little Volcano at Mount Tabor Park. Save the date.

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Note: During the remodeling of Library Hall the meetings of the Society will be in Room A of the Public Library. This room is entered from the foyer facing Tenth Avenue.

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COOS BAY TRIP - LABOR DAY

The trip committee would like to know if enough members would like to join in and make possible a three-day trip to Coos Bay over Labor Day. This would include a visit to (possibly stay at) the Marine Laboratory at Charleston. The trip would be lead by Dr. Stauffer. Notify R. Erickson, 1119 Equitable Building, CA 8-7537, if you are interested.

Promptly Please.

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NEW MEMBERS - GSOC - JUNE 1956

MacMickle, Dr. and Mrs. Virgil — 465 - 3rd Street, Oswego, Oregon, Phone NE 6-2349

New Junior Member

Fletcher, James Stewart — Mist Route, Vernonia, Oregon.

Change in Telephone Number

Hopson, Dr. Ruth — CA 2-1430

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SUMMER COURSES IN GEOLOGY

Lewis and Clark College is offering the following summer courses in geology. These are open to anyone and may be taken for or without college credit.

Geology of Eastern Oregon - The Wallowa Mountains. Study of the physical and historical geology of the region. Overnight trips to Hell's Canyon and the lake basin, as well as numerous short excursions to points of interest. Cost, including course fee, food for two weeks, pack trip by horse to and from the lake basin, $70.00. July 23 to August 11.

Geology of the Oregon Coast. Headquarters will be at the Coos Bay Marine Station near Cape Arago. Cost, including course fee, food for two weeks, rental of a dormitory room, $55.00. August 29 to September 11. Two other courses will also be offered at Coos Bay Marine Station by members of the Lewis and Clark faculty, one in Drawing and Painting, by Alice Boyle, and another in Musical Masterworks by Reinhard Pauly.

Anyone interested in any of the above should inquire of Dr. James Stauffer, Lewis and Clark College, Portland 1, Oregon.

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CHARCOAL DATES OLD MINES

As a result of archeological expeditions to Isle Royale in Lake Superior, Dr. R. W. Drier, professor of metallurgical engineering at Michigan College of Mines and Technology, reports that charred wood unearthed in one of the old mining operations on the island dates back to about 2000 years B.C.. The ancient miners heated copper-bearing rocks with fire, then poured water on the rocks to split them. Age of the old charcoal discovered was determined by the radioactive carbon-14 method.

(From Engineering and Mining Journal, April 1956.)

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TITANIUM METAL

By
Gregory A. Davis*

Titanium, discovered in 1790 and later named after the Titans of mythology, is one of the most plentiful elements in the earth's crust. Since the first commercial production of ductile titanium metal in 1948, its uses and demand have increased at an astounding rate. Once a laboratory curiosity, titanium and its alloys are now regarded by metallurgists as the best lightweight-high strength structural metals in use today.

Titanium is a hard, silvery gray, brittle metal with a melting point of approximately 1670° C., and a density of 0.16 pounds per cubic inch. Its density is 40 percent less than that of steel and 60 percent greater than that of aluminum. This metal combines the lightness of the stronger aluminum alloys, the corrosion resistance of stainless steels, and the strength of heat-treated steels.

The two principal ores of titanium are rutile (TiO_2) and ilmenite ($FeTiO_3$). Other titanium-bearing minerals, not usually found in economic quantities, include sphene, perovskite, octahedrite, brookite, and leucoxene. Reserves of rutile in the United States are limited, and production in 1954 totaled only 7400 short tons. This mineral is mined from the beach sands of northeastern Florida. It is from rutile that most titanium metal is produced. Ilmenite is used chiefly for the manufacture of nonmetallic titanium compounds, and is found in the United States in abundance, especially in the states of New York, Florida, Virginia, and Idaho. Domestic production of this mineral, usually mined from basic igneous intrusives, amounted to 548,000 tons in 1954. Production of both minerals in this country lags far behind consumption. In the year mentioned above, for example, 15,100 short tons of rutile were imported from Australia. United States' ilmenite supplies are supplemented principally by imports from the Allard Lake deposit of Quebec, Canada.

Rutile and ilmenite from beach sands are concentrated by either flotation or electrostatic methods. As ilmenite is magnetic and rutile is not, the mixed concentrate of the two minerals is separated by magnetic methods. Most ilmenite, however, is mined from deposits occurring in anorthosite, gabbro, or related rock types. The ore, frequently an intergrowth of ilmenite in magnetite (titanomagnetite), is usually mined open-pit. It is then crushed and separated from the gangue by either flotation, gravity, or magnetic methods. The removal of the iron content presents a problem, but a smelting process has been developed whereby the greater part of the iron is withdrawn in a molten state. Approximately 70 percent of the slag produced by this operation is TiO_2. Chemical treatment of the titanium-rich slag produces pure TiO_2.

In 1955, all commercial production of titanium metal was by the Kroll process, devised in 1940 and modified by the United States Bureau of Mines during the war. In the first step, titanium tetrachloride is formed by passing chlorine through a mixture of titanium ore and carbon.

$$TiO_2 + 2Cl_2 + 2C \rightarrow TiCl_4 + 2CO$$

*Alpha Kappa Lamba Fraternity, Box 1333, Stanford, California.

In the second step, the titanium tetrachloride is allowed to drip through a helium atmosphere onto molten magnesium. The magnesium replaces the titanium, and a spongy, cokelike mass of metallic titanium is produced.

$$TiCl_4 + 2Mg \rightarrow Ti + 2MgCl_2$$

The disadvantage of the Kroll method arises from its being a batch process, and therefore, not best suited to large-scale operations. Production of titanium metal by electrolysis of titanium compounds in aqueous solution has proven unsuccessful to the present time, since all such compounds are readily hydrolyzed.

Melting of the sponge to ingot form is best accomplished by a process in which the sponge, either pure or mixed with alloying elements, is pressed into rods and welded together to form a bar of desired size. In an inert gas atmosphere, this bar is fed either mechanically or manually into an electric arc, and acts as a consumable electrode. As the electrode melts off, a pool of molten metal forms below and freezes into a solid ingot. The advantage in using this method is that the titanium metal is not contaminated by carbon or tungsten from nonconsumable electrodes.

Titanium can be fabricated by all standard methods. In casting, dies must be specially designed as the metal flows less readily than steel, and has lesser shrinkage on freezing. Heavy plates $2\frac{1}{2}$ inches in thickness and weighing 1000 pounds can be rolled on large plate mills easier than steel, and they have excellent surfaces. Thin strips as much as 8 inches wide and 0.0005 inch thick have been rolled. Excellent results have been reported on extrusion methods.

Titanium's behavior in welding is, at present, a limiting factor in its utilization. It is practically impossible to weld it to dissimilar metals; only pure titanium and its alloys containing aluminum and tin (alpha titanium) can be welded together by ordinary fusion techniques. Contamination by air and structural changes during welding present added problems. At elevated temperatures titanium is extremely reactive with oxygen and nitrogen, dissolving both in large amounts. Oxygen and nitrogen, as impurities exceeding 0.15 percent and 0.05 percent respectively in unalloyed titanium, cause poor physical properties of weldment. To reduce weld bead and base metal cracking, the titanium is first preheated to 300-500° F., and then welded in an inert gas atmosphere.

Less than 5 percent of all titanium ore mined is used for the manufacture of metal. This percentage is increasing annually, but by far the greater amount of ore is employed in the production of titania, a high-opacity pigment used as a base in the manufacture of paints, enamels, and glazes.

The aircraft industry is the largest consumer of titanium metal and its alloys. Because of its light weight, its strength, and its ability to function well at moderately high temperatures, titanium is substituted for heavier stainless steel. The unalloyed metal is primarily used because of its availability in sheet form, its ease of fabrication, and its weldability. Airframe parts which bear high stresses, or in which stiffness is required, are often fabricated from alloy metals. In structural applications it has been found that titanium tends to creep under a constant load. Creep, however, can be eliminated by cold work or alloying. It is reported that approximately 600 pounds of titanium are used in a jet plane, in parts such as bullheads, shroud assemblies, ammunition tracks, and jet engine compressor disks and blading.

Titanium's resistance to corrosion by chlorides, nitric acid and aqua regia, dilute hydrochloric and sulfuric acids, and its complete immunity to sea water make it an important metal in the manufacture of marine and chemical processing equipment.

Because of this metal's military applications, especially in the airplane industry, its increased production has been encouraged by the United States Government. Production statistics since 1948 show an impressive increase from year to year.

Titanium Metal - Metric Tons

1948	1949	1950	1951	1952	1953	1954	1955
3	8	50	500	1075	2250	7000 est.	25,000 est.

As a result of cost improvements achieved by increased volume production, the price of titanium sponge has dropped five times since mid-1954. From 1948 to 1954 the price had been $5.00 per pound, but as of the last reduction on May 15, 1956, stood at a new low of $3.25. The current price for titanium sheet and strip is about $12.70 per pound.

In the last month two corporations, Kennecott Copper and Titanium Metals, have announced individual plans for either expansion of present facilities for the production of titanium metal, or the construction of new plants. Kennecott Copper, which controls large titanium ore deposits in Quebec, is expected to construct in the near future a metal producing plant near Tonawanda, New York. Titanium Metals Corporation of America bought a three-million dollar cold rolling plant last January, and announced plans for a 67-percent expansion in capacity of their Henderson, Nevada, sponge and ingot melting plant. A third corporation, Columbia-Southern Chemical, recently opened a new multi-million dollar titanium tetrachloride plant on the Ohio River in West Virginia, with an annual production of 35,000 tons.

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FROM THE EDITOR

WHAT DOES GEOLOGY MEAN TO YOU? Does geology affect you personally? You live in Portland or the "Metropolitan Area." Why? Presumably because a populated district is best suited to your carrying on your particular activities. Why is Portland a large city while Burnips Corners or Squashville, settled at the same time, have stood still or perhaps disappeared entirely?

Our founding fathers recognized that a broad valley with agricultural and timber resources adjacent to the confluence of two large rivers was an ideal site for industry and trade so Portland came into being and grew while other settlements with the same start declined.

And that brings us to the nub of our question. Those favorable conditions were due to a sequence of geological events which created a topography adapted to the conditions that the early settlers foresaw. Had these events been different there would have been no Portland, at least not where it is now.

In recent years the entire area hereabouts has been stimulated by the great industrial development brought about by the availability of hydro-electric power. Where does this power come from? Sure it comes from Bonneville Rapids and Celilo Falls and other natural sites, each one of them traceable to some geological cause which set up conditions by which man would profit after he came on the earth millions of years later.

We should like to run an article, or a series of articles, setting out this idea, that each one of us today is profiting by those events of so long ago. Now that the editor has passed the ball what loyal Gesocker is going to catch it and carry it to a touchdown?

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LIBRARY NIGHT PICNIC

LIBRARY NIGHT, May 15, was much more than just another library night. It began at 6:00 P.M. with a picnic de luxe in the recreational area near the swimming pool. After the excellent refreshments and an informal social session which everyone enjoyed we adjourned to the library for the usual browse and then gathered in the biology class room where we saw three films, different subjects but each outstanding in its class.

"Glacial Origin of the Great Lakes" gave us an idea of how these titanic forces of ice and snow gouged out the great basins that have been filled by the inland seas. Then came "The Horse in North America" which traced the evolution of this useful animal from tiny eohippus to the ton-weight Clydesdales that pulled the beer trucks of a generation ago until the gasoline horse took over the job. The third film, "Wild Flowers of the West," outclassed the others for sheer beauty and took us to all parts of the West and under all conditions of climate and scenery.

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HAVE YOU PAID YOUR DUES?

The new membership list is to be published soon. Prompt payment of dues and notification of changes in address and telephone number will enable the Secretary to make an accurate list.

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MEMBERS AND FRIENDS OF GSOC

The following is received from our former member Jack A. Wolfe whose scholastic achievements were a matter of notice in the May News Letter.

Mr. Leroy A. Palmer
1209 S.W. 6th Avenue
Portland 4, Oregon

Dear Mr. Palmer:

Thanks very much for your recent letter - it was certainly appreciated. About the short note concerning my activities, past, present, and future, it is indeed gratifying to me that someone is interested in the work of persons in paleobotany. In a very real sense I feel a debt to the Gesocers for their interest.

This year I was able to spend much more time in paleobotany, due primarily to the excellent courses open to students. In the fall I had a course under Prof. Barghoorn concerning the fundamentals of paleobotany, and, at the same time, worked with him in a research course. In this latter course, I worked on the megafossils from the Collawash River locality, and this term I turned my attention to the microfossils. Harvard is an excellent place for palynology since the largest collection of modern pollen is housed in the paleobotanical laboratories, not to mention Prof. Barghoorn's wide experience in this subject. However, besides this work in palynology, I have also dabbled a bit in other areas, e. g., making thin sections of gunflint chert from the Lake Superior region. This chert contains the oldest evidence of plant life, (about 1.5 billion years) although very primitive (blue-green algae and fungi).

As for future plans, this summer I will collect with Prof. Chaney in the John Day Basin for a few weeks, and will then work for the Mineral Deposits Branch of the U.S. Geological Survey. Next year I will finish my study here at Harvard, and then I hope to enter the University of California and study under Prof. Chaney and his associates.

Hope that this is what you wanted. Since I will be in Oregon this summer, I would be most happy to write something for the News Letter.

Looking forward to seeing you, I am

Sincerely yours,
Jack A. Wolfe ('57)

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We are pleased to publish in this issue "Titanium Metal" by our junior member Gregory Davis, now a senior at Stanford University. In his covering letter Greg says:

"I am working this summer with the Stanford Geological Survey in Nevada and California in completion of requirements for my Bachelor of Science degree which I

will receive in September. I have been admitted to the Stanford School of Mineral Sciences for graduate work and was awarded a teaching assistantship for the coming academic year.

"Please say 'Hello' to the Ericksons and Simons for me. I hope you can use the paper."

GSOC has reason to feel proud of its junior members.

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RECENT PUBLICATIONS

Energy Sources - The Wealth of the World, by Eugene Ayres and Charles A. Scarlott.

Here is a thorough census of our energy sources - past, present, and future. The book presents a detailed review of the size of fuel supplies, technology of production, efficiency of conversion, and progress being made in conservation. It shows how man has used energy in the past, and what we may expect in the future. Everything from fossil fuels and hydro-electric power generation - to nuclear and solar energy is discussed in a highly readable, thought-provoking manner. Comparisons are set up among all the important sources of energy, and definite programs are proposed for future developments. There are 344 pages, 114 illustrations, 60 tables. Published by McGraw-Hill Book Company, $5.00.

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The University of California has recently made available vol. 31, no. 5 of its Publications in Geological Sciences. This number is devoted to a contribution by Theodore Downs entitled The Mascall Fauna from the Miocene of Oregon. The publication has 155 pages and numerous illustrations, including aerial photographs of the localities. It may be obtained from the University of California Press, Berkeley, California. Price is $2.50, paper bound. The author's abstract is as follows:

Three assemblages of fossils from the type Mascall area, the Crooked River area, and from the Gateway area in central Oregon contain identical taxonomic units and are considered to belong to the Mascall fauna. The Crooked River material has provided new specimens for study. Mammals from the Gateway area of Jefferson County are described for the first time. Much undescribed material stored in museums in the eastern and western parts of the United States has been reviewed and figured.

The Mascall formation, particularly in the type area, includes wind-blown and water-laid deposits of variable thickness. It was probably deposited in a shallow synclinal basin bordered by uplands and crossed by streams that meandered across flood plains between forests and grasslands.

A new species of marmotlike rodent and a heteromyid resembling the Dipodomyinae are described. New material referable to the known carnivores, Tomarctus rurestris and Leptarctus oregonensis, is described. The study indicates that Parahippus brevidens (Marsh) is synonymous with P. avus (Marsh) and that Merychippus insonesus (Cope) is synonymous with M. serversus (Cope). Merychippus quartus is considered to be a nomen vanum.

The Mascall formation is believed to be transitional Hemingfordian (middle Miocene) and Barstovian (late Miocene) in age. There is no evidence for subdivision of the formation or the fauna.

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RECENT DISCOVERIES OF MAMMALS IN THE CLARNO

By

Lon Hancock

Talk at Public Library, May 11, 1956

In his talk at the Public Library on May 11, Lon Hancock brought us up to date on recent discoveries of mammalian fossils in the Clarno formation.

First with a description of the "New Clarno" he told us of the present topography and geology and then reverted to the "Old" or, as he calls it, "Real Clarno," a land of luxurious tropical forests in a flat country with wide and verdant valleys in which all of the streams flowed westward, a peaceful scene broken occasionally by the eruption of explosive volcanoes until the John Day River took over, and by its erosion, modified the topography to approximately that which we now see.

Our speaker estimates that he has traveled at least 20,000 miles in his trips from Portland to this region and feels that he is better acquainted with the Old Clarno than the New.

First discoveries of fossils were made by Dr. Knowlton who identified 22 forms of plant life and this number was increased by other researchers, including the speaker, to more than one hundred. After careful study these placed the age as middle Eocene but all were fossil flora; no animal fossils were found.

In 1940, while searching in the formation, the speaker told us he found a tooth, the first fossil fauna found in the Clarno. This was taken to the University of Oregon, thence to the University of California where Dr. Chaney tentatively identified it as a rhino but sent it to the New York Museum of Natural History for further study. Here Dr. Chaney's identification was confirmed, a small rhino about the size of a collie dog.

Following this first discovery of evidence of animal life others were made. In 1954 a jaw identified as that of a brontothere but not conclusive as fixing the age of the formation. In the same year a member of the Agate and Mineral Society brought Lon a rock which contained a part of a rib. With this clue as to locality he started a search that revealed this area to be the most fertile field for paleontologic research that has been discovered in the last 70 years. In 1955, 3000 to 4000 bones were unearthed in an area of less than an acre and this spot is comparable with such famous fossil fields as the Agate Quarry of Nebraska, the Bone Quarry of Wyoming, and La Brea Tar Pits of Los Angeles. While the mammal excavation has been going on, plants are still being uncovered, 75 percent of these no longer native to the region. The British Museum has stated that the nut fossils from the Clarno are the oldest and best preserved of any that they have had.

The reason for this great concentration of animal remains in so limited an area was discussed, or rather speculated on. One explanation advanced is that this particular spot may have been the only water hole for miles about, that it was floored with quicksand and when animals came in great numbers to drink some of them were crowded into the water and ensnared in the quicksand.

We were given an idea of the extreme accuracy and care required in carrying out this work when our speaker described the system of 3-foot grids in which the area is laid out and promising spots marked for identification on a plat and illustrated the care with which a specimen is unearthed and packed in plaster of paris before shipment.

The last phase of the talk was a showing of pictures illustrating the general nature of the country, geological formations, fossils, a reconstructed scene showing animals of the Eocene and a very interesting series depicting the activities at Camp Hancock. Incidentally it was announced that the camp has been booked full for two sessions this summer and a third booking is in progress.

L.A.P.

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METEORITES AND THE ARIZONA METEOR CRATER

By
Mrs. Bella Johnson
Public Library Lecture, May 25, 1956

As Mrs. Johnson and her husband were residents in charge of the world famous meteor crater in Arizona for several years she is particularly qualified to talk on the subject.

First Mrs. Johnson distinguished between various terms such as meteor, meteorite, meteorology, the differentiation of which is not clear to many laymen. Several of the largest meteorites that have been found, the largest in Africa, were discussed briefly and mention was made of that discovered near Oswego many years ago.

Meteorites vary in composition but all of them are made up of elements common to the earth. Broadly speaking they may be classed as metallic, those containing such metals as iron, copper, nickel, chromium, etc., and nonmetallic, which are made up of various silicates. Then there are some that are a combination of the metallic and nonmetallic.

So far eleven meteor craters have been found, the largest the Chubb Crater in Canada near Hudson's Bay, which is 3 miles in diameter with a depth of 500 feet to the surface of the water that has accumulated in the bottom. The Meteor Crater of Arizona is the best known as it was the first to be explored and has had the most publicity. It is 4150 feet in diameter which would give it a circumference of 2½ miles. The depth is 507 feet and it is remarkably symmetrical in appearance.

The location is in the central part of the state, a quarter of a mile from a highway and not far from Canyon Diablo. From a distance it has the appearance of a low mesa and in the surrounding country is the wild life characteristic of the desert. The adjacent area bears a sparse growth of forage plants and has been a cattle range for years. The mantle of soil is thin, overlying a series of red sandstone and buff limestones. The crater is attributed to a tremendous explosion which occurred when the meteorite encountered a stratum of water-impregnated sandstone.

Many attempts have been made to reach the meteorite, some with the idea of commercializing it, but so far these have not been successful. A shaft was sunk 200 feet but abandoned because of bad ground and water; 30 vertical drill holes in the floor of the crater missed it before one of a series of five at the southside located it at a depth of 1000 feet. Meteorites are scattered about the adjacent country and the speaker mentioned two in particular, one weighing 1460 pounds and the other 900 pounds. A number of samples were on display from the size of marbles to weights of several pounds.

Following Mrs. Johnson's interesting talk we saw a series of slides of the crater and attendant features, including the adjacent scenery and the beautiful flowers of the desert.

L.A.P.

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LUNCHEON TALKS

OATFIELD RIDGE. Ed Kelham. May 10, 1956. - Oatfield Ridge lies a mile to a mile and a half easterly of the Willamette River, extending 4 miles southerly from Kellogg Creek where the latter makes a westerly bend toward the river. Elevations rise gradually from aproximately 200 feet at each end to 400 feet at a knob about the middle. The ridge never has been officially named but the speaker suggested the name that he used as appropriate as the first settler on the ridge was one Michael Oatfield who in the '70s or '80s took up a donation land claim of 640 acres extending southerly from Kellogg Creek.

The top of the ridge is capped by a fertile soil but the sides have been denuded of this, presumably by the Spokane Flood which swept about the ridge on both sides. The southerly one-third to one-half shows Troutdale formation but at the northern end this deposit does not appear, the predominant outcrop being Boring lava, presumably overlying the Troutdale. Toward the center the outcrops are of Columbia River basalt.

From this sequence and other evidence adduced in the field the speaker concludes that Oatfield Ridge is an anticline or dome formed as a secondary fold on the Willamette syncline and subsequently modified by erosion of the flanks and ends by the Spokane Flood. Rock samples taken from various points on the ridge were exhibited to illustrate the talk.

Inasmuch as this is a prominent topographic and historical feature which has never been named officially it was suggested that the society take the necessary steps to have it designated Oatfield Ridge that this name may appear on future maps of the locality.

TEMPSKYA. Al Keen. May 17, 1956. - Tempskya, one of the ancient ferns which grew during the Cretaceous period, has been found in several of the states and in parts of Europe. The first specimens were discovered in England in the early part of the 19th century and later in Germany, France, Russia, and Czechoslovakia. Around 1845 a paleontologist, Friedrich Tempsky, found several pieces of this material along the Elbe River in Czechoslovakia and made a detailed study of them. In recognition of this work his name was given to this fossil fern. All the European Tempskya was found in Upper Cretaceous formations. In this country Tempskya was discovered in Maryland in a Lower Cretaceous formation, but all other material found in the other states - Oregon, Idaho, Montana, Utah, Nevada, Wyoming, and Texas - occurs in the upper part of this period.

Tempskya is unlike any fern which grows at the present time. Fossil specimens look a great deal like a petrified tree trunk, but their internal structure is entirely different. The stems grew mostly upright and were bound tightly together and completely surrounded by thousands of tiny roots, which grew up along with the stems. Corrugations on the external surface are part of these roots, and are very typical of Tempskya. Leaf shoots grew out from the main stem all the way up. Since no fossil imprints have ever been found it is not known whether the foliage was a leaf or a frond. These ferns sometimes grew to a height of 20 feet or more, leaving silicified trunks, or "false stems" as much as a foot in diameter and several feet in length. However, most of the specimens found are a great deal smaller than this. A cross section of a good piece of Tempskya shows "eyes" (stems), horseshoe-shaped leaf traces and many small dots (roots).

Tempskya is found in only one place in Oregon, along Lightning Creek in the immediate vicinity of the old IXL mine about a mile northeast of the abandoned mining town of Greenhorn. Here it occurs as float in the stream bed or just under the surface of the ground back of the mine. Where all the Tempskya found in the rest of the country and Europe is invariably black, that found in Oregon is an attractive tan, light brown and sometimes a red color. It is well silicified and the structure in most of it is excellent. Since it has a hardness of seven, it takes a fine polish and specimens of this material are in demand by collectors. As interesting as the talk itself were a number of beautiful polished rock sections showing this interesting fossil which added much to our understanding.

OREGON TECHNICAL COUNCIL. Ralph Mason. May 24, 1956. - Most of us knew there was such a thing as the Oregon Technical Council but few of us had an idea as to its functions until Ralph Mason explained them to us in his luncheon talk. It consists of about 25 delegates chosen from various engineering societies in the state, some of them national and some of them local. The object is to protect and further the interests of the various branches of the engineering profession.

The Council makes a careful study of all subjects brought to its attention and because of its representative nature its recommendations carry weight. One of its functions is to watch any bills introduced into the legislature that may affect the profession and work for or against them as circumstances dictate. It also checks on matters of technical practice which may involve ethics.

Through the activities of the Council legislative aid was secured for the Oregon Museum of Science and Industry and it now is considering a program for "Scientists of Tomorrow."

The speaker cited as one of the things that come to it for consideration, and one that gives it much trouble, is the practice of various Federal agencies seeking bids for services on engineering jobs, bidding on services being considered definitely unethical in the profession.

BIG HORN MOUNTAINS. Marvin Lytle. May 31, 1956. - Marvin's talk covered some of his experiences in surveying the 11th Standard Parallel of the Sixth Principal Meridian in the southern part of the Big Horn Mountains of Wyoming, a locality known a half century ago as the "Hole in the Wall Country" and famous, or perhaps we should say infamous, as the hideout of the toughest bands of outlaws in those tough days. Along the basin of the Big Horn River is a series of red sediments of Triassic age carrying beds of gypsum. Percolating waters dissolve out the gypsum in places thus creating numerous small caverns snd sometimes the roofs of these caverns collapse so that walking or riding across the country can be quite precarious.

Marvin also spoke briefly of his experience in the Elk River country of West Virginia in retracing some surveys originally made by George Washington and told us that despite the lapse of time and the great improvements in surveying instruments the old surveys could be retraced and identified.

FOSSIL PLACERS. Leroy A. Palmer. June 7, 1956. - After a brief discussion of placers as commonly understood the speaker defined fossil placers as those formed in remote geological ages and consolidated into conglomerate by the weight of strata above them or by the infiltration of waters carrying cementing agents in solution. Such placers are found in rocks varying in age from Cambrian to Cretaceous and may have been beds or bars of ancient rivers or perhaps deltas or beaches.

One of the oldest and best known of this class of deposit is found in the Black Hills in the Deadwood formation of the Cambrian period. The Deadwood consists of a basal conglomerate overlaid by coarse sandstone or quartzite, a middle layer of sandy shales and calcareous beds and an upper layer of sandstone. Gold is found free in the conglomerate in water-worn particles and is assumed to be derived from the degradation of associated Paleozoic schists carrying auriferous quartz veins. Somewhat similar deposits are found in Cretaceous beds in Siskiyou County, California.

Followed a brief description of the buried channels of California and Australia which are not commonly classed as fossil placers but might come in that category.

L.A.P.

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GEOLOGICAL NEWS LETTER

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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Society Objectives

To provide facilities for members of the Society to study geology, particularly the geology of the Oregon Country; the establishment and maintenance of a library and museum of geological works, maps, and specimens; the encouragement of geological study among amateurs; the support and promotion of geologic investigation in the Oregon Country; the designation, preservation, and interpretation of important geological features of the Oregon Country; the development of the mental capacities of its members in the study of geology; and the promotion of better acquaintance and closer association among those engaged in the above objectives.

Persons desiring to become members should contact the Membership Chairman, Mrs. Ruth Harrison, 1879 S.W. 10th Avenue, Phone CA 3-0255. Regular annual dues (single or family memberships) are $5 for residents of Multnomah and adjacent counties; $2.50 for others; and $2 for Junior Members. Make remittances payable to the GEOLOGICAL SOCIETY OF THE OREGON COUNTRY.

(Society Activities)

(See "Calendar of the Month")

Evening Meetings: Formal lectures or informal round-table discussions on geological subjects, on the second and fourth Fridays of each month at Public Library Hall, S.W. 10th Ave. and Yamhill.

Field Trips: Usually one field trip is scheduled for each month.

Library Night: Once a month. Lewis and Clark College.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.00 per plate.

Publication: The Geological News Letter, issued once each month, is the official publication.

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CALENDAR FOR JULY AND EARLY AUGUST

Buffet luncheons will be discontinued during August as the Chamber of Commerce Cafe will be closed for the month. Luncheons will be held this month until July 26 and the next will be September 6.

IMPORTANT NOTICE: The remodeling going on at the Public Library makes it necessary to find another location for our Friday Night meetings. The July 13th meeting will be the last at the Library for some time. Arrangements have been made for the July 27th meeting and others will be announced in due time.

Friday July 13 — Public Library, Room A, 7:30 P.M.
Two excellent films put out by mining companies will be shown: "Million Dollar Drill Holes" by Utex Exploration Company, Moab, Utah, and "Mining for Nickel" by Rothacker, Inc., New York.

Sunday July 15 — Joint Field Trip with the Salem Geological Society. (Note correction in date: July 15th, not July 1, as in June News Letter.)
Meet 9:00 a.m. in front of Highway Building (first as you come in from the north) in Capitol Mall. Leader of Trip - Reynolds Ohmart. Trip will be through the west portion of the hills south of Salem, then across the hills for picnic lunch on the campus of the Oregon College of Education at Monmouth. From Monmouth the route will be north on the West Side Highway with several stops ending in the vicinity of Amity. Object of this trip is to present landscape of the Salem and Eola hills and to discuss probable geological happenings that gave rise to present conditions.

Friday July 27 — Portland State College, 1620 S.W. Park Ave., Room 301, 7:30 P.M.
"The Glenn Canyon of the Colorado River." Misses Hazel and Ruby Zimmer will describe their trip with the Sierra Club for seven days down the Colorado River in rubber boats, and will show colored slides taken by a friend.

Friday Aug.10 — ANNUAL PICNIC: Little Volcano, Mount Tabor Park, 6:30 P.M.
Already there are rumbles of the forthcoming eruption. Lay your plans for another happy evening of food and frolic. The event is pot-luck, buffet; but bring your plate, cup, and silver. NOTE CHANGE IN DATE from June News Letter.

Sunday Aug.19 — Field Trip to Cooper's Spur and Cloud Cap Inn on north side of Mount Hood.
Details in August News Letter.

Saturday Sept. 1 — Three-day field trip to Coos Bay. See June News Letter. This will be a most interesting trip but will depend on the number who will make it. It is necessary to plan well in advance, so if you are considering going please decide definitely and notify Rudolph Erickson just as soon as possible.

* * *

TRACE WADE LIBRARY

Mrs. Tracy Wade, widow of the late Tracy Wade, a charter member of our society and long active in its affairs until his health compelled him to moderate his activities, has offered Mr. Wade's geological library to the society for $75.00. Those familiar with it consider the library a bargain at this price, and a group of our members has taken it upon themselves to raise the money by subscriptions among our members. To date they have collected $64.75. Those wishing to participate in making up the small balance are asked to send checks made out to the society to our treasurer, Bob Wilbur.

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TALES FROM THE LUNCHEON TABLE
The Great County Seat Battle

Contests between towns as to which shall have the honor and prestige of being the county seat have been common enough but most of these have been decided at the polls after more or less preliminary oratory. The case of Custer vs. Keystone was different.

The first discovery of gold in the Black Hills was made in 1874 by a detachment of soldiers under General Custer, who was to make his famous "last stand" two years later. The discovery was a placer deposit which attracted much attention and when a small town sprung up it was named Custer. Later, when the territory was divided into counties, this portion of it became Custer County.

Meantime prospecting had spread and Keystone came into being. Keystone had both lode and placer and the lodes were rich while the placers at Custer were found to be only mediocre so in time Keystone outgrew Custer and when the county was formed it automatically became the country seat. This griped Custer, which was the older of the two, and better situated geographically. There was keen rivalry and much talk between the two and finally the Custerites decided it was time for action rather than talk.

So one day a small group of horsemen jogged into Keystone, "tied their horses to the ground" in front of the court house, just an ordinary store building, and went into the saloon next door. No one paid any attention to a stout farm wagon with half a dozen men in it which followed at a distance and pulled up at the back door of the court house.

In the saloon the horsemen had a few drinks and then got into an argument which was getting more heated as they left and walked toward their horses. There, in front of the court house, words gave way to actions and the fight started. The cry of "Fight! Fight!" went through the street and spectators came from every direction. County officials and clerks dropped their work and piled out into the street to watch what by then had become a battle royal. The fight raged back and forth and lasted for some time before the battlers, sweating and panting, stopped apparently by mutual consent, climbed aboard their horses and rode off in the direction of Custer.

The county men went back to their offices to be greeted by empty desks and shelves. Not a book or a record was left, even the small primitive safe with all of the county cash was gone. Rushing to the back door they saw the tailgate of a farm wagon disappearing rapidly around a bend of the road and a group of horsemen following it as a rearguard.

Custer is still the county seat of Custer County.

L.A.P.

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CORRECTION

The editor's pencil missed a beat in giving the date of the July trip with the Salem Society as July 1. The correct date is July 15th.

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LAHEE - NEW EDITION

Our old friend, Lahee's Field Geology, is with us again in a new and revised edition, the fifth, bringing us up to date with the latest advances in geological research and practice. Lahee's book is so well known through the years that it has been considered a standard work for geologists that a review is hardly necessary. McGraw-Hill Book Co., Price $9.50.

CENTRAL OREGON FIELD TRIP - MAY 12 and 13, 1956

By

R. F. Wilbur

Map by Dr. Francis G. Gilchrist

Cove Palisades State Park, 800 feet below the rim of the Crooked River Gorge in Jefferson County, Central Oregon, provided the camp site for the first GSOC overnight trip of the season. Caretaker Lewis Hope had reserved for us a newly developed section - in the grassy orchard of the old homestead originally occupying the narrow bench close to stream level. By early afternoon of the 12th "claims" had been staked and canvas up. In an assembly called by the Trip Committee, geological features as viewed from the camp site were noted and explained.

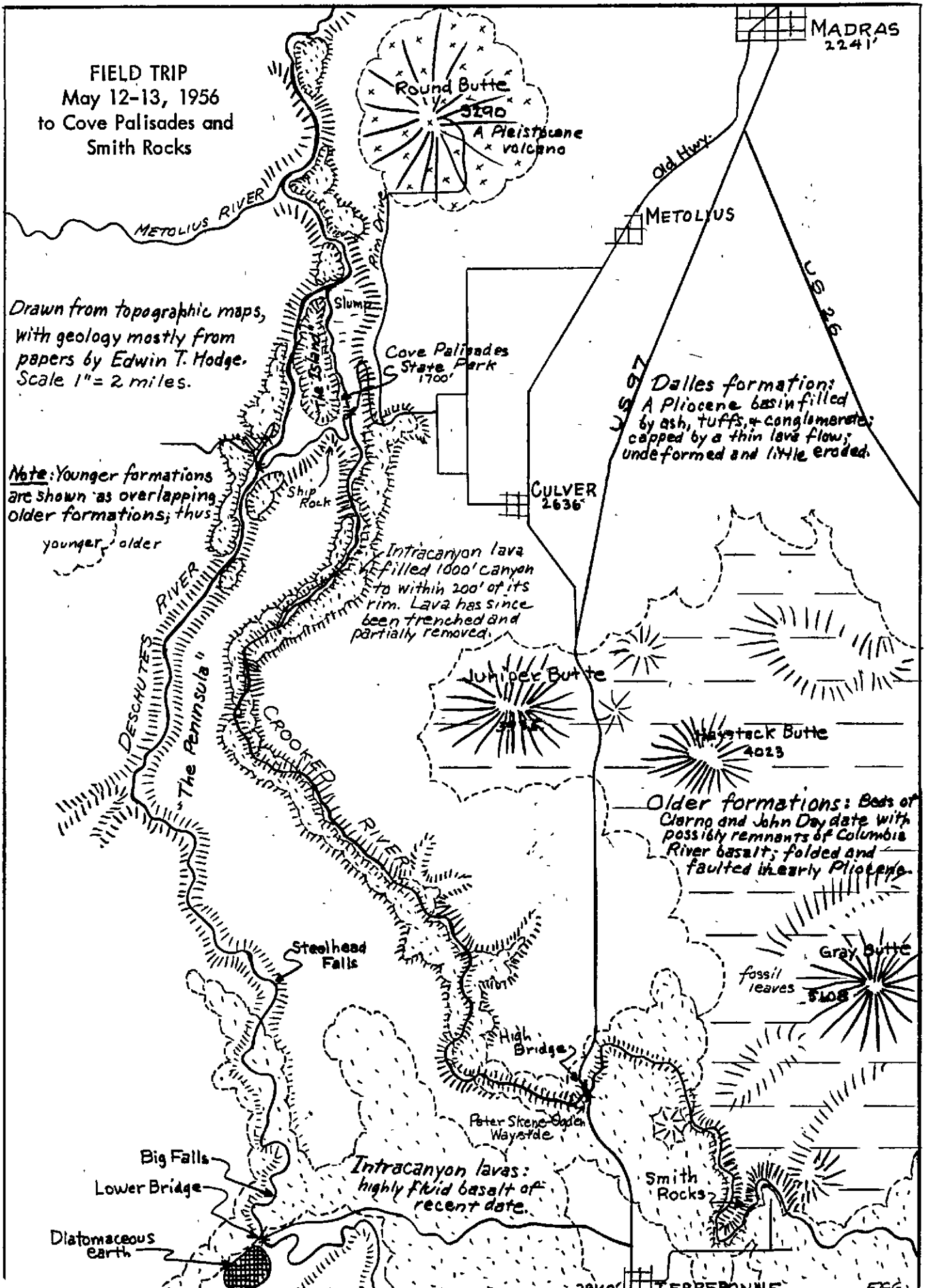
The east wall of the gorge down which we had traveled on a steep grade shows in nearly horizontal bedding the extremely variable composition of the "Dalles" (or "Deschutes") formation, thought to be of late Pliocene or early Pleistocene age. Sedimentary deposits of sand, gravel, silt, and volcanic detritus had been laid down by the ancestral Deschutes and Crooked rivers, flowing in wide and "braided" courses described as similar to those of the Platte River in Nebraska. Falling ash and pumice were also deposited, together with an occasional thin sheet of basalt flowing from nearby cones and fissures. The rimrock capping the formation at this point is of basalt that had flowed from Round Butte, a few miles to the north.

At the top of the grade there appears prominently the diagonal line of contact of the east wall of the original Crooked River canyon with the Pleistocene intracanyon flow of lava which nearly filled it to the rim. This flow is thought to have originated in vents or fissures somewhere south of the Smith Rock area which is about 15 miles southeast from our camp.

The west wall of the gorge, across the river from camp, is of this same intracanyon flow; a remnant listed as "The Island" on the maps. Upstream it terminates at a gap separating it from "The Peninsula" of Dalles deposits with Ship Rock overlooking the gap. "The Island" extends a few miles downstream to the confluence of Crooked and Deschutes rivers. Of columnar basalt indicating slow cooling, it shows spectacular distortion of the columns in certain areas, bending nearly to horizontal position. "Old Man River" at this point is showing a very human trait. Having cut a gorge from 350 feet in depth near Smith Rock to 1000 feet at its confluence with the Deschutes River it had the job to do all over again when the intracanyon flow nearly obliterated its good work. Now it is taking life easier in the vicinity of Cove Park by veering off to the right and cutting its way into the softer strata of the Dalles formation, causing some slumping on the right bank.

Mr. and Mrs. John Carter of Bend led the afternoon trip to a fossil leaf-bed location on the west slope of Gray Butte about 8 miles southeast from Culver. This outcropping is thought to be of "Bridge Creek" late Oligocene age. Limited time did not permit of extensive digging, but fragmentary specimens of bark, stem, and leaf prints were found. One leaf print has since been determined as apparently Platanophyllum angustiloba, akin to our present-day sycamore, by our member Jack Wolfe. Jack will be returning to Harvard as a senior in paleobotany in the fall.

An apple-log campfire in sage and juniper country! Thanks again to Caretaker Lewis Hope--this was the novel setting for the evening pow wow in camp. W. E. Wieprecht, District Supervisor of State Parks, himself a "rockhound" from Bend, was commended for his part in development of


FIELD TRIP
May 12-13, 1956
to Cove Palisades and
Smith Rocks
Drawn from topographic maps, with geology mostly from papers by Edwin T. Hodge. Scale 1" = 2 miles.
Note: Younger formations are shown as overlapping older formations; thus
younger
older
MADRAS
2241'
Round Butte
3290
A Pleistocene volcano
Old Hwy.
METOLIUS
METOLIUS RIVER
Rim Drive
Slump
Cove Palisades State Park
1700'
US 26
US 97
Dalles formation: A Pliocene basin filled by ash, tuffs, & conglomerate; capped by a thin lava flow; undeformed and little eroded.
Ship Rock
CULVER
2636'
Intracanyon lava filled 1000' canyon to within 200' of its rim. Lava has since been trenched and partially removed.
DESCHUTES RIVER
"The Peninsula"
CROOKED RIVER
Juniper Butte
3942
Haystack Butte
4023
Older formations: Beds of Clarno and John Day date with possibly remnants of Columbia River basalt; folded and faulted in early Pliocene.
Steelhead Falls
Gray Butte
fossil leaves
5108
High Bridge
Peter Skene Ogden Wayside
Big Falls
Lower Bridge
Intracanyon lavas: highly fluid basalt of recent date.
Smith Rocks
Diatomaceous earth
TERREBONNE

eastern Oregon camp sites. Historical highlights and geological features of points of interest we would visit on the weekend trip were given by Phil Brogan of Bend. As one of our Trip Committeemen, Phil had spent much time in scouting the area in preparation for it.

Ewart Baldwin, our member on the geological staff of the University at Eugene, told of the evolution of the area since it was lowered in the form of a deep basin by a down warping of underlying basalt topped with tuffs of probable Clarno (Eocene) age. Approximately 1000 feet of Clarno tuffs are topped with andesitic flows from the vicinity of what is now the Cascade Range. These in turn are topped with about 150 feet of basalt from unknown sources but thought to be from buried fissures in the Deschutes valley. Next come the approximate 1000 feet of Dalles deposits to complete the picture, in cross section, of the area to be traversed on this trip.

Sunday the 13th proved to be a heyday for the photographers. From the point of assembly on the rimrock at the top of the grade overlooking Cove Park the snow-capped Cascades loomed up in all their glory. Phil Brogan took over as trip leader and called attention to the main features to be seen from this point. Upstream in the immediate foreground is a narrow bench of irrigated crop land on the same remnant of intracanyon lava so conspicuous from our camp site. Another such bench could be seen in the distance.

On the new Rim Drive terminating atop Round Butte about 5 miles to the north we stopped at three more such observation points. In turn they afford excellent views of "The Island," the slump area at the base of the cliff, the confluence of Crooked and Deschutes rivers, another bench of intracanyon lava downstream, and the Metolius River canyon where it joins that of the Deschutes.

From the 3290-foot elevation of Round Butte there is a splendid panoramic view of the irrigation project under the high-line ditch tapping the Crooked River in the Smith Rock area. We were reminded of the immensity of that other flow - of the lava that entered Crooked River gorge at about the same point, flowed up the Deschutes canyon 4½ miles, up the Metolius canyon 2 miles, and is thought to have flowed another 10 miles down the Deschutes beyond the mouth of Metolius River!

Twenty-five cars were counted as the caravan left Round Butte for the "lunch stop" in Peter Skene Ogden State Park at the high bridge over Crooked River. The gorge at this point is 306 feet deep and in intracanyon lava in the vicinity of the bridge although a section of the ancestral gorge in Dalles formation protrudes above it a short distance upstream.

Several miles west from Terrebonne, at Tetherow Butte, we examined a volcanic-cinder deposit being quarried for the splendid road-surfacing used in that area. A pronounced curvature of the strata at one end of the cut was the object of much discussion as to probable cause. The possibility was mentioned of it's being an aeolian deposit from strong west winds. Jagged mounds of scoriaceous lava encountered in quarrying yielded "good pickin's" of fluorescent hyalite opal. Locally these beads of opal are known as "Terrebonne diamonds."

On the Deschutes River a few miles west of Tetherow Butte the diatomite quarry of the Great Lakes Corporation was visited. Their product, under the trade name of "Dicalite", is from a deposit of about 40 feet in depth extending over several hundred acres. This material is composed of the siliceous skeletons (tests) of microscopic algae known as diatoms. Living only in clear water free of sand, silt, or other foreign matter they are thought to have thrived

in shallow spring-fed lakes formed by lava dams occurring in the Dalles formation. Dicalite is used extensively for abrasives and refractories.

The last stop on the trip was for a close-up view of Smith Rock, tilted flows of Columbia River lava, the horizontal intracanyon flows, and the deposits that formed behind them as they dammed Crooked River. Smith Rock and adjacent jagged ridges were described as apparently of Oligocene sediments with rhyolitic intrusions. In the early stage of sunset they put on a real show for the photographers; one of whom was seen to "race for cover" after standing on an ant hill!

Participants in this weekend trip are greatly appreciative of the "ground work" done by the Trip Committee in preparation for it. It has been an event long to be remembered.

* * * * *

I am greatly indebted to the following for information aiding in preparation of this account of our trip: Ewart M. Baldwin, Phil F. Brogan, Dr. Francis Gilchrist, and a treatise on Geology and Water Resources of the Middle Deschutes River Basin, by Harold T. Stearns.

(Following the talk by Jack Wolfe at the Library on June 22 we saw a number of very interesting pictures of this trip taken by different members of the Society. Ed.)

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LUNCHEON TALK

THE CHAMBERED NAUTILUS. Mrs. Emily Moltzner - June 21, 1956. Quoting Herbert B. Schenck, an authority on cephalopods in the Pacific Northwest, "Thirty-eight species or varieties of the genus Aturia have been named from marine formations ranging in age from Upper Cretaceous to Lower Pliocene, but on the Pacific Coast specimens have not been found in rocks younger than Mid Miocene and only one individual in the Cretaceous."

The chambered nautilus is in a class by itself, not only for the beauty of its dynamic symmetry but also biologically. It belongs to the most highly organized group of mollusks - the nautiluses, cuttlefishes, squids, and octopuses. These animals, in contrast to other mollusks, have large bodies, well-developed eyes, and a circle of arms (tentacles), often with sucker discs, arising from their heads. A particular specimen (illustrated) is a member of the octopus family. It is most commonly found in the deep waters of the Pacific. The nautilus is an animal with an ancient lineage revealed by 2,000 fossil species; yet today only three living species survive. The nautilus animal occupies only the largest outer chamber of its shell. It protrudes from this to swim about and to catch crabs and other animals with its tenacles. For protection it withdraws completely within its shell. The wirelike tube running through the middle, all the way from the apex to the last chamber is called a siphuncle. As the baby nautilus grows, it builds its spiral with mathematical precision and, as it moves outward, leaves vacant chambers sealed with water-tight partitions. According to one theory, the siphuncle enables the animal to control the gas pressure of these empty chambers and thus give its shell buoyancy to become a vehicle of transportation. The age of the shell is unknown. The chambers do not bear any relationship to the years. One of the largest perfect specimens of the chambered nautilus ever found measures about 11 inches across.

The talk was made more clear by the circulation of the July 1949 National Geographic with colored illustrations, not only of the chambered nautilus but other shells, and closed with an impressive reading of Oliver Wendell Holmes' well-known poem.

L.A.P.

DEVELOPMENT OF THE CONIFEROUS FOREST IN THE NORTHWEST

By
Jack Wolfe

Talk at Public Library, June 22, 1956

Compared to other regions of the United States, comparatively little has been written concerning the development of the modern flora. Axelrod has written extensively on the derivation of the desert and chaparral vegetation of the southwestern United States, and Lucy Braun has been occupied with the derivation of the mixed mesophytic forest of southeastern United States from the Arcto-Tertiary flora. Yet, outside of a very few papers of a highly theoretical nature, we know little of the history of the forest which clothes the Pacific Northwest, nor do we know the factors which have caused this type of vegetation.

One of the theoretical papers mentioned above brings forth a series of interesting comparisons. Kuchler points out that there are three other areas of the world which have a similar climate to the Northwest, the so-called west-coast marine climate. In each of these three areas, West New Zealand, West Chile, and West France, the forest is dominated by broad-leafed trees. In France it is the beech, Fagus, which is most common, while in Chile and New Zealand, it is the relative and southern hemisphere counterpart of the beech, Nothofagus, which dominates the landscape. Why, then, should the Northwest be the only area which supports a coniferous evergreen vegetation? Kuchler further believes that the assumption of a summer-wet climate during the Tertiary is without foundation, and that much the same regime of precipitation prevailed in the middle and late Tertiary as today. Thus, Kuchler feels that there are two factors which may be responsible, either one or both: (1) glaciation, and (2) a gigantic struggle between the beech and the conifers, leading to the extinction of the former. He suggests that an experiment on a large-scale might decide the question in favor of the latter explanation.

Our discussion this evening will be concerned with the derivation of the Northwest coniferous forest from the Tertiary vegetation. Was there actually a summer-wet climate during the Tertiary? Were the beeches losers in a titanic struggle with the conifers? Or was the glaciation responsible for the somewhat depauperate forest?

We will begin our search for answers to these questions in the John Day Basin. The first record which the angiosperms left in Oregon is in the massive breccias and tuffs of the Clarno formation. Here is found vegetation unlike anything with which we are familiar. A warm-temperate to subtropical forest of broad-leafed evergreens. Certainly this type of a forest did not give birth to the present-day vegetation. And, the other subtropical floras, such as the Comstock and Goshen, may also be passed over as possible ancestors. With the Middle Oligocene came the arrival of the first temperate vegetation, but it was not until the Upper Oligocene that the climate was such that truly temperate plants became dominant. Yet, along the coast still grew some of the subtropical plants that were more resistant to the colder climate. In such floras as the Rujada, Cascadia, and Sweet Home, we find a sprinkling of legumes and laurels, more characteristic of the older, warmer floras. In the John Day country the shales of the lower member of the John Day series contains abundant plant remains of a temperate vegetation not unlike that of central China. Here, for the first time, we also see some broad-leafed trees which have managed to survive to the present day: the service berry, alder, dogwood, and the big-leafed maple and box elder. But, the conifer which dominated the landscape was Metasequoia, the dawn redwood now found only in China.

On Upper Thomas Creek is found a flora similar to the Bridge Creek, dominated by conifers which belong to the Asiatic element. During the Oligo-Miocene times, there existed a pre-Cascade highland, on which grew plants of a somewhat more temperate character. The composition of this vegetation is known from a flora found on the Collawash River. This vegetation was restricted to the highest slopes, for not too far from this locality grew a flora which contains subtropical laurels. However, in the Collawash flora are found many plants which still grow in the Northwest today: poplars, aspen, willows, alder, oaks, service berry, birch-leaf mountain mahogany, maples, madrone, huckleberry, rhododendron, and others. Still, except for the yellow and white pines, the coast redwood, and hemlock, the conifers are characteristic of regions which have warm summer rains, rather than winter rains. Yet, it should be noted that in more upland floras, the western conifers become more abundant. Perhaps the disparity of the record of these conifers may be due to the lack of upland deposits, since generally these deposits are local in extent and easily eroded. It may well be that the small occurrence of such plants as hemlock, fir, douglas fir, and larch in lowland floras indicates that these plants were abundant in the lowlands.

The Mascall flora and associated floras of central and eastern Oregon represent vegetation similar to the Collawash. It is apparent that in the uplands bordering the Mascall deposits there were western conifers.

The Pliocene floras east of the Cascades show a forest not unlike that growing in the great basin where the rainfall is slightly higher, that is in the mountains. The western element in these floras is dominant, in contrast to the exotic elements in the older floras. This increasing resemblance to the vegetation of the present-day flora was brought about by the rise of the Cascades, which dropped the precipitation below the critical minimum for many of the more exotic plants.

However, west of the Cascades, the story is completely different. At the time when the western plants were finally achieving dominance, species characteristic of the forests of eastern Asia and eastern United States, where warm, summer rains prevail, were still abundant. Unfortunately, we know nothing of the vegetation west of the Cascades after the deposition of the Lower Pliocene Troutdale. However, there is no reason to believe that the vegetation was not similar to that of the Troutdale throughout the rest of the Pliocene, since even today many of the members of the Troutdale flora are successful upon introduction. I would like to point out that the last occurrence of the beech was in the Upper Miocene Mascall, and it is not found in the Troutdale. Perhaps the extinction of the beech might be due to disease, but this is, of course, only a suggestion. It was obviously not due to competition with the conifers.

The next record of the vegetation is in deposits considered to represent the third, and we hope, last interglacial, found in the Puget Sound region. Here, the western conifers have assumed complete dominance, suggesting that the extinction of the majority of the broad-leafed angiosperms was due to the unfavorable climate of the Pleistocene. In the eastern United States, the Arcto-Tertiary forest retreated before the on-coming glaciers, and is now re-invading its former territory. But, where was the Arcto-Tertiary forest of the western United States to go? By the Pleistocene, this type of flora was extinct east of the Cascades, and west of the mountains, the way of migration was blocked for lowland species by the intervening Klamath Mountains. Some of the hardier angiosperms were able to survive, but most of them are no longer native of this area. Those which were of a more cold, tolerant character, such as the maples, alders, willows, and poplars, have survived and flourish today. The conifers which were once restricted to the uplands by competition with the angiosperms now found their competitors gone, and were

thus able to invade the niches left vacant. Some of the species were damaged genetically, so that today they have small distributions compared to their former ranges. Such are the coast redwood, which as late as 8,000 years ago was a native of British Columbia, or the Port Orford cedar, which extended to the Rockies in the Oligocene, and as late as the lower Pliocene grew in the vicinity of Portland.

The glaciation thus reduced our flora to a mere shadow of its former self. In Europe, the glaciation had similar effects, while in eastern North America, many species escaped extinction by migration to Mexico. The botanists speak of the flora of Europe (and also of western North America) in tens of species, that of eastern North America in hundreds, and that of eastern Asia in thousands.

However, the glaciation, or rather the effect of nearby ice sheets, may not be the only reason for extinction. We know almost certainly that during the Tertiary warm, summer rains prevailed. Yet today we have a climate of winter rains. Some of the species which now are restricted to climates of warm summer rains once grew here, and might grow here again if the climate were suitable. What the effect of an ice sheet covering 30 percent of the land surface of the world would do to the Tertiary system of ocean currents and wind belts is difficult to say, yet it seems to have changed the entire climatic regime of the western United States. So the answer to our previous question concerning the reason for the present vegetation is in part answered.

Yet, the picture is not complete. Only a thorough study of all interglacial deposits and the late Pliocene formations west of the Cascades will complete the picture, and thus give us the finished story of the development of the western coniferous forest.

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FIELD TRIP IN THE AREA SOUTHWEST OF PORTLAND, APRIL 15, 1956

By

T. Herbert Laurence

April's field trip was essentially a continuation of that of March 25, 1956, which was taken through the Portland west hills where a study was made of the late Pleistocene flood depositional and erosional features. We were given to understand on that trip that the area we were studying today, the Tualatin Basin, is a syncline covered largely by sands and gravels, although in places Boring lavas, from local volcanoes, are also present.

We began this Sunday's study just off the playground of the Riverdale School. A large plutonic (granite) erratic was examined by the group. It is believed that this erratic and others were borne by icebergs which came down with the flood from the upper Columbia basin. A fresh fracture of a broken piece showed it was porphyritic texture with large feldspar phenocrysts. From here the group went to Oswego where we studied a different kind of flood deposit in an excavation for a service station. The deposit consisted of sediments that range from fine silt on top to coarse gravels on the bottom. Other basement excavations have shown that silt and sand depositions are widespread throughout the City of Oswego.

Beyond Oswego a short ways, Dr. Stauffer explained to us an erosional feature of the flood, a depression with a small pond in it; but it is not considered a part of Lake Oswego,

because only a narrow passage connects them. It is thought to be a plunge basin of the flood waters as they surged across what is now Oswego golf course and plunged downward near Diamond Head. It was also pointed out that the old Oswego iron mine may be seen close by Diamond Head. Next, Dr. Stauffer showed us how opal veins had formed in a basaltic Boring lava flow. It apparently was the uppermost part of the flow, as it was very vesicular in structure. However, it was not amygdaloidal in any place, but a fresh fracture showed it had a highly inflated texture.

Beyond Lake Grove and southwesterly toward Cipole we were shown flood deposits in sand and gravel pits. From them we learned how the flood came from the east and with very great force. This was evident from the west and southwest sloping of the torrential bedding planes of the sand and gravel, the numerous fragments of limonite and opal, and the presence of quartzite pebbles. In addition there were also a great many huge basalt and breccia boulders and a few erratics in and around the pits. In other places, especially that north of Peach Cove, the erosional features of the flood could be seen in the scabland appearance of the topography. Here it was noted that scrub oak was growing in very thin soil, and that the soil was entirely stripped off in other places. We learned how the surging flood waters had removed the soil and also many large rocks from this area. Later these flood waters deposited them in what was then the channel of the Willamette River to such extent that they blocked the channel. This caused the river to cut a new course around them in the shape of a horseshoe bend. That bend is nowreferred to as Peach Cove.

At the last place where we stopped was a flood deposit that was not known until they built the Wilsonville bridge on the Portland Expressway. The flood deposit here is similar to what we saw in the other pits, although there are not any fragments of limonite and quartzite pebbles. However, there are some erratics. Hence, when one realizes how far removed this place is and the very great quantity of sediments which have been transported, he can visualize how immense this flood must have been.

(In connection with with Mr. Laurence's interesting paper it is suggested that the reader consult the maps accompanying Dr. Stauffer's paper in the March News Letter. Ed.)

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MEMBERS AND FRIENDS OF G.S.O.C.

Miss Jessie G. Neikirk died June 12 and was buried June 13. She was born in Central City, Colorado. She moved to Portland after her retirement from the Seattle School system in 1940. She joined the Geological Society of the Oregon Country soon thereafter, and remained on our membership list until 1954. She was 84 years old when she passed away.

* * * * *

Bend -- The Oregon Newspaper Publishers Association closed its annual convention Saturday, June 16. The Amos Voorhies award, presented for outstanding accomplishment, went to Phil Brogan, associate editor of the Bend Bulletin, who is widely known for his writings on geology and astronomy. Robert W. Sawyer, former publisher of the Bulletin and a former winner of the award, made the presentation. (Oregon Journal, June 17, 1956.)

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GEOLOGICAL NEWS LETTER

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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Society Objectives

To provide facilities for members of the Society to study geology, particularly the geology of the Oregon Country; the establishment and maintenance of a library and museum of geological works, maps, and specimens; the encouragement of geological study among amateurs; the support and promotion of geologic investigation in the Oregon Country; the designation, preservation, and interpretation of important geological features of the Oregon Country; the development of the mental capacities of its members in the study of geology; and the promotion of better acquaintance and closer association among those engaged in the above objectives.

Persons desiring to become members should contact the Membership Chairman, Mrs. Ruth Harrison, 1879 S.W. 10th Avenue, Phone CA 3-0255. Regular annual dues (single or family memberships) are $5 for residents of Multnomah and adjacent counties; $2.50 for others; and $2 for Junior Members. Make remittances payable to the GEOLOGICAL SOCIETY OF THE OREGON COUNTRY.

(Society Activities)

(See "Calendar of the Month")

Evening Meetings: Formal lectures or informal round-table discussions on geological subjects, on the second and fourth Fridays of each month at Public Library Hall, S.W. 10th Ave. and Yamhill.

Field Trips: Usually one field trip is scheduled for each month.

Library Night: Once a month. Lewis and Clark College.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.00 per plate.

Publication: The Geological News Letter, issued once each month, is the official publication.

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CALENDAR

August is vacation month for many of us. The only GSOC events will be the Annual Picnic on August 10th and the field trip to Cloud Cap Inn on August 19th. Friday-night meetings will resume on September 14th, luncheons on September 6th, and library nights at Lewis and Clark College on September 20th. It may be the middle of November before we can be accommodated again at the Public Library for our Friday-night meetings.

Friday Aug.10 — ANNUAL PICNIC - Little Volcano in Mount Tabor Park. 6:30 P.M. The rumbles of the forthcoming eruption are growing louder. Get set for another evening of food and frolic. (You supply your own food except coffee; be sure to bring your plate, cup, and silver) . Ray Baldwin is in charge and has a fine program in prospect. This is always one of the highlights of the GSOC year.

Sunday Aug.19 — FIELD TRIP to Cloud Cap Inn and Cooper's Spur on north side of Mount Hood. Meet at 8:30 A.M. in front of the service station at west entrance to Hood River on Highway 30. Leave at 8:45. At 9:30 we stop to see the Parkdale lava formations. At 10:30 we leave for Cloud Cap where we have lunch upon arrival. A two-hour hike up Cooper Spur will start at 12:30, then back to Cloud Cap, from which we will depart for Portland about 4:30. Required are lunch, heavy shoes suitable for walking on ice, dark glasses, head covering, and sunburn lotion. For those who are interested in a two-day trip into this area the Tillie Jane Forest Camp, on the Cloud Cap road, has adequate facilities. Round trip, about 200 miles.

P.S. - Don't forget your camera. Trip Leader, Franklin Brown.

Sat.-Mon. Sept. 1-3 — LABOR DAY FIELD TRIP. There will be a three-day field trip over Labor Day to the Coos Bay-Cape Arago area. Members will meet on Saturday, September 1st, at the Marine Biological Station at the west end of the bridge at Charleston. Turn right (north) about 200 yards at bridge end. Camp will be in buildings of Station at cost of $1.25 per night. Bring bedding and subsistence.

Trip leader on Sunday will be Dr. Stauffer.

Distance round trip, about 500 to 550 miles from Portland. Coast route most direct, about 6 hours each way. Bring camera and colored film.

Friday Sept.14 — REGULAR MEETING. Journal Building Auditorium, 7:30 p.m. Ed and May Bushby will bring us the story by word and colored slide of their trip through the Colorado Plateau parks.

Tuesday Sept. 20 — Library Night resumes at Lewis and Clark College, 7:30 to 10:00 p.m.

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OATFIELD RIDGE

Through the efforts of Ed Kelham a petition has been drawn up and signed by several residents of the vicinity requesting that this landmark, which Ed described in a luncheon talk on May 10, 1956, be officially designated as above. The petition was forwarded to Phil Brogan, Chairman of the Oregon Geographic Board, who has promised to take the necessary steps to have such designation approved by the U.S. Board of Geographical Names.

Word was received from Mr. Brogan on July 31 that the Oregon Board has approved the name and has forwarded a recommendation to the U.S. Board of Geographical Names.

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MCKAY RESERVOIR FAUNA DESCRIBED

Fossil bones from the famous locality at McKay Reservoir near Pendleton in Umatilla County are described by Dr. J. Arnold Shotwell in an article entitled "Hemphillian mammalian assemblage from northeastern Oregon," appearing in the June 1956 issue of the Geological Society of America Bulletin.

The fossils were discovered in 1949 in sediments exposed by wave erosion on the east bank of the Reservoir. Since that time many specimens have been collected. They include more than 25 species of mammals, several kinds of birds, reptiles, and amphibians. Among the mammals are rodents, wild dogs and cats, horses, rhinos, and camels; a number of genera and species are new. The entire assemblage is similar to certain faunas (Hemphillian) of middle Pliocene age occurring in North America, Europe, and northern China. Of these faunas the one at McKay Reservoir is the nearest to the Eurasian-North American land bridge and shows that at the time these animals lived there was considerable migration and interchange particularly among the carnivores.

MLS

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MEMBERS AND FRIENDS OF GSOC

We are pleased to announce the marriage of our member, Miss Averill Dryden, to Mr. Egner Olsen on June 30th. After a honeymoon trip to Vancouver Island they will make their home at 931 N.W. 20th Avenue, Portland 9.

We wonder if there is any parallel between the romance of the Olsens and that of the Herbert Hoovers. Mrs. Hoover (then Miss Henry) met Herbert on a geology field trip, with romantic results.

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LUNCHEON TALK

BYWAYS CAN BE FUN - Howard Rose - June 14, 1956. This was an account of a trip down the Truckee River, the river that flows from lake to lake, rising in Lake Tahoe and discharging into Pyramid Lake. Ancient shorelines and deltas, visible at much higher levels than that of the present lake were described. There are great numbers of an odd fish, known locally as "qui" (pronounced kwee) many of which are caught by the many white pelicans as they enter the Truckee on their upstream spawning run. There are also large rainbow trout in the lake, some of them of 20 pounds or more.

The Indians catch the qui by snagging, that is using several hooks on one line, and this caused some lively round-table discussion as to the legality of such tackle. (The Indians are accorded special treatment in matters of fishing and hunting, both as to seasons and limits, so this probably extends to other restrictions, such as kinds of tackle. (Ed.)

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ANTARCTICA

By

Leroy A. Palmer

The following is abstracted from two articles in The Mining Journal, (London, England) supplemented by some encyclopedic research. As the writer has never done any field work in either Antarctica or Gondwanaland he disclaims responsibility for any errors - commission or omission - that may be noted.

When the famous Norwegian explorer, Roald Amundsen, reached the South Pole in 1911 it was regarded as scarcely more than an interesting geographical exploit. The vast immensity of the land he had penetrated or its importance were not appreciated nor was it expected that further exploration on a large scale would be justified from an economic standpoint. Events following World War I, particularly the development of long distance flying, have changed that attitude and brought a realization of the importance of this continent of 6,000,000 square miles, greater than the United States plus all of Europe.

On the economic side there are many features. The South Pole route offers the shortest flight between many thickly populated areas of the Southern Hemisphere just as the North Pole route does for the Northern. The most valuable whale fisheries remaining in the world are in these waters and meteorological investigations are proving of value in forecasting world weather. Its strategic value as a base is recognized by military authorities.

No doubt the most interesting possibilities are in the great mineral wealth which is undoubtedly concealed under the polar ice cap and snow that blankets the entire region except where an occasional mountain rises to sufficient height to project above them. It is estimated that not more than one percent of the entire area is exposed rock. The immaturity of the exploration is indicated by the fact that it was only a year and a half ago that discovery was made of a mountain range at least 100 miles long with peaks rising to 10,000 feet and largely free of ice covering.

We shall know more about these things after the International Geophysical Year of 1957-1958 which will draw teams of scientists to Antarctica from at least thirteen countries. Meanwhile studies have been carried on of scattered rock exposures on the mainland and adjacent islands and also of morainic debris recovered from glaciers and icebergs and the information thus gained has been correlated so that it is possible to piece together a series that gives a tentative idea of the geologic column. The mineral deposits must remain a matter of conjecture with perhaps one exception, a deposit of coal that has been found within 300 miles of the pole.

As it is not practical to accompany this article with a map on sufficient scale to be intelligible it may seem futile to refer to place names but this has been done in case any reader should be sufficiently interested to follow through on a competent map.

Geological formations

From a geological standpoint Antarctica may be divided into two parts. The smaller of these, about one fourth of the whole, seems to be definitely related to the western part of South America, an extension of the Andean chain which shows eruptive rocks similar to those of the Andes and is the most striking scenic feature of the continent. If we line up the general trend of the Palmer Peninsula with the southerly tip of Chile it will require little stretch of the imagination to accept this theory and among the more recent discoveries is a range of mountains extending on the same general trend for 1100 miles with peaks as high as 15,000 feet.

Referring to the other three-fourths of the continent, formations have been identified as late as the Miocene but the greater part of the area is underlaid by basal rocks; gneisses, schists, crystalline limestones, and quartzites, which on the basis of stratigraphic location and similarity to formations found farther north are assumed to be pre-Cambrian. Western Graham Land is composed of ancient crystalline rocks such as granites, greenstones, and syenites; and Cape Tuxen is a huge wall of green diorite, probably intrusive at a later age. A series of old rocks consisting of radiolarian cherts and greenish-gray slates is regarded, from its stratigraphic position, as Cambrian; and a series of slates and graywackes is assigned to the Silurian on the basis of similar fossiliferous beds in the South Orkney Islands.

The most widespread and important sedimentary formation is the "Beacon Sandstone," a series of interbedded sandstones and shales which occurs at least 2000 feet thick in Victoria Land and covers a large area. What is supposed to be the Beacon Sandstone is found with associated limestones in the vicinity of Beardmore Glacier and it is here that the only actual discovery of mineral has been made, a series of seven coal seams of an aggregate thickness of 25 feet. Plant fossils collected by Captain Robert Scott, the second man to reach the pole, indicate Carboniferous age and the conclusion has been drawn that in this age Antarctica had a mild and humid climate with sufficient vegetation to produce coal. As accounting for a climate favorable to the formation of coal it is suggested that through the Carboniferous the crust of the earth was warmed by either its own heat or that of the sun, but if by the latter the poles must have moved a few thousand miles since that time (see "Only a Stone's Throw," Geological News Letter, May 1956).

GEOLOGICAL COLUMN

AGE	CHARACTER	LOCALITY
Miocene	Limestone	Campbell Island
L. Miocene U. Oligocene	Limestone & sandstone	Adjacent islands
Cretaceous		Adjacent islands
Jurassic	Graywacke, shale (fossiliferous)	Hope Bay, adjacent islands
Permian Carboniferous	Beacon sandstone (coal)	Wide distribution
Silurian	Slate, graywacke	
Cambrian	Slates, cherts	
Pre-Cambrian	Crystalline, gneiss, schist, limestone, quartzite	Most widely distributed

Somewhen in this time that we have been discussing there was an immense intrusion of granite, or perhaps we should say intrusions as it appears in different phases, which is supposed to be post-Cambrian. In South Victoria Land the Beacon Sandstone is intruded by an immense diabase sill with a thickness in places as great as 1500 feet. Naturally the diabase must be post-Carboniferous and in the vicinity of Ferrar Glacier what is supposed to be the same sill is found with a thickness of 300 feet between two different types of the granite intrusive. This latter occurrence, which has been designated the McCardo Sill, has an areal extent equal to that of the British Isles.

The Jurassic is represented at Hope Bay in Graham Land by fossiliferous graywackes and slates and in many of the adjacent islands are ferns, conifers, and cycads of the Jurassic and

ammonites of the Cretaceous. At Seymore Island are upper Oligocene and lower Miocene sandstones and at Campbell Island is Miocene limestone. Perhaps the latter is somewhat far afield as it is in Latitude 53° and somewhat outside of the Antarctic zone proper. The Tertiary fossils collected have been of both land and marine origin.

Structural features

The most striking topographic feature is the chain of mountains which appears as a probable extension of the Andes and extends as far as the Ross Archipelago and the Belleny Islands, in which latter two there is still some volcanic activity. This activity is linked to a crustal weakness which resulted in a portion of the continent which occupied what is now the Ross Sea breaking off and sinking below the ocean. The largest active volcano is Mt. Erobus along this break.

The eruptive rocks of this chain belong to the same series as those of the Andes and one of the recent discoveries was an apparent extension traced from Latitude 86° to 71°, a length of 1100 miles, with peaks rising as high as 15,000 feet, in which eruptives cap horizontal beds of limestone and sandstone which overlie granite and gneiss.

The remaining three-fourths of the continent, that which is not considered as linked to South American orogeny, embraces the great Antarctic Plateau, shaped by great faults over very wide areas which occurred toward the close of the Miocene and were instrumental in shaping the coastline. Raised beaches give evidence of an emergence of land during the Quaternary and there are signs of a recent glacial period when the land surface on Graham Land was a thousand feet higher than it is now.

Resources

What that may eventually be of value to man exists under this vast waste of ice and snow? Obviously agricultural products, timber, and such resources are out but by comparing what we have learned of the geology with that of other localities that are better known we have every reason to believe that somewhere in this six-million square miles are vast mineral resources of which the world stands in need.

We have considered the probability that the mountains of Antarctica are an extension of the Andean chain, which in the days of the conquistadores yielded their treasures of gold and silver and now in the prosaic twentieth century are one of the important sources of the world's supply of copper, tin, and other useful metals. Is it not reasonable to assume in its course of 3,000 miles across Antarctica this mountain range will be similarly productive?

This considers one-fourth of the continent - what about the remaining three-fourths? Three-quarters of a century ago the theory was propounded that at one time the land surface of the earth was gathered into two supercontinents (again see "Only a Stone's Throw"). These extended generally easterly and westerly, the northerly one designated Laurasia and the southerly Gondwanaland. The latter included what is now the southern part of India, Africa south of the Atlas Mountains, South America east of the Andes and all of Australia. It would be natural to include Antarctica on the basis of location and such an assumption is supported by the nature and position of the crystalline rocks that form the basement complex of both areas and by the fact that some of the fossils of Antarctica are duplicated in rocks of South America, South Africa, India, and Australia. Of the above regions a great part is covered by tropical rain forests of Africa and South America and is still to a large extent unexplored but in those parts that have been developed are the gold mines of South Africa and

Australia, the diamond mines of Africa and Brazil, the copper of Rhodesia and the Belgian Congo, and a host of others, a total of 33 useful minerals, according to the late Sir Lewis Fermor in an address before the British Society of Mining and Metallurgy, in which he also named 12 minerals of which more than 50 percent of the total production came from this province. Of particular interest is ancient Gondwanaland as a source of the metals vital to nuclear energy, all of the monazite, zirconium, columbium-tantalum, 90 percent of the beryllium and 50 percent of the uranium coming from this ancient continent. We can only assume that if we could explore this six-million square miles of Gondwanaland we should find a treasure trove comparable to that proven to exist in the known portion.

Naturally the question arises, assuming this great mineral wealth is there under the ice and snow, what are we going to do about it? Frankly the writer doesn't know, but as we look back over the developments of the past century who can say that this vast treasure will remain inaccessible to man forever?

(Note: Graham Land, which does not appear on any of the American maps that the author has found, is the English name for Palmer Peninsula.)

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WHAT GEOLOGY MEANS TO ME

By

T. Herbert Laurence

Inasmuch as geology, in its broadest sense, has for its object several divisions of science from that of astronomy on the one hand to that of anthropology on the other, several answers could be mentioned, but in a short article of this kind it is quite impossible to give them all. Hence, the writer will just state the one that means the most to him; the physical geological and petrological provinces of the science.

Now as for the regular provinces of geology, they mean a great deal to the writer academically, recreationally, and, if you please, spiritually. Physical Geology is usually considered the study of the forms of the earth's surface, their structure, mode of origin, and the nature of the processes that have sculptured it and still are modifying it even now. Although these forms are seen all around us, it is the more picturesque ones that are generally given special notice. Those within access of public highways are commonly called scenery and are visited by thousands of tourists. However, the writer has grave doubts that the geology behind the scenery is truly appreciated. While the tourists look, most of them fail to visualize the geologic features and processes that made these forms.

However, enchanting as a crystal clear mountain lake, or the swift white water of a turbulent stream, or the precipitous cliffs of a gorge, or the grandeur of serrated mountain ridges, or the majesty of a solitary snow-capped peak towering skyward with its gleaming glaciers sparkling in the sun may be, the knowing, even in a very limited way, of what they are composed (being as they are essentially all rocks, the knowledge of petrology has a very great significance), how they originated, and how they were sculptured and how they still are being modified, is surely an academic achievement well worth acquiring whether a person is a professional geologist or not. What has been said of the scenery seen by the average tourist is greatly surpassed by what he seldom or never sees. This scenery, or forms of the earth's surface to be more correct scientifically, is largely seen and admired by those who

dare to venture and to him who dares to climb and hike for many rugged miles into what is popularly called, "Nature's wild and raw places." This is particularly so of our own High Cascades, especially those of northern Washington usually referred to as the "High Country." Here the breath-taking views, particularly those from a major snow peak, are no longer forms of the earth's surface in the shape of castellated crags and pinnacles. They become huge igneous masses that are vividly seen as being "born of fire" before your very eyes. To the writer, at least, this is a great deal of recreational pleasure.

The more stupendous of these will, if you will let them, RE-CREATE you by their, if you please, spiritual inspiration. They, as the Sierra Club's creed says,* are no longer simply inanimate objects of stone garnished by vegetation, but are places where one may experience a very moving understanding that can never be experienced anywhere else in the "Natural Scene." Our purposes become not to map and collect physical data, but rather to interpret with keen comprehension of the heart of Nature in terms of ecstatic inspiration.

*The Creed is not quoted verbatim, therefore, no quotation marks are used in repeating.

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URANIUM AND NICKEL
Motion Pictures
Public Library, July 13, 1956

This program was one of the best of its kind that has been presented to the Society. The pictures themselves were excellent and presented information that was technically correct in such a manner as to be grasped readily by the layman.

Some people have an idea that if a man wants a mine he just hunts around until he finds one and then starts digging out ore. The film on uranium showed the intensive and thorough research that must be carried on after favorable indications are found in order to be sure that there is an ore body that justifies mining. The film on nickel showed the extensive and costly development work that must be done after the ore body is proven to open up a mine for sustained production.

The uranium film illustrated the activities of the Moab Drilling Company which operates principally in the Colorado Plateau area on potential uranium deposits. When a locality is found that appears to justify exploration the first thing in this rugged country is to make it accessible. We saw the engineers making the road surveys and the bulldozers gouging out the roads over which the diamond drills would be brought into the drilling sites.

The drill rig is self contained, the mast being mounted on the truck that carries the drill and power plant so that it can be set up in a minimum of time. The drill bit is annular, faced with industrial diamonds, or "bortz." Thus when the bit is revolved it cuts out a circle of rock, leaving a solid core which passes through the bit as the latter advances and into the core barrel. The cuttings, the ground-up rock, are blown out of the hole by compressed air and, as it is desired to have a complete record of the formation, samples are taken at 5-foot intervals for analysis.

Cores are removed every 20 feet, carefully logged, and placed in order in core boxes. At the laboratory the core is split, one half to be retained permanently and the other half to be checked with a Geiger counter and the live spots analyzed. If a hole shows encouraging indications it is probed by lowering a Geiger counter in it and recording the reactions at various depths. All of this information is correlated and considered from all angles and a conclusion reached as to whether the extent and value of the deposit is such as to justify the expense of equipping and mining.

The film on nickel showed operations of the International Nickel Company at Sudbury, Ontario, which produces about 80 percent of the nickel used in the free world. There was a brief showing of the early history of the deposit, its surroundings and the first development work, emphasizing the obstacles of working in what was then a wilderness.

By diagrams we saw a vein encased in barren rock and learned the difference between hanging wall and footwall. Then a shaft, ultimately to reach a depth of thousands of feet, was sunk in the barren rock of the footwall and, as depth was attained, tunnellike openings (crosscuts) were driven from the shaft to the vein at regular intervals of depth. When a crosscut reaches the vein it is turned so as to follow it but now, as it follows the vein, it becomes a "drift." At intervals along the drift "raises" are driven upward in the ore and at certain heights drifts are carried from one raise to another. In this way ore is made available for extraction and the mine manager knows how much is available and, by sampling and assaying, its value. These preliminary operations also yield information as to the physical characteristics of the ore body, on which will depend the choice of the particular system of mining best adapted to its recovery.

International Nickel Company is not a single operation but a half dozen or so different mines, each of which has its individual peculiarities and its own problems in mining and processing several tons of ore each day. We saw several scenes underground showing the different methods of mining and transporting the ore and some thrilling scenes of blasting, then back to the surface and the plants where the ore is processed for the final extraction of the nickel in marketable form.

Viewing these films we were impressed that finding and developing a mine is not a haphazard process but a highly complicated enterprise calling for plenty of brains and lots of money.

L.A.P.

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LUNCHEON TALKS

LOCAL WATER CONDITIONS IN NEW JERSEY - Ray Baldwin - July 5, 1956. This was largely a talk about water conditions on the "old home place" of the Baldwin family in Northern New Jersey. As a preliminary, we were given some general information about topography and water supply, notably a range of hills, 400 to 600 feet high, that traverses the state in a northeasterly-southwesterly direction and the changes brought about by diversions of the major streams for municipal and recreational purposes.

The Baldwin property was fortunately endowed from the standpoint of water with five wells and four springs. A drilled well went through decomposed rock for 4 feet and then entered firm rock in which it was carried to a depth of 60 feet. Under pump it showed a drawdown of only 16 inches, which it recovered immediately after pumping stopped. This well never went dry and at times served as a water supply for as many as a dozen families in the neighborhood. (Note: Your Editor knows what a boon a good well can be to a small community. His first experience with a domestic water supply was a dug well with an old oaken bucket in a country town in Illinois to which the neighbors came from blocks around in seasons of drouth.)

ATOLLS and BARRIER REEFS - Robert F. Wilbur - July 12, 1956. The atolls of the Pacific first received attention from a German naturalist after an 1815-1818 expedition. This man, Chamisso, advanced the "fairy ring theory" and reasoned that the coral mass grew upward from a central point by feeding on nutriment contained in the sea water. However, as the mass grew, only the perimeter was washed by the food-bearing surf so that the

inner portion died from malnutrition while the outer portion continued to grow and expand and a lagoon formed in the inner. At that time the charting of the ocean was but little developed and the relation between depth of water and coral growth was not recognized.

In 1918 two French scientists, Quoy and Laimard, studying the same phenomena, established the fact that reef-forming coral grows only in shallow water. They formulated a theory, later agreed to by other scientists, that atolls marked the sites of extinct volcanic craters about which the coral started its growth when the water over the crater was shallow. This was plausible but did not explain the great barrier reefs that rise from depths too great for the growth of reef coral.

It remained for Charles Darwin, then on his famous voyage aboard the "Beagle" at the age of 27, to develop a theory which would account for both atolls and barrier reefs and which is still considered the most acceptable. Darwin postulated certain essential conditions: presence of coral animals, optimum temperature, salinity and depth, the latter 150 to 180 feet. He figured that the growth of the coral would correspond to the subsidence of the ocean bed so that the process would be carried upward constantly at the favorable depth and thus a reef or atoll would be built up, the latter marking the outline of an island that had sunken beneath the surface of the water.

An American scientist, Daly, proposed a theory that the depth necessary for favorable growth was related to the last glacial period. The vast quantity of waters impounded by the glaciers caused a subsidence of sea level to a depth which made conditions favorable to the growth of coral on submarine shoals or platforms and this growth continued upward as the water level was raised with the melting of the glaciers.

The speaker based his talk on an article in Walkabout by William J. Dakin, emeritus professor of zoology at the University of Sidney, and gave reasons why Professor Dakin prefers the theory of Darwin rather than that of Daly but also says there are many things yet to be explained.

MIDWAY, THE BATTLE THAT DOOMED JAPAN - Rudolph Erickson - July 19, 1956. The talk was a resume of a book by two Japanese naval officers, one of whom took an active part in the battle while the other was with that portion of the fleet which was moving against the Aleutian Islands as part of one grand plan of attack. The book is well written and apparently attempts a detailed factual account without alibiing or passing the buck.

First moves in the naval war in the Pacific were made with a view of obtaining control of the oil areas, and these were amazingly successful, even beyond the expectations, or even hopes, of the Japanese themselves.

With a large portion of the Pacific under its control there was some discussion among the top brass as to whether the next move should be southerly toward Australia or easterly toward Midway, an important outpost of Hawaii. The Doolittle raid decided the matter in favor of Midway and intensive preparations were made during which the closest secrecy was maintained in hopes that, as at Pearl Harbor, the attack would be a complete surprise. This intense secrecy hampered the Japanese themselves and, as it turned out, was of no avail as the Americans had broken the Japanese code and knew what was going on all of the time.

During the latter week of May a fleet of more than 200 vessels rendevouzed and sailed eastward, later to split with one force sailing for the Aleutians and the other, the larger, sailing for Midway. The first attack wave was launched early on June 4th but, as the enemy had been forewarned, was a disappointment to the Japanese. Sharp fighter opposition was encountered and the grounded planes they expected to destroy were in the air so that the attackers had to retire without inflicting serious damage and the commander reported a second attack necessary.

Shortly after, the Americans launched a counter attack but, due to lack of fighter escort, this was beaten back but was followed shortly by attack by surface-based Army planes, which likewise was unsuccessful. By this time the Japanese planes that had made the first attack had returned and all were being refueled and rearmed preparatory to the second. It was while this was taking place that the crisis occurred. Just as the Japanese started launching their planes American bombers appeared out of concealing clouds dropping bombs on the crowded decks of the carriers. Inside of five minutes three of the four carriers were disabled so that the Japanese were definitely on the defensive, and the fourth carrier was hit before many hours and also put out of action. There was nothing left for the Japanese to do but retreat, thus destroying their great hope that a victory at Midway would force the American fleet to come out for an all-out surface engagement before it had recovered from the beating it had taken at Pearl Harbor.

The writers give what appears to be a very fair analysis of the cause of the defeat. There is the usual "Hindsight better than foresight" criticism of the tactics, also the clinging to tradition of some outmoded practices. Japan was behind in technology, only two ships in the fleet being equipped with radar. Due weight was given frankly to the arrogant attitude of the Japanese after their early victories and their consequent underestimation of their enemies.

L.A.P.

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FINAL REMINDER

According to our by-laws, Article II, Section 3: - ". . . if such dues become six months in arrears, the delinquent member shall forfeit his connection with the Society." As our fiscal year starts March 1st, September is the deadline for payment of dues.

Johanna Simon, Secretary

****

NEW MEMBERS - August 1956

Brice, Mr. and Mrs. Lloyd J.
8525 S.E. 32nd Avenue — Phone - OL4-2960

Jaenke, Mr. and Mrs. Henry H.
410 N.E. 160th Avenue — " AL4-2960

JUNIOR MEMBERS

Rolunson, Jared K.
6712 E. Sleret Avenue, Vancouver, Washington — " OX-5-8134

Wallace, Bill
236 N.E. Lombard Street — " BU9-9449

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GEOLOGICAL NEWS LETTER

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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Vice Pres:	Dr. Ruth E. Hopson	4138 S.W. 4th Avenue	1	
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Mr. Leroy A. Palmer (1958) Mr. William F. Clark (1958) Dr. James Stauffer (1959)

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Membership:	Mrs. Ruth Harrison	Public Relations:	Mr. Clarence D. Phillips
Publicity:	Mr. H. Bruce Schminky	Historian:	Miss Ada Henley

Society Objectives

To provide facilities for members of the Society to study geology, particularly the geology of the Oregon Country; the establishment and maintenance of a library and museum of geological works, maps, and specimens; the encouragement of geological study among amateurs; the support and promotion of geologic investigation in the Oregon Country; the designation, preservation, and interpretation of important geological features of the Oregon Country; the development of the mental capacities of its members in the study of geology; and the promotion of better acquaintance and closer association among those engaged in the above objectives.

Persons desiring to become members should contact the Membership Chairman, Mrs. Ruth Harrison, 1879 S.W. 10th Avenue, Phone CA 3-0255. Regular annual dues (single or family memberships) are $5 for residents of Multnomah and adjacent counties; $2.50 for others; and $2 for Junior Members. Make remittances payable to the GEOLOGICAL SOCIETY OF THE OREGON COUNTRY.

(Society Activities)

(See "Calendar of the Month")

Evening Meetings: Formal lectures or informal round-table discussions on geological subjects, on the second and fourth Fridays of each month at Public Library Hall, S.W. 10th Ave. and Yamhill.

Field Trips: Usually one field trip is scheduled for each month.

Library Night: Once a month. Lewis and Clark College.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.00 per plate.

Publication: The Geological News Letter, issued once each month, is the official publication.

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CALENDAR FOR SEPTEMBER AND EARLY OCTOBER

Thursday luncheons, which were suspended during August because of the closing of the cafe, were resumed on September 6 and will be held each Thursday there after, as heretofore.

Chamber of Commerce, 824 S.W. Fifth Avenue, Second floor, price $1.00.

Friday
Sept.14 — Auditorium, Journal Building, 7:30 p.m.
Mr. and Mrs. Edward D. Bushby, who have recently made a trip through the Southwest will discuss "Basic Geology of the Colorado Plateau," illustrated with kodachromes. They will also have a display of large black and white prints from their trip.

Thursday
Sept. 18 — Library nights will be resumed at Lewis and Clark College, 7:30 to 10:00 P.M.

Sunday
Sept.23 — Field Trip to Scott Mills-Wilhoit area.
Members will meet at Marquam on the Molalla-Silverton road at 8:30. Bring picks for digging, lunch, flashlight, and clothes suitable for trip into the Wilhoit coal mine. Round trip from Portland, about 100 miles.

Friday
Sept.28 — Auditorium, Journal Building, 7:30 p.m.
Mr. Donald Kyehl and Mr. Vail Schermerhorn, Hydrologists U.S. Weather Bureau, River Forecasting, will speak on "River Forecasting Methods in the Columbia Basin."

Friday
Oct.12 — Dr. John Eliot Allen, past president of the Society, recently returned to Oregon as professor of geology, Portland State College, will speak on "Scenic Geology of the Navajo Country," showing us the best of his kodachromes which he took during three years of geological mapping on the reservation.

* * *

Geology - a pastime for people who are on the rocks.
(M.B.D., Newsletter of AIME)

* * *

FROM THE EDITOR

Through the courtesy of our junior past-president, William Clark, your editor is enjoying "The Scenic Treasure House of Oregon" by the late Dr. Warren D. Smith, former professor of geology at the University of Oregon, from which we quote:

> "In closing this all too short outline of the geological framework of Oregon, let it be pointed out also that for any fundamental understanding of many of the state's economic problems, some knowledge of these basic facts is absolutely prerequisite. Upon the geological formations and structures depend our resources and conditions of living."

The emphasis is the editor's as it brings out the point on which he has been harping in previous issues of the News Letter. Isn't there among our many well qualified members someone who will take the time and the pains to bring home to us the fact that our daily lives are closely linked with the geological phenomena of past aeons which made this locality, in which we live, what it is?

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MEMBERS AND FRIENDS OF GSOC

GSOC rolls out the red carpet for its past-president and always friend, Dr. John Eliot Allen, who has returned to Portland to assume the chair of Geology at Portland State College.

Dr. Allen is a son of the late Dr. Eric W. Allen, former Dean of the School of Journalism at the University of Oregon, from which John Eliot graduated in 1931 and received his M.S. the next year. From 1938 to 1947 he served as field geologist and chief geologist of the State Department of Geology and Mineral Industries, during which period he was awarded, in 1944, his Ph.D. by the University of California.

In 1947 he went to Pennsylvania State College as associate professor of geology and in 1949 to New Mexico to supervise a survey of the mineral resources of the Navajo Indian Reservation. He is a Fellow of the Geological Society of America, a member of a number of technical and scientific organizations, and author of numerous publications on geology and allied subjects.

One of the first things he did after his return was to prepare an application to the Geological Society of the Oregon Country. His last meeting with the Society was on October 14, 1954, when he was the speaker at our luncheon meeting.

Dr. Allen, with Mrs. Allen and daughter, Sallie Anne, are presently residing at the Blackstone Apartments, 1831 S.W. Park Avenue, while seeking a permanent home.

* * * * *

Dr. and Mrs. Gilchrist, with their son Alden, left August 17 for a trip to Denver via Craters of the Moon, Yellowstone, and the Tetons. At Denver Alden will leave his parents and proceed to Paris, where he will pursue a two-year scholarship in his profession of music.

Maybe Dr. Gilchrist doesn't know it yet but an interesting account of his trip will appear in an early issue of the News Letter.

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NATIONAL SCIENCE FOUNDATION GRANT

National Science Foundation grants for the support of basic research in the sciences were in excess of $3\frac{1}{2}$ million during the second quarter of 1956. Among the 289 grants was one of $17,600 for a study of the Petrogenesis and Structure of a part of the Wallowa Mountains to be conducted by Dr. W. H. Taubeneck of Oregon State College.

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OUR 1956 PICNIC

On the overcast evening of August 10 some 130 members and friends assembled in the crater of Mount Tabor for their 21st annual picnic.

Many hot dishes, salads, and desserts attesting the culinary abilities of the ladies were placed on serving tables while the committee bustled about making a great kettle of coffee. In no time at all the "come and get it" call sounded and all filled -- and I do mean filled -- their plates and seated themselves, while conversation and laughter enlivened the diners. The meal concluded, tables were quickly cleared and all made their way to the Little Volcano Theatre.

President Gilchrist welcomed guests and made announcements. In honor of Miss Margaret Hughes, for many years the Society's librarian, who had just passed away, he asked that all stand a moment in silence. Franklin Brown, leader, gave details of the forthcoming field trip to Cooper's Spur on Mount Hood. The meeting was then turned over to Ray Baldwin, M.C.

Dr. Arthur C. Jones led the singing which began with the theme song, "The Oregon Country Ain't What She Used to Be," words by Ken Phillips, with Mrs. Hancock at the piano.

Ray then announced the feature of the evening for which he apparently used as his basis the Biblical statement ". . . all men are liars." Surely no taller tales were ever told than those that fell from the seemingly truthful lips of the various contestants. Beginning with the mild falsehoods of Bruce Schminky, the lies became progressively more scandalous as they were related by E. W. Haggerty, Leroy Palmer, Leonard DeLano, Norris Stone, Leo Simon, Bill Clark, Dr. John Walsted, and Lon Hancock. Only those who heard them could believe that such wild imaginings lurk in the minds of our honest-looking boys. It only proves what encouragement can do to promote duplicity. We were well nigh exhausted from laughing when the contest ended and the judges retired.

First prize went to Dr. Walsted for the whopper about his "pump-handle cow" and her identical heifer calf. It was a biography of Dr. Thomas Condon by Ellen Condon McCornack which he modestly accepted with thanks. (See page 88.)

Lon Hancock, winner of second prize, received a toy wheelbarrow which he declared would be most useful to him in moving excavated material in the Clarno.

Honorable mention was given Dr. Gilchrist.

Thus ended the liars' contest.*

Harry Munson then related an amusing psychological story from a recent issue of the Readers Digest.

The Society extends appreciation to the following:

Sam Allen of the Portland Park Bureau for his help with fires, coffee making, floodlights for the stage, and numerous other details.

Collins and Erwin for loan of piano and to Ray Golden for hauling it.

Dr. Jones, song leader, Mrs. Hancock, accompanist, and Harry Munson for projecting songs on screen.

Mrs. Bill Clark, chairman, and her committee of Mrs. Barr, Mrs. Golden, Mrs. Franklin Brown, Mrs. Schminky, Mrs. Gilchrist, Mrs. Lilly, and Mrs. Clara Davis, who put the picnic together.

Bruce Schminky for co-ordination with the Park Bureau.

Eddie Bushby for acting as microphone engineer.

Any and all others whose presence and helpfulness contributed to the happiness of the occasion.

Emily Moltzner

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* Your reporter wonders if the ladies were omitted from the contest because they cannot tell a lie or for fear they might be so much better at mangling the truth that the men dared not compete with them.

DR. WALSTED'S PRIZE-WINNING LIE

I have always been successful in gardening. Neighbors frequently visit my garden in an effort to find my secret of success. One time a visitor was snooping around while I was busy and not paying too much attention to his actions. I warned him that the place he was looking at had just been planted and leaning over the planted row could be somewhat hazardous. I had just planted some beans which I expected up most any minute. I heard a yell and when I turned around there he was hanging in the air on a bean plant. It took me several minutes with the aid of a ladder to get him down. When my beans sprout they come a hellin'. It is necessary to dig the trench, place the seed, cover, pat down, and leap back. It's the only safe way.

My success in gardening led me to believe that I would have some success on a small farm. We purchased a place several years ago and as we had plenty of pasture decided to keep a cow to furnish our milk and butter. As I liked to go away frequently on week ends, the presence of a milking cow was something of a handicap. I solved the problem by purchasing a self-sucking cow. When we were home I put a snaffle on her nose and had all the milk we needed. When we went away for a week and I would take off the snaffle. We enjoyed our week ends and the cow milked herself during our absence. She proved to be the most profitable animal I ever owned.

I bred her to a pitcher pump and got a heifer calf. When the heifer came into milk, I set a pail under her, grasped her tail, and pumped it up and down. The milk flow was continuous with little effort. The method is far superior to any of the milking machines now on the market.

One knowing Dr. Walsted's scientific and professional achievements is prone to recall the old adage

"A little nonsense now and then
"Is relished by the wisest men."

(Ed.)

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NEW BOOKS

Elementary Crystallography by M. J. Buerger, professor of mineralogy and crystallography at Massachusetts Institute of Technology, is a comprehensive introduction to the fundamental geometrical features of crystals, particularly concerned with their symmetry properties. The first half is devoted to a rational development of the megascopically observable symmetries of crystals and the second part to the internal symmetries. The third section introduces advanced material on group theory and its application to symmetry. The space group theory is presented without the use of extensive mathematics; similarly each space group is derived in simple fashion and their derivations clearly illustrated with diagrams. 528 pages. $8.75. John Wiley and Sons.

Principles of Sedimentation, revised second edition, by W. H. Twenhofel, professor emeritus of geology, University of Wisconsin, analyzes physiography, diastrophism, climate, and other environmental factors that influence the production, transportation, and deposition of sediments. It describes the extent of desert, glacial, and marine deposits; the influence of sediments and sedimentary conditions on organisms; covers the causes of deposition, rates of settling of sediments, and deposition by inorganic and organic chemical processes. Reference is provided on the formation of calcitic limestones, sedimentary deposits of iron-bearing minerals, carbonaceous sediments, evaporites, etc. Structural features of sedimentary origin, such as stratification, cross-lamination, unconformity, soft rock deformation, concretion are given careful treatment. 673 pages. 83 illustrations, $9.00. McGraw-Hill Book Co.

SADDLE MOUNTAIN FIELD TRIP

By

Franklin M. Brown

One of the most beautiful areas in Oregon was visited by members of GSOC on a two-day trip to Saddle Mountain State Park, June 30 and July 1. Here was found an abundance of things of interest to the most ardent enthusiast in the field of geology, botany, photography, hiking, or just plain love of outdoor life.

Of major interest to the geologist was the perfectly formed and most impressive dikes progressing vertically up the mountain side. Another point of interest was the discovery of several good specimens of iron ore in a small creek bed. Some samples had a very high content of metallic iron. Pyrites were also in evidence.

Saddle Mountain, 3,283 feet elevation, consists of basalt breccia in the upper portion. The average breccia is composed of angular basalt fragments ranging in size from less than an inch to as much as five inches. These fragments are cemented by a matrix of reddish-brown to black colloidal hydrated glass known as palagonite. The presence of iron oxides allows it to readily weather to yellowish earthlike palagonite. The glassy fragments are possibly sideromelane, a variety of tachylite. This breccia is about 1300 feet thick and rests upon a foundation of the Astoria sediments. The mountain was once located beneath an arm of the sea which covered most of Clatsop and Tillamook counties and was extruded through the Eocene basalt extending over most of that area. Deformation of the post-Columbia River basalt in this area has left Saddle Mountain as part of the upturned limb of a syncline of about 10 degrees, dipping in a north to northwest direction.

Erosion has cut through the breccia into the underlying Astoria sediments thus undercutting the lava formation allowing the gradual widening of valleys. This also exposed the dikes and left the main masses that form the peaks. Interlacing this mass are numerous thin dikes of perhaps one to ten feet in thickness and upwards of 20 feet in height. These dikes are later than the mass and are composed principally of homogeneous fine-grained basalt intruded along major fractures of the overlay. Comparison with Onion Peak and other mountains in the area indicates that Saddle Mountain is for the most part Columbia River basalt formation on Astoria sediments and is to be considered of Miocene age.

Additional and valuable information on the geology of this area may be obtained from the News Letter, vol. 2, no. 24, December 25, 1936, containing an article by Robert A. Layfield, and Dr. E. M. Baldwin's article in the April 1952 News Letter, vol. 18, no. 4.

The four-mile trail to the top of the mountain takes us through at least two major life zones and at each level was found a profusion of flora. Some 125 different species in evidence out of some 190 catalogued. Mr. Leo Simon brought forth from his store of knowledge the names both scientific and common of each new plant encountered; also much was added about how the early settlers used many of these plants and herbs. Dr. Gilchrist kept another group supplied with information as we progressed up the mountain. Everywhere we turned there was something new and interesting to examine or photograph. We hope to have a slide show in the near future highlighting this trip.

On Saturday June 30 we were led by Dr. Gilchrist on a most interesting side trip to examine and photograph the largest living fir tree in North America. located only a few miles from the Park. Also Dr. Gilchrist took the party to examine Indian kitchen middens near Ecola State Park. These large mounds of mollusk shells were the refuse dumps of early Indian tribes of semi-nomadic nature who in season camped at these sites year after year. There are many kitchen middens along the Pacific Coast in British Columbia, Oregon, and southern California.

That evening we gathered around the camp fire and listened as each member present told about why and when they joined the Society; also we learned many interesting things about geology in a most congenial atmosphere.

Before we leave Saddle Mountain State Park we wish to comment on the cleanliness and well-kept facilities and express our great pleasure in having such a courteous host as the Superintendent, Mr. James V. Webb. The writer wishes to thank Mr. Leo Simon, Dr. Gilchrist, and others who were most helpful in supplying information necessary to complete this article. My appreciation is also extended to Mrs. Simon for her help in keeping an eye on the noisiest, most inquisitive, and most exuberant member of the group, Master Richard Brown, age eight.

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FIELD TRIP TO CLOUD CAP INN AND COOPER SPUR

By

Clara J. Davis

About fifteen cars met at the service station at the west entrance to Hood River on August 19 for the trip to Cloud Cap Inn and Cooper Spur. The trip was led by Franklin Brown, assisted by our field-trip chairman, Rudolph Erickson. Mr. Erickson gave a brief outline of the geology of the region and said that he understood this region was formerly known as Clifton. The caravan traveled along the west side of the Hood River valley. Soon after starting, large glacial boulders were pointed out along the roadside where they had been removed from agricultural land. Where the road crossed the river the roadside ledges showed many glacial boulders of varied sizes.

The first stop was overlooking the mill pond at Dee which was formed by a dam built across the river. We were told that the concrete dam was a very expensive construction because the soil through here is all made up of glacial debris. This debris shows that the last ice cap extended from Mount Hood to the city of Hood River.

Next we stopped at the home of Mr. Vollmer at the foot of the Parkdale lava flow. Mr. Vollmer kindly permitted the caravan to park in his yard and he contributed some of the information about the flow. This lava is olivine basalt. The eruption probably came from a crater some distance south of the lava deposit but far north of Mount Hood. It is believed to have erupted about 200 years ago, and is very likely the most recent flow in the Northwest. The flow is about 100 feet deep and is barren with the exception of a few small struggling fir trees, here and there, standing on its slope, which is very abrupt.

From the lava flow we drove to Inspiration Point on the Cooper Spur road, a very scenic mountain view. Directly in front, and to the right, one overlooks the deep forest in the canyon below. To the left is Mount Hood in bold outline. The silver stream of water flowing from Eliot glacier increases in size as it accumulates other flows on the downward cascade. It is truly an inspiring sight and the group lingered here for some time, taking pictures and enjoying the picturesque view.

About noon we arrived at the Tillie Jane Forest Camp where we ate lunch and relaxed in the quiet friendliness of the trees. Then we drove the half a mile to Cloud Cap where we were joined by Mr. Wilson Appelgren, a member of the Crag Rats, as well as of our organization. He assisted as a guide up the trail.

Leo Simon was very much in demand to identify the botanical specimens that bordered the trail up Cooper Spur. Many plants were in flower and some were in the fruiting stage. Above timberline, Alpine plants were growing for a ways; then there was no more plant life.

When the barren, rock-strewn spur was reached, many of the group decided the view was enough and turned back. Others went on farther along the spur, but only a few continued to the foot of Eliot glacier. The glacier itself produced the most spectacular sight

of all and was well worth the extra climb. Below the mass of ice a U-shaped moraine, at first glance, looked stable enough to walk on. But closer inspection showed it to be well-mixed rock and ice frozen together, and the hot sun was melting the ice. In fact it was soon evident that to venture on it would be very dangerous. Several times a large section of the frozen structure was seen to sink into the cavity below, causing a roaring noise that lasted several seconds and sounded like a huge load of gravel or wood being dumped from a truck. One piece looked to be at least 20 feet in diameter.

Altogether it was a most enjoyable trip and much appreciation is due the leaders who gave of their time and knowledge to make it a memorable day.

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September 1956
Compiled by Mrs. Leo F. Simon, Secretary

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Wallace, Bill	236 N.E. Lombard	11	BU 9-9449
Wolfe, Jack A.	6005 N. Arcadia Road, Vancouver, Wash.		

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GEOLOGICAL NEWS LETTER

OFFICIAL PUBLICATION OF THE

PORTLAND, OREGON

GEOLOGICAL NEWS-LETTER
Official Publication of the
Geological Society of the Oregon Country
703 Times Building, Portland 4, Oregon
POSTMASTER: Return Postage Guaranteed

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Officers of the Executive Board, 1956 - 1957

			Zone	Phone
President:	Dr. Francis G. Gilchrist	0644 S.W. Palatine Hill Road	1	NE 6-4792
Vice Pres:	Dr. Ruth E. Hopson	4138 S.W. 4th Avenue	1	
Secretary:	Mrs. Leo F. Simon	7006 S.E. 21st Avenue	2	BE 6-0549
Treasurer:	Mr. Robert F. Wilbur	2020 S.E. Salmon Street	15	BE 5-7284

Directors: Mr. Fay W. Libbey (1957) Mr. Albert J. Keen (1957)
Mr. Leroy A. Palmer (1958) Mr. William F. Clark (1958) Dr. James Stauffer (1959)

Staff of Geological News Letter

Editor:	Mr. Leroy A. Palmer	1209 S.W. 6th Avenue	4	CA 7-9347
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Committee Chairmen

Program:	Dr. Ruth E. Hopson	Display:	Mr. Murray R. Miller
Field Trip:	Mr. Rudolph Erickson	Research:	Mr. Rudolph Erickson
Luncheon:	Mr. Leo Simon	Service:	Miss Margaret L. Steere
Library:	Dr. James Stauffer	Museum:	Mr. Alonzo W. Hancock
Membership:	Mrs. Ruth Harrison	Public Relations:	Mr. Clarence D. Phillips
Publicity:	Mr. H. Bruce Schminky	Historian:	Miss Ada Henley

Society Objectives

To provide facilities for members of the Society to study geology, particularly the geology of the Oregon Country; the establishment and maintenance of a library and museum of geological works, maps, and specimens; the encouragement of geological study among amateurs; the support and promotion of geologic investigation in the Oregon Country; the designation, preservation, and interpretation of important geological features of the Oregon Country; the development of the mental capacities of its members in the study of geology; and the promotion of better acquaintance and closer association among those engaged in the above objectives.

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(Society Activities)

(See "Calendar of the Month")

Evening Meetings: Formal lectures or informal round-table discussions on geological subjects, on the second and fourth Fridays of each month at Public Library Hall, S.W. 10th Ave. and Yamhill.

Field Trips: Usually one field trip is scheduled for each month.

Library Night: Once a month. Lewis and Clark College.

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CALENDAR FOR OCTOBER-NOVEMBER

Buffet luncheon every Thursday noon at the Portland Chamber of Commerce, 824 S.W. Fifth Avenue, second floor. One dollar.

MEETINGS

Friday Oct.12 — Auditorium, Journal Building, 7:30 P.M.
Dr. John Eliot Allen, past-president of our society, recently returned to Oregon as professor of geology, Portland State College, will speak on "Scenic Geology of the Navajo Country," showing us the best of his kodachromes which he took during three years of geological mapping on the reservation.

Sunday Oct.14 — FIELD TRIP to The Dalles to see the results of the Wakemap Project which has been in charge of Dr. B. Robert Butler. This project has been the excavation of ancient occupation at the Wakemap Project upstream from The Dalles but on the Washington side near the Five-Mile Rapids. This area will be included in that flooded by The Dalles dam waters when the dam is completed in March of 1957.

Members will meet at the old Seufert Cannery at 9:30 A.M. Just east of The Dalles turn left just before reaching the road junction where the Dufur-Maupin Road leaves Highway 30. The trip will probably include a visit to the Celilo Indian fish village, and total mileage will approximate 225 to 250 miles.

For further information call Trip Chairman, Rudolph Erickson, NEptune 6-1873.

Tuesday Oct.16 — Library Night at the Biology Building, Lewis and Clark College, 7:30 P.M.
Mr. James Carle, instructor in astronomy at Lewis and Clark, will talk on "The Geology of the Moon." If the evening is clear we shall have an opportunity to observe the moon through the college telescope.

Friday Oct.26 — Auditorium, Journal Building, 7:30 P.M.
Color slides by members. This is an opportunity to see a few of the best slides from the summer activities of members. All who have slides they would like to show are asked to contact the program chairman, Dr. Ruth Hopson (CA 2-1430, or 4138 S.W. Fourth Avenue, Portland 1) before October 12. She will then assign the number of slides each may show. If you have taken some good pictures be sure to take part in this program.

Friday Nov.9 — Auditorium, Multnomah College, 1022 S.W. Salmon Street, 7:30 P.M.
Mr. Melvin Burke, Division of Water-Supply Management, U.S. Forest Service, will give an illustrated talk on "Relation of Forests to Soil, Water, and Erosion."

Friday Nov.23 — No meeting. Too soon after Thanksgiving.

Change of Address

Rose, Howard E.	1505 N. Terry Street	Zone 3	Phone: BU 9-6738
Spak, Edward, Mr. and Mrs.	3814 S.E. Lambert Street	" 2	" PR 1-8764

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MARY MARGARET HUGHES

Members of the Geological Society of the Oregon Country were saddened by the death on August 10 of Mary Margaret Hughes, one of our revered members, who slipped quietly away while conversing with her physician. She had been in declining health several years and lately had been confined to a wheel chair. One of her chief interests was the Geological Society, which she served faithfully as librarian ten years, 1941 to 1951. As long as she was able she attended the weekly luncheons as well as the Society's meetings, and in the earlier years she enjoyed the trips most of the time, although she was unable to do any hiking owing to injuries from an accident.

At the 17th annual banquet, February 22, 1952, Miss Hughes was presented with a scroll which read:

> "To Miss Mary Margaret Hughes, in recognition of outstanding and meritorius service, the nomination of Honorary Life Fellow, with the additional honor of designation of Librarian Emeritus."

Her hobby of collecting early American glass goblets was started many years ago, early in her nursing career in Minneapolis. She accumulated 200 in all, ranging in age from 130 years old to 50. She was a student of early American glass and was an authority on the subject. She founded the organization, Antiques Unlimited.

Mrs. Amza Barr

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The Society gratefully acknowledges to Miss Margaret E. Hughes of the Medical School Library of the University of Oregon the gift of the following volumes from the library of her aunt, the late Mary Margaret Hughes

Branson and Toar	Introduction to Geology
Rice	Dictionary of Geological Terms
Holmes	Principles of Physical Geology
Willard	Montana - The Geological Story
Lawrence	Mount Hood - Latest Eruption and Glacial Advances (Reprint from Mazama)

It is particularly gratifying that our library should have these useful volumes as mementos of one who served it so long and so faithfully as librarian.

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NEW MEMBERS - GSOC - October 1956

		Zone	Telephone
Allen, Dr. and Mrs. John Eliot	1162 S.E. 58th Avenue	15	
Blore, Mr. and Mrs. Stephen W.	5520 S.W. Downs View Court		CA 8-7977
Brown, Mr. and Mrs. Jesse L.	126 N.E. 86th Avenue	16	AL 3-4924
Dodson, Mr. and Mrs. Guy R.	4350 S.W. 96th Avenue, Beaverton,		MI 4-1609
Hyman, Selma (M.D.) denotes Dr. title - 2311 N.W. Northrup Street, 10,			
Spaulding, Jacquette E.	8620 S.W. Willow Lane		AT 2-0981

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MARVELS OF THE COLORADO PLATEAU

By

The Bushby's

September 14th was a night to remember. It was then that Eddie and May Bushby took us with them on the 4300-mile trip they made during the first half of June to the Colorado Plateau area. With Eddie's colored photography and May's running description of the scenery and the geology we felt that we were actually there viewing the wonderful vistas that were portrayed on the screen.

Starting May 31st the trip took us through the Malheur River country in Oregon and on into Idaho where we took in the beautiful Shoshone Falls on our way to Craters of the Moon, where we paused for a little geological study. Here we saw three different epochs expressed in the lava flows, the latest estimated to be not more than 500 years old. The region gets its name from the fact that its wierd topography bears a resemblance to the surface of the moon as seen through a telescope. Many unusual phenomena appear; numerous craters, ice caves, the "Devil's sewer pipe" and other fantastic shapes held our interest.

On to Salt Lake City, where we stopped briefly and kept on toward our real objective, the beautiful parks of southwestern Utah and the Grand Canyon country. Passing through Bryce, Zion, and Grand canyons we see the pages of the geologic book opened before us so that we can look back almost to the beginning of geologic time and to assist us in this we had a chart displayed on the screen. Bryce Canyon shows the youngest strata, its rocks relating to the Cenozoic, then comes Zion in the Mesozoic and Grand Canyon which takes us back to the pre-Cambrian, each of which was presented to us in detail on individual charts.

Bryce Canyon is not, strictly speaking, a canyon but rather a series of connected amphitheaters. The rocks are sufficiently soft to yield readily to erosion to great depths but with such coherence that they stand in almost vertical cliffs. Differential erosion causes them to assume unusual shapes and we saw staircases, domes, pinnacles, and many statuesque figures, whose similarity to familiar objects is limited only by the observer's imagination.

From Bryce Canyon we made a 75-mile side trip to Cedar Brakes where we found multicolored igneous rocks and great thickets of aspen. From Cedar Brakes to Zion Park (84 miles), and here was an interesting exhibit set up by the National Park Service, a geologic column in which each formation was represented by the rocks of which it is composed where found in place. In Zion we noted that in some formations the stratified rocks have pronounced vertical jointing as well as horizontal bedding and where this occurs in conjunction with proper conditions of weathering and erosion huge blocks would fall from the cliffs and accumulate, almost unbroken, at their bases. The nature of these formations, as has been mentioned, causes them frequently to erode into great monoliths, one of which, rising sheer to a height of 2400 feet, is considered the greatest such occurrence in the world.

Thence we went by Big Arch Trail and Checkerboard Mountain through the Kaibab Forest, which has its own particular specie of deer, not found elsewhere, and reached the north end of the Grand Canyon of the Colorado. This stupendous work of nature is 4 to 18 miles wide and 217 miles long, with depths exceeding a mile. To use the hackneyed expression, it beggars description. We observed many scenes depicting the multitude of colors, the strange and weird shapes of erosion, the stratification and the foliation of the sedimentaries and traced the age

of the strata back to the earliest periods, almost to the time that "the earth was without form and void."

Leaving Grand Canyon we wandered by way of Verde River Valley, Montezuma's Castle, the old ghost town of Jerome and turned northward, finally reaching home, the granddaughter, and the dog after 4300 miles and two and a half well-spent and pleasure-filled weeks.

L.A.P.

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JORDAN CRATER, OREGON'S YOUNGEST, CAN BE REACHED EASILY

By
Boyd French
(From Journal Northwest Living Magazine, May 23, 1954)

Oregon history is rich in volcanos and volcanic action. Geologists tell us the magnificent basalt cliffs of the Columbia Gorge have been there some 20,000,000 years. Mount Hood built itself within the last million years. Mount Mazama "blew its top" about 6500 years ago where we now have Crater Lake.

But down in the southeast corner of the state there is a volcano so young by comparison it seems only a few minutes old, though its age is estimated to be from 200 to 500 years.

This is Jordan crater, a real volcano complete with all the trimmings: crater, cinder cone, lava fields, tunnels, lava troughs, and driblet or fissure cones. It is so small that the entire area covered by the eruption can be viewed from the low hill above the crater.

Jordan Crater is reached by way of Highway 20 to Burns, then south on Highway 78 to the junction with Highway 95, thence to the town of Jordan Valley. This is a day's drive from Portland and a convenient first-night stop. The motel operated by Floyd Acarregui is modern and comfortable.

Nine miles north of Jordan Valley the road to the crater leaves the highway to the left. It is only 27 miles to the crater but since this is all cattle range with a maze of roads it is necessary to get explicit directions. The road is gravelled for a few miles only, the balance quite passable when dry but very difficult or impassable when wet. The road ends at the base of the cinder cone and at the edge of the lava bed.

The crater is roughly 500 feet in diameter and from 100 to 150 feet deep. A trail leads to the bottom, winding down the side of the cinder cone, not an easy trip.

The eruption first broke through the surface on the east slope of a fairly steep hillside and at the head of a small valley. In the early stages it erupted mostly cinders and lapilli, building up the cone which at the present is about 100 feet in height.

Later, the molten lava welled up and broke through the west wall filling the small valley on the upper side to the level of the rim. Being forced to find another way out it made a break in the southeast side and flowed away following the valley. As the lava advanced small lateral valleys were filled and these long black tongues form an interesting pattern.

The flow continued for approximately 10 miles until reaching Cow Creek, damming it and forming Cow Lakes which can be seen shining in the distance. The lava bed averages 4 to 5 miles in width, covering an area of approximately 50 square miles. When we consider that the ancient lava plateau of which the Columbia beds are part covered some 250,000 square miles, this seems very tiny. But standing there looking out over this immense black field we were amazed that so much material could come from so small a crater.

The lava cooled slowly forming the typical smooth pahoehoe and the recent origin is clearly shown by the complete absence of soil or vegetation on the surface and the wonderfully fresh appearance of the ropy crust.

Several pits, 30 to 50 feet in diameter and 20 to 30 feet deep were found, evidently lava tunnels at one time and the thin shell left at the surface had broken through. An excellent example of a lava trough, starting near the rim, ran down the slope for about 200 feet before disappearing under the surface.

Monotony of the bare black basalt was broken when a rattlesnake, stretched out full length taking a sun bath, was discovered. He put up a "rattling" good fight against having his picture taken but the photographer finally won.

One of the most interesting features is a row of fissure or driblet cones extending up the slope west of the crater. Geologists explain that these are caused by the lava before being forced up through a crack or vent in the underlying rock formation. It was in this way that the immense lava beds of Idaho and Oregon were erupted rather than by volcano craters.

There are ten to twelve of these cones varying in height from 10 to 25 feet. Some have caved in and broken down but others are still well preserved in their original form. Some of these can be entered and are beautiful and interesting. The walls are covered with gobs or stalactites of brilliant red lava formed there by the last final gasps of the hot gases.

The outside of one cone was covered with shining "satin rock" and was particularly beautiful. A photograph of the interior of this cone shows exceptionally brilliant coloring.

Jordan Crater has been the mecca of geologists for many years. Nearly all the features of the larger volcanos are there on a scale that permits of close and intimate investigation. It is a rare opportunity for anyone interested in this type of natural phenomena.

The Crater lies in an area that has been visited before by similar eruptions. There are three other craters, from 3 to 5 miles apart, extending in a row down the valley south of Jordan Crater but they are much older and difficult to reach.

Jordan Crater is considered one of the most interesting attractions in a very interesting and little known section of Oregon. (Article supplied by Ray Golden.)

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UNUSUAL FOREST LAKE CREATED BY BIG VOLCANIC 'BELCH'

By
Phil F. Brogan

Long ago, as humans measure time, a volcano thundered on the skyline of the mid-Oregon and spewed into the upper valley of the McKenzie River a flow of lava that created one of the Pacific Northwest's most unusual lakes.

The flaming volcano was Belknap crater, which faces the Three Sisters from the north over the McKenzie pass. Water impounded by the massive flow became Clear Lake. In this lake is a "ghost forest."

* * * * * * *

When hot, smoking lavas flowed westward from Belknap crater, possibly 2000 years ago the molten rock tumbled into the spring-fed headwaters of the McKenzie. Soon a lake, covering about 2 square miles, formed in the canyon, covering trees growing in the basin. Clear Lake is at an elevation of 3030 feet. It is 190 feet deep in its deepest part, and it is fed by large springs of cold water that spills from under the lavas.

Largest of the inflows is Giant Spring, at the mouth end of the lake on the east side. Summer temperature of this water is 41 degrees. The cold water preserved the inundated trees, some of which are nearly 3 feet in diameter.

Tops of none of the submerged trees stand out of the water. They lost their tops long ago by decay in the air, and by the whipping winds of mountain storms. A few have been cut off so as not to impede the fleet of boats that plys over the lake in the fishing season.

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Not all boatmen are anglers. Some persons who row gently over the blue, cold lake, to examine the strange ghost forest seemingly growing from a carpet of silvery diatomaceous earth on the lake bottom. (From The Oregonian, Sunday, September 30, 1956.)

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RIVER FORECASTING

By

Donald Kyehl and Vail Schermerhorn
(Lecture at Mary Cullen Auditorium, September 28, 1956)

Our speakers are hydrologists with the U.S. Weather Bureau and their talk was a description of their methods of computing in advance the flow of various streams, thus enabling them to give warning of possible floods and also of seasons of low water which would affect irrigation and power supply. Their function is to cover the Northwest as far south as the Eel River in California, watching all rivers and tributaries. In reaching their conclusions they depend on reports from six different stations throughout the area, which in return receive reports from many individual observers scattered about the different watersheds. It is obvious that the Northwest falls naturally into two major divisions, one east and one west of the Cascades.

Forecasting can be reduced to three elemental questions: when, where, and how much? The answers are drawn from the reports of the individual forecasters, which are forwarded to the division offices and thence to headquarters in Portland.

By the study of the performance of a large number of past storms, estimates are made of the percentage of precipitation on a given watershed that reaches the streams as runoff. In computing this ratio, consideration must be given to various factors, such as temperature, snow, intensity of the storm, and soil. Each stream has its own individuality, particularly with respect to its rise and subsidence. Volume of flow at any point, such as Portland, is calculated, beginning at the head of the watershed, by estimating the volume of the runoff of a particular drainage area, the time it will take this water to reach the next principal tributary down the river and the increment to be expected at that point. In this way the volume of the stream at any point and the time that it will reach that point can be foretold.

A very important factor in runoff is snow, its amount and water content, and its behavior on melting. The Weather Bureau starts making its snow observations with the first snowfalls, usually in August or September.

Forecasting floods is a major duty but damage of an indirect nature may occur without what is popularly regarded as a flood. High water, not actually reaching flood conditions, may not breach a levee but it can damage adjoining land by back seepage, or it may flood basements and cause damage to goods in storage or it may damage highways causing delay and rerouting of traffic, which may be expensive. In such cases it is an advantage to know in advance so that goods can be moved and traffic can avoid the threatened areas.

The various storage dams that have been constructed on the Willamette and Columbia rivers have been of definite help in regulating the flow of the major streams. Had the flow of the Columbia not been regulated by Grand Coulee during the high water of last summer the gauge at Vancouver would have been periously close to what it was during the flood of 1948. Incidentally, it was stated during this talk that the latter flood was due to an unusal combination of very heavy precipitation coming at the same time as a very rapid snow melt.

L.A.P.

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LUNCHEON TALKS

New Mexico - John Eliot Allen - September 6, 1956.

At our first luncheon meeting after the August vacation we had the pleasure of welcoming our former president, Dr. John Eliot Allen, with Mrs. Allen and Sally Anne.

As we had no scheduled speaker Dr. Allen took over as pinch hitter. After assuring us that he is glad to be "back home" after six years in the Southwest, he talked to us briefly about New Mexico. New Mexico is very similar to eastern Oregon in average elevation and climate. Geologically the Paleozoic and Mesozoic are much more widely distributed but there is a striking similarity between the later formations, notably the Cascade andesite which corresponds to our Columbia River basalt.

The mineral resources of the state are not generally appreciated but it is outstanding in this respect, particularly in oil, gas, copper, and potash. One-third of the total tax revenue of the state comes from the mineral industry.

After all, the most important mineral resource of any locality is water, in which New Mexico is deficient. In contrast the Columbia River and its tributaries furnish the Northwest with power, transportation, and irrigation the year round whereas the Rio Grande, New Mexico's principal stream, is dry a considerable portion of the year, and the state has exceeded its allotment from this source, in accordance with a compact with its neighbor, Texas, by 300,000 acre feet and does not yet know how it is going to pay it back.

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The September-20th luncheon was one of the best attended in many months, 27 members and friends gathering about Mrs. Quick's festive board, and it was fitting that we should have among our guests our past-president, Ford E Wilson, and Mrs. Wilson. Also we had two speakers on this occasion.

Beginner's Luck in Fossil Hunting - Mrs. Emily Moltzner.

The speaker assigned the above title to her talk because while on the Coos Bay trip she stubbed her toe on a rock which, on examination, proved to contain a number of fine specimens of fossilized teredos of Oligocene age. Later in the day she supplemented this discovery by finding a log with perforations in the root end which proved to be the borings of the present-day descendants of the Oligocene ancestor whose fossilized remains had appeared in the first specimen. Some of the borings in the wood showed the skeletal remains of the animals that had made them.

The teredo, or ship worm, has been the bane of shipping since the days of the Greeks and Romans. They not only attack wooden hulls but destroy piling, wharves, or anything else wooden in salt water that they can reach. The creature is really a clam with a bivalve head attached to the end of a wormlike body. This head is covered with tiny teeth and, as the animal advances, he rotates, thus cutting a smooth cylindrical bore about the size of a lead pencil. When the teredo starts his bore he is very tiny, perhaps only 1/200th of an inch in diameter, so that the entrance hole that he makes is so small that it would escape notice except for two microscopic filaments that are really tubes. One of these takes in water which supplies oxygen and the other passes off waste matter from the body. The damage done by teredos is amazing and, because their ravages do not show on the surface, often is manifested entirely without warning. Instances are recorded of a whole wharf breaking away from a shore and of another that broke off and drifted away, carrying with it a boat that had been moored to it. Much research has been done on control of this little animal but without entire success although it is hoped that before too many years a means will be found to check this destruction.

Quartz Crystals - Ford E Wilson.

Following Mrs. Moltzner's talk Mr. Wilson took over and spoke on quartz crystals, which he illustrated with many unusual, and frequently beautiful, specimens. We saw right-hand and left-hand crystals, twins, intergrowths, Japanese twins, and countless other unusual and interesting forms. Your reporter is obliged to confess that he is so rusty on his crystallography that he is not able to give an adequate report on Mr. Wilson's talk but he is sure that it was both interesting and enlightening to those more erudite members who were present.

* * * * * * * *

The Navajo Country - Paul Howell - September 27, 1956.

On this date we were happy to welcome our former member, Paul Howell, who has returned to take up his residence in Portland. As usually happens when an old member shows up he was conscripted at once to act as our luncheon speaker. For his subject he chose the Navajo Indian Reservation on which he worked for some time with Dr. John Eliot Allen.

The locality is the plateau region of Northeastern Arizona and Northwestern New Mexico. This being desert country, the region is barren which simplifies the study of the geology as one can deduce the major characteristics of a wide area from a single vantage point. The particular work about which Mr. Howell talked was in connection with gathering material for a Ph.D. thesis. The area is in the Cenozoic and the problem on which he is engaged is to develop the Tertiary history of the region, especially the later Tertiary and extending into the cutting of the Colorado River.

There have been some publications but none of these gives a complete history, there being a lack of data on this particular locality. Some fossils have been correlated with the Santa Fe formation in New Mexico from Upper Miocene to Recent but there are no data to give a clue to the climate of the Eocene and the Miocene. It is hoped that this thesis will fill the gap and thus enable a complete picture to be drawn for the Tertiary of this region.

Apparently the speaker took the five-minute limit literally as he left unsaid much to which we would have listened with interest. Mr. Howell stated he will make application at once for renewal of his membership in our society.

L.A.P.

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MEMBERS AND FRIENDS OF G.S.O.C.

September 13th we had at our luncheon Greg Davis, long time a junior but recently advanced to regular membership, whose article on "Titanium Metal" appeared in the June News Letter. Greg has been very busy at Stanford University where he received his B.S. degree in June. Following his graduation he spent some time with a field party studying the sedimentary rocks in the vicinity of Coalinga, California. This area is near the great San Andreas fault and presents many interesting features. The next work was in Leevining Canyon in the great batholith of the Sierra Nevada's where the study covered not only the intrusive granites but also the roof pendants and the metamorphics, largely quartzites and hornfels. In the latter part of September Greg returned to Stanford where he will work for his master's degree and also do some teaching in physical geology.

September 16th the Lon Hancocks were hosts at their home at 2720 S.E. 84th Avenue to about 175 teenagers at the sixth annual reunion of those who have taken part in the annual gatherings at Camp Hancock under the auspices of the Oregon Museum of Science and Industry. Movies were shown of many of the adventures at the camp and the guests had the opportunity to study Mr. Hancock's collection of fossils, which all of us know is outstanding.

Bob Wilbur, with his father and mother, left October 2nd for a family reunion with his brother in Lincoln, Neb., where they will be joined by another brother from Little Rock. Bob plans to do some digging in Pennsylvanian and Permian formations in the SE part of Nebraska.

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Buffet luncheon every Thursday noon (except November 22) at the Portland Chamber of Commerce, 824 S.W. Fifth Avenue, second floor. One dollar.

MEETINGS

Friday Nov.9 — Auditorium, Multnomah College, 1022 S.W. Salmon Street, 7:30 P.M. Mr. Melvin Burke, Division of Water-Supply Management, U.S. Forest Service will give an illustrated talk on "Relation of Forests to Soil, Water, and Erosion."

Tuesday Nov.20 — Library Night at the Biology Building, Lewis and Clark College, 7:30 P.M. Two films: "Magnesium Metal from the Sea" and "Sulphur."

Friday Nov.23 — No meeting.

Friday Dec.14 — Auditorium, Multnomah College, 1022 S.W. Salmon Street, 7:30 P.M. Mr. Robert Brown, Jr., Geologist, U.S. Geological Survey, will give an illustrated talk on the "Geology of the Northern Portion of the Olympic Peninsula."

Friday Dec.28 — No meeting.

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THUNDER EGGS

By

Mary Louise Oberson

Thunder egg is the Indian name for nodule. The Indians believed that they were hurled from craters by angry mountain spirits. Nodules are filled with either agate or opal. They are formed in rhyolite lava and in no other kind of rock. If they are hollow or have some crystals in them, they are called geodes. These are not thunder eggs. There are many theories as to how they are formed, but no one knows for sure. Mr. A. W. Hancock, geologist, said he has never seen anything written about thunder eggs in any geology or rock book. They may be found in eastern Oregon, Chocolate Mountain, California; Yellowstone National Park, Wyoming; and New Mexico. My father found the thunder eggs I have in my rock collection in eastern Oregon near Madras.

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The above was a report, with exhibits, to the author's fifth grade class at Alameda School. Does anyone know a younger contributor to the News Letter than Mary Louise?

Ed.

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MEMBERS AND FRIENDS OF GSOC

Our members certainly have been getting into the news lately.

The October 21st issue of Northwest Magazine carried a three-fourths page article, with portrait, of Orrin E. Stanley. The article tells in some detail of his activities as a photographer, especially since 1950 when he made a long trip through eastern Canada and eastern United States and his 1953 trip to Mexico.

The same issue of Northwest Magazine carried a prize winning photograph, "Predawn at Middle Sister" by Ruth E. Hopson, and on October 17th Lon Hancock was guest on the Red Dunning show, KOIN-TV, with a talk on the fossils and pre-historic life of eastern Oregon.

Following is an extract from a letter from Don Lawrence to Ken Phillips, dated July 6, 1956:

> "We are having a glorious summer touring. We left New York on June 26 by Icelandic Airlines and spent most of five memorable days in Iceland being shown about by a former student who is now in charge of Icelandic Soil Conservation Service and doing a remarkable job of constructing a new vegetation and soil on surfaces eroded to gravel by 1100 years of sheep grazing and howling winds. We went by jeep up the southwest slope of Hekla and then walked on lava flows of four different ages including the newest, formed in 1956-47.
>
> "The next day we went by jeep up the outwash surface formed by a 'glacier burst' in the eruption of Katla beneath the ice in 1918, and climbed up on the snout of the Höfdabrekkujokull (glacier) which is still blanketed with a layer of black cinders and lighter colored picture-puzzle bombs deposited on it higher up. A five-hour flight brought us from Iceland to Bergen, Norway, where we spent a day, then on by boat up the Sogne fjord watching for one-sided trees to see how seasonal winds compared with those of the Columbia Gorge. There is really little similarity in the winds of these fjords and those of western North America although I had always supposed that they should be similar. Today we spent hiking about 7 km (round trip) to the Nigardsbre (glacier) which is in western Norway north of the head of Sogne fjord. The history of 17th and 18th century advance and subsequent recession of 3 km is very well known from historic accounts and this is fortunate because one could learn little from the vegetation since grazing by cows and browsing by goats have kept everything in a scrubby condition. It is curious to see the terminal (1748) moraine within a few yards of houses and barns. The extent of glacier recession and the character of the moraines produced are very similar indeed to those of the Mendenhall and Herbert Glaciers of the Juneau area but there is of course a world of difference in the vegetation."

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PICTURES BY MEMBERS

October 26, 1956

Our "lecture" this Friday was of a different kind. Instead of the usual talk eleven of our members showed colored pictures, each selection the choice of the individual's collection. It would be unfair to select any one exhibitor or any one group of pictures as outstanding. All were of the best. The many slides made up a travelogue that took us from Mt. Tabor, close at home, as far east as Niagara Falls, to the beautiful glacial scenery of Alberta on the north and historic Mission San Juan Capistrano on the south. We saw beautiful fields of flowers, deep canyons and the rugged Tetons. Works of man were not omitted. There were the diatomaceous quarry at Terrebonne, the Rushmore Memorial, a dude ranch in Arizona, oil wells on the capitol grounds at Oklahoma, all in all a series that bespoke the widespread interests and artistic capabilities of our members.

L.A.P.

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KRAKATOA

By
Gregory A. Davis

"Diseased nature oftentimes breaks forth
In strange eruptions." 1/

The year 1883 is not often thought of as being historically significant. It was the year of the opening of the Brooklyn Bridge, and the formation of the Triple Alliance between Germany, Italy, and Austria. However, if, in recording history, we referred to each year past by its most important event, 1883 might well be called "The Year of Krakatoa."

It was in this year that a small volcanic island, lying in Sunda Strait between Java and Sumatra, blew apart in what is believed to be the greatest explosion of historical time. The island, Krakatoa, began eruptions in May 1883 after a period of long dormancy. These eruptions culminated three months later in a series of explosions which, in their magnitude, lie beyond the realm of belief, and defy adequate description. This violent release of volcanic power killed 36,000 people, most of whom died through drowning by tidal waves 70 feet high. Sounds of the disintegration of this volcanic island were heard over one-thirteenth of the world's surface, and atmospheric conditions over the entire globe were affected for 3 years. In order to better understand the full wonder of Krakatoa's great eruption, it is necessary to describe briefly the ancient history of that volcano, and the unique natural conditions that led to its 1883 eruption.

The East Indies have long been noted as an area of intensive volcanic activity. Java, alone, has more that forty-nine volcanoes, some half of which are classified by vulcanologists as active. Most of these peaks are concentrated along linear zones of structural weakness in the earth's crust. Two of these zones intersect nearly at right angles under the Strait of Sunda, and it was at this intersection that Mt. Krakatoa, a great prehistoric volcano, rose above the sea. This mountain must have been no less than 10,000 to 12,000 feet high, rivalling the largest of today's East Indian peaks. Somewhere in unrecorded time ancient Mt. Krakatoa blew away in an eruption, or series of eruptions, dwarfing even those of its modern descendant. A "basal wreck" 2/ of several small islands surrounding a submerged crater was all that remained of the ancient peak.

By the time this "basal wreck" was first seen by white men subsequent volcanic activity had largely filled in the crater, and four islands, covered with tropical vegetation, marked the site of ancient Mt. Krakatoa. The largest of these islands, Krakatoa, had as its most conspicuous feature the volcanic cone of Rakata, 2,623 feet in height. Two lesser cones, Danan and Perboewatan, were also important landmarks. Low-lying Verlaten and Lang islands made up northwest and northeast sections, respectively, of the old crater ring. The fourth island, Polish Hat, was little more than an ejected mass of rock protruding out of the crater.

1/William Shakespeare, King Henry IV, Part I, Act II, Sc. 4, Line 215.

2/This is a term applied by Charles Darwin, the noted biologist. Darwin, in addition to his biological work, was a geologist of some renown.

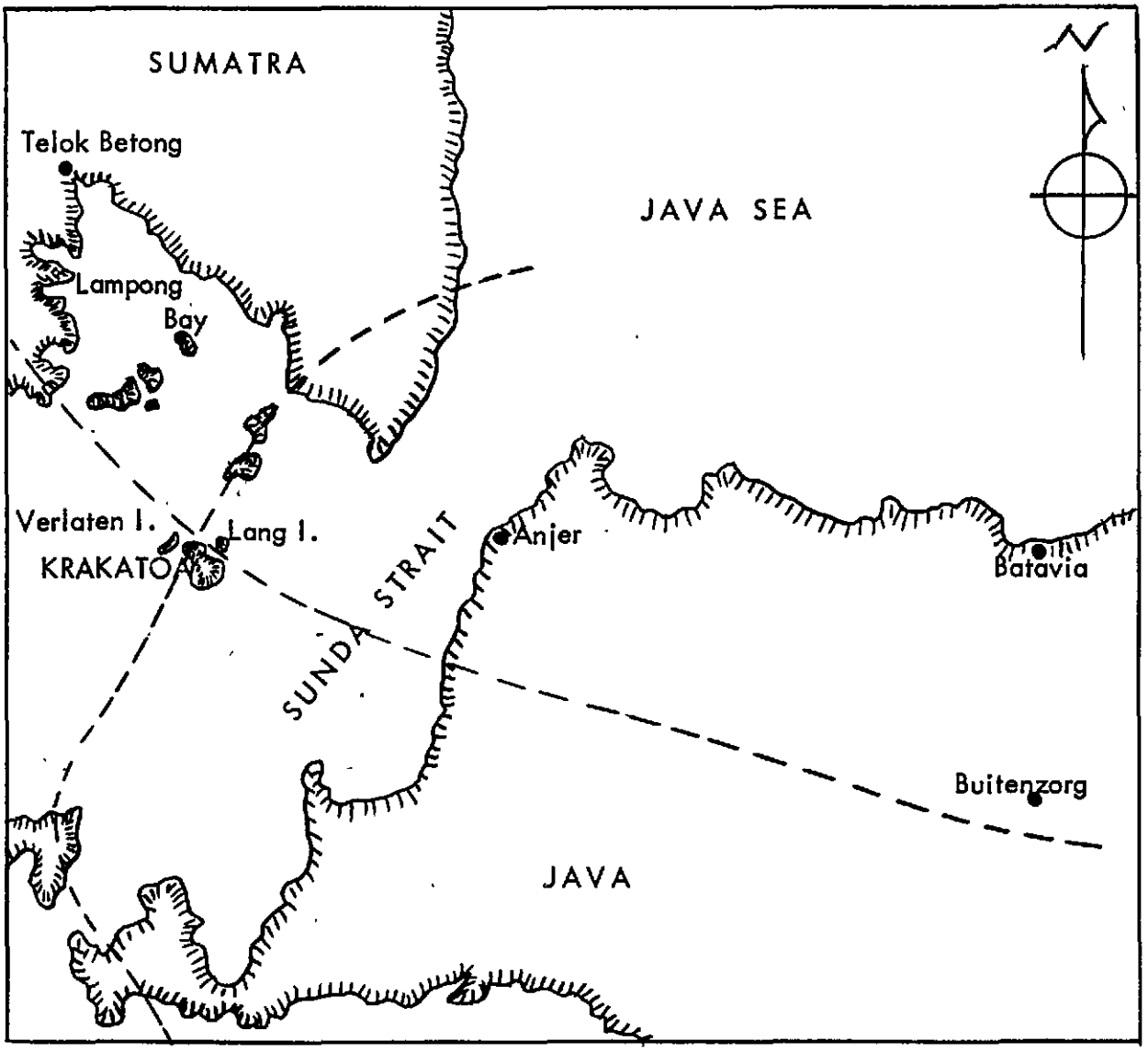

Fig. 1 - Map of Sunda Strait, between Java and Sumatra, showing position of important geographical localities mentioned in this report. Krakatoa's relationship to the area's two great zones of intense volcanic activity is also shown. These zones are indicated by the the two lines - - - - -.

The first reported eruption of Krakatoa was in 1680; this is an outburst about which little is known. Volcanic activity on the island continued in some degree for almost a year and a half. This was the last important expression of volcanic forces in the Sunda Strait area for almost 200 years. Krakatoa, although uninhabited, was visited occasionally by tourist parties who found numerous hot springs in its thick jungles. A little before 1880, earthquakes, several of which were quite intensive, began to rock the Strait area frequently.

On the morning of May 20, 1883, sounds resembling artillery fire were heard in the Javan towns of Batavia and Buitenzorg. It was not known in these towns, both nearly 100 miles east of Sunda Strait, that the sounds were the first indication that Krakatoa had awakened from its long quiescence. On the next morning a light shower of ashes fell on Buitenzorg. It was first realized that Krakatoa was in eruption when a column of steam was seen rising that evening

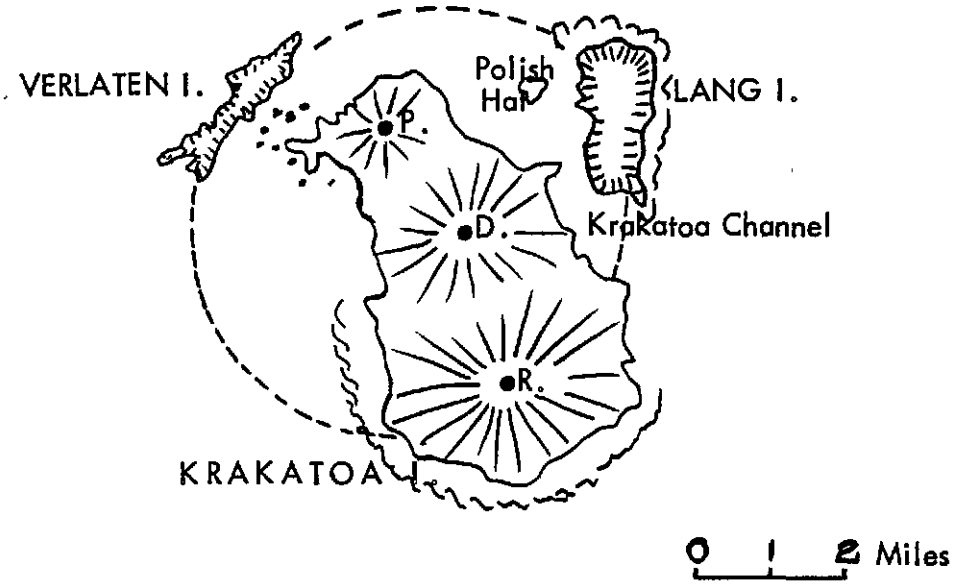

Fig. 2 - Map of the Krakatoa Island Group before the eruption of 1883. The nearly circular line (------) indicates approximately the submerged edge of the great crater.

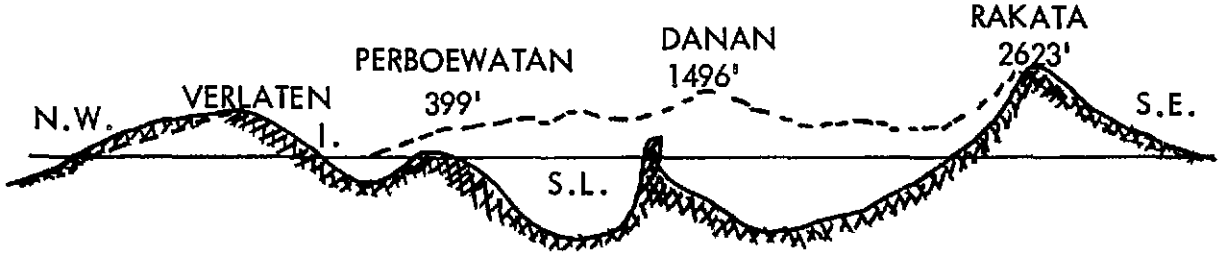

Fig. 3 - Section of the crater of Krakatoa as it appeared shortly after the explosion. The dotted line indicates the original island profile. The change in the form of the mountain flanks was caused by the fall of ejected materials upon them.

from Perboewatan, the smallest of the island's three cones. This outburst was of considerable violence, and prompted an expedition to leave Batavia for an investigation of conditions on Krakatoa. The island was reached on the morning of May 27. Most of the vegetation on the northern part of Krakatoa had been killed, and the trees denuded by falling pumice, a porous igneous rock. The party climbed to the rim of Perboewatan and in their words:

> ". . . found a large basin-shaped crater, more than half a mile across at the top, and almost 150 feet deep. In the centre of this was an aperture 150 feet in diameter, from which a column of steam issued with a terrific noise." 3/

3/ Sir Robert Stawell Ball, In Starry Realms (Philadelphia: J. B. Lippincott Co., 1892) p.322.

After this visit there was evidently a decrease in activity until about the 18th of June; it was then noticed that Perboewatan's steam column was increasing in height. On the 24th of that month another steam column ascended from what is thought to have been the cone of Danan. A third column soon joined the two. Nevertheless, even at this time the inhabitants of the many villages along Sunda Strait, accustomed to frequent volcanic displays inland, found little interest in Krakatoa. The island was last viewed closely by competent observers on August 11. At this time, in addition to the three centers of eruption, there were at least eleven other points of minor activity on the island's lower elevations.

In the days that followed the center of the old "basal wreck" crater was gradually being scoured out as the many igneous vents enlarged themselves and united. All activity was apparently confined to this filled-in section of ancient Mt. Krakatoa's crater, for Rakata on the old crater rim showed no signs of disturbance. No display of activity from Lang or Verlaten Islands is mentioned in any of the pre-climactic descriptions.

For the purpose of this report, it should be stated that until the late afternoon of Sunday, May 26, Krakatoa's behavior was, geologically speaking, normal. No phenomena had presented itself that had not been witnessed before in other eruptions. The uniqueness of Krakatoa's eruption can be chiefly attributed to the peculiar position of its crater, the significance of which did not become apparent until the 26th. The greater part of the crater was below sea level under the cones of Danan and Perboewatan. The violent scouring action of the surface eruptions was so diminishing the barrier between sea and crater, and so weakening the structure of the island, that its continuance could result only in a breaching of the crater by the sea. This was the fate of Krakatoa. The first breach, of which there were four, occurred Monday morning, August 27, at 5:30 local time.

It should not, however, be assumed that the violence of the Krakatoan eruption was due to the sudden expansion of sea water to steam as the sea entered the igneous center. Although lesser stages of the August 26-27 climax may be attributed to the expansion of water into steam, this theory has been proven inadequate in accounting for the magnitude of the principal explosions. Scientists are of the belief that as the water rushed into the depths of the island it chilled liquid lava, or magma, in the numerous vents and pipes into hardened plugs. These plugs and the tremendous weight of water above them succeeded in checking the release of hot gases rising from below. These gases, formed by the disengagement of melting rock, attained pressures so great that the island was torn to pieces as they fought to escape and expand.[4/]

Excellent descriptions of the death throes of Krakatoa have been furnished us by several ships in the island's immediate vicinity. Other accurate reports on the final phase of the eruption were compiled by European officials stationed in the Strait lighthouses. Instrument readings from inland towns have proven invaluable.

At 1:00 p.m. Sunday, August 26, Krakatoa began its demise. Detonations from the island were heard in Buitenzorg and Batavia. By 2:00 p.m. the detonations were occurring at 10-minute intervals. A column of smoke and ash rose some 17 miles into the air. Later that afternoon the sound of the detonations was to be heard over all of Java and Sumatra. Strong air shocks occurred, but no earthquakes were reported. By midnight the detonations

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4/ If the safety valves on a steam boiler were not released, and if the fires under the boiler were not extinguished, the boiler would eventually burst apart under the tremendous gaseous pressure exerted from within. This is analogous to conditions at Krakatoa.

had increased to such a tempo that their sounds were heard as one continuous roar. To sleep that night within 100 miles of the Strait was impossible. Mud and dust which had begun falling Sunday afternoon over a wide area continued to rain down in ever greater quantities. Several small tidal waves swept ashore Sunday night in warning of the greater waves which were to follow. The minor detonations, as mentioned before, culminated in four great explosions which occurred at 5:30, 6:44, 10:02, and 10:52 Monday morning. The third explosion was by far the largest, and was responsible for most of the spectacular and widespread phenomena that give this eruption its renown. Krakatoa continued to rumble on Monday afternoon and Tuesday morning; a final explosion on the shattered island two weeks later ended the volcano's three-month display. (To be concluded in December issue.)

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FIELD TRIP - SCOTTS MILLS

By
Jane Erickson

Some sixty or seventy members and guests of the Geological Society took advantage of a beautiful "Indian summer" Sunday, September 23, to visit the shores of a former inland sea in the locality of Scotts Mills, Oregon. The fact that no sea water had dampened the location for upwards of 30 to 40 millions of years did not detract from the enjoyment of the group, in fact, from all evidence, only added to it for it provided them with the thrill of searching the record for remains of a past life that had lain dormant since Oligocene times.

The trip, planned and scouted by Franklin Brown and Rudolph Erickson, began at Marquam, where a caravan of twenty cars assembled at 8:30 a.m. The first stop was some 2 miles distant at the Arthur Olson quarry where a number of specimens of fossilized sea life were obtained, including some specimens of pelecypods and what appeared to be a type of sea worm.

Before leaving this location Dr. Francis Gilchrist called our attention to some of the geological features of the area which are summarized following this article.

From the Olson quarry the caravan took off for a roadside location 3½ miles up Butte Creek road from Scotts Mills and before the last car had come to a halt at the location, the "sound of hammers blow on blow" greeted us, for here was a veritable bonanza of fossilized shell material awaiting Geesocker picks. Perfect specimens, however, were hard to come by as the formation here is under a layer of volcanics and the shells were twisted and flattened showing the effect of immense pressure.

After an hour at this spot, the group moved on to the Scotts Mills picnic area, where lunch was enjoyed in the shade of an oak grove.

The flat-lying Oligocene sandstone deposits in the bed of Butte Creek under the bridge at Scotts Mills was the next objective. This is an area that is accessible only at very low water and while it had yielded many fine specimens previously, it looked for a time as though we were to be disappointed for nary a shell showed its obliging face to our diligent searching. A crowbar, however, wielded by a husky member of the group finally turned up the desired plunder - beautiful specimens of Dosinia. Interest in digging in that particular area zoomed immediately, in fact the scramble was described by one member as something similar to a flock of sea gulls turned loose on a school of herring, but the results justified the effort for many fine specimens were taken.

The fossil shell Dosinia is particularly interesting due to the fact that it occurs in so few known locations. It is not described by Weaver in his excellent reference work "Paleontology of the Marine Tertiary Formations of Oregon and Washington." It was found in Oregon several years ago by Ellen James Trumbull near Coos Bay and was the subject of a paper presented by her at Seattle, Washington. At about the same time the shell turned up at Scotts Mills, so the interest taken by our group in procuring good specimens was amply justified.

It was with reluctance that we finally left this spot but our host, Mr. Mandrones, was waiting at the final stop, the Mandrones Coal Mine at Wilhoit. He obligingly led the group back into the farthermost recesses of this interesting coal mine and many of us who had never had the privilege of inspecting a real mine before, found it a most intriguing and out of the ordinary experience.

The party broke up late afternoon and headed homeward - well pleased and satisfied with the day's happenings.

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SUMMARY OF REMARKS ON SCOTTS MILLS
By
Dr. Francis Gilchrist

Oligocene tuffs, marine and continental: The shore line of an ancient, shallow sea bordered by low swampy land was not far from the Butte Creek area which we visited on our field trip. To the east Oligocene volcanoes, such as Old Mount Clackamas, threw forth clouds of ash. Settling in the shallow sea the ash became the marine tuffs full of the fossil shells which we enjoyed collecting at three locations. These tuffs have been variously called the Butte Creek formation, Illahe formation, and Eugene formation. Settling on land the ash has given rise to terrestrial deposits bearing leaf fossils (Molalla formation). The coal beds at Wilhoit were probably laid down on swampy land adjacent to the sea at about this time.

Then came deformation, and the Oligocene beds in the region north of Butte Creek and extending at least as far as the Molalla River were bowed upward into hills. We may call these the ancient Molalla Hills.

Miocene basalts: The mid-Miocene was marked by a series of great outpourings of basaltic lavas. They filled the lowlands and lapped around the Oligocene volcanoes and around the ancient Molalla Hills. On previous field trips we have examined these basalts along the Clackamas River to the north, and at the falls of Silver Creek to the south; but, except for a small area where they crossed to the north of the present Butte Creek, they seem never to have overflowed this area. The basalts to the north are called Columbia River basalts; those to the south are the Stayton lavas.

Then there followed a long period of weathering and erosion to what may be termed the post-Miocene surface.

Pliocene volcanics: Some time in the Pliocene there began a gentle tilting to the northwest of the area which we visited.

Volcanoes were again active in the Pliocene (and continuing into the Pleistocene) and covered the entire area with lavas and ash. To the north the deposits are called Boring lavas; to the east they are the andesites of the higher Cascades; to the south they are known as Fern Ridge tuffs.

Butte Creek and the several streams parallel to it began to flow about this time as consequent streams down the gentle ash- and lava-covered northwest-dipping slope. They have

since removed much of the Pliocene ash and lavas over their lower reaches, thus re-exposing the old post-Miocene surface. This is the peneplane one sees as he looks across from table land to table land. More recently, however, possibly as a result of renewed tilting, the streams have entrenched themselves to a depth of several hundred feet below the post-Miocene surface. On our trip we saw how Butte Creek had cut through the Miocene basalts and into the Oligocene tuffs. Indeed, at our farthest stop east it had cut all the way through the tuffs to Eocene lavas below. Or possibly these lowest rocks were intrusives into the Oligocene tuffs, and hence of later date, as some of our party contended on the basis of the apparent crushing of the tuffs.

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SCENIC GEOLOGY OF THE NAVAJO COUNTRY

By
Dr. John Eliot Allen
October 12, 1956

This illustrated lecture is based on studies of an area of 480 square miles in northern New Mexico, the object being to determine the existence of any geologic features that might lead to the discovery of mineral deposits of value. The talk was copiously illustrated by colored slides which added greatly to the understanding of the subject.

Geologic Column

Tertiary	Basalt and kimberlite plugs, plugs and flows	
	Chuska sandstone	1100+ feet
Upper Cretaceous	Tohatchi formation	850
	Menafee "	2300
	Mesa Verde "	1100
	Mancos shale	800
	Dakota sandstone	250
Upper Jurassic	Morrison formation*	700
	Summerville "	360
	Todilto limestone*	0 - 15
	Entrada sandstone	250
Upper Triassic	Wingate sandstone	200
	Chinle formation	1200
	Shinarump conglomerate*	50
Permian	De Chelly sandstone	280
	Cutler formation	900
Pre-Cambrian	Quartzite	?
	Total	10355+ feet

* Uranium-bearing formation.

As the table shows, there is a great gap in the geologic column between the pre-Cambrian and the Permian. Then there is the usual sequence: deposition of sediments, folding, erosion, vulcanism; and these were made more clear by the distinctive coloring of the different strata, their composition and their attitude, one toward another. We saw the uranium-bearing beds of the Shinarump conglomerate in the Triassic and the Morrison formation and Todilto limestone in the Jurassic, then into the Cretaceous where the yellow Dakota sandstone appears underlying the red Mancos shale. Total thickness of the strata is in excess of 10,000 feet. Those noted above are but a few of the many that were noted and explained to us.

L.A.P.

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WAKEMAP* PROJECT
Field Trip - October 14, 1956

On October 14th at least 38 cars, perhaps more, assembled at The Dalles for a trip to Wakemap Mound, an archeological project on the Washington side of the Columbia River about 5 miles above The Dalles. Here the group scattered and followed its own devices in exploring the excavations that mark the site of an ancient civilization or in viewing the numerous petroglyphs carved in the cliffs overlooking the river, no one knows when or by whom.

The site will be flooded by March 1957 when the waters behind The Dalles Dam will reach it so efforts are being concentrated on recovering as much material as possible and leaving correlation and interpretation of the finds until later.

As deduced so far from the various artifacts found and their relationship, this may be the site of the longest continuous occupancy by man of any place in the world. Carbon 14 tests dated a projectile point found here as possibly from 12,000 to 16,000 years old and Lewis and Clark found an active community there when they passed in 1805.

In its greatest development Wakemap was a community of perhaps 1000 population and was a trading center and gathering place of 3500 transients. The inhabitants built circular homes of split cedar planks, partly below ground like the bara-baras of the Alaskan Aleuts. Their occupations were hunting and fishing. Later trading became important and the locality grew to become a center at which others congregated, even from points hundreds of miles distant.

Carving of stone and bone developed and some of the pieces found show definite artistic ability. The inhabitants finally disappeared during the past century but one very old woman, a basket maker, was alive during the present generation.

*We are told to pronounce it "Wuq-mup."

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LUNCHEON TALK - United Nations - Albert Keen - October 26, 1956: The Keens' first objective on their summer trip was Glenns Falls, New York, which they reached in time to help their granddaughter celebrate her first birthday. Glenns Falls is at the lower end of Lake George and while there they visited Lake Champlain, both in the granite of the Adirondack Highland. A most interesting feature of the trip, after the family visit, was observing the United Nations in action in New York City. The United Nations buildings and grounds occupy an area of 18 acres, covering 6 square blocks, with 4 main buildings. The administration building is 39 stories tall and affords working space for 3500 employees from 26 different nations. While there they attended a meeting on the use of atomic energy for peacetime purposes. The delegates sat at two horseshoe-shaped tables, the 81 nations present seated in alphabetical order. At each visitor's seat is a set of headphones and, by pressing a button, he may listen to a speech in English, French, Russian, Chinese, or Spanish. The impression that they received from their visit is that U.N. is doing a great work and that their functioning is a vast stride forward in adjusting the affairs of the world.

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L.A.P.

GEOLOGICAL NEWS LETTER

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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Society Objectives

To provide facilities for members of the Society to study geology, particularly the geology of the Oregon Country; the establishment and maintenance of a library and museum of geological works, maps, and specimens; the encouragement of geological study among amateurs; the support and promotion of geologic investigation in the Oregon Country; the designation, preservation, and interpretation of important geological features of the Oregon Country; the development of the mental capacities of its members in the study of geology; and the promotion of better acquaintance and closer association among those engaged in the above objectives.

Persons desiring to become members should contact the Membership Chairman, Mrs. Ruth Harrison, 1879 S.W. 10th Avenue, Phone CA 3-0255. Regular annual dues (single or family memberships) are $5 for residents of Multnomah and adjacent counties; $2.50 for others; and $2 for Junior Members. Make remittances payable to the GEOLOGICAL SOCIETY OF THE OREGON COUNTRY.

(Society Activities)

(See "Calendar of the Month")

Evening Meetings: Formal lectures or informal round-table discussions on geological subjects, on the second and fourth Fridays of each month at Public Library Hall, S.W. 10th Ave. and Yamhill.

Field Trips: Usually one field trip is scheduled for each month.

Library Night: Once a month. Lewis and Clark College.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.00 per plate.

Publication: The Geological News Letter, issued once each month, is the official publication.

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CALENDAR

DECEMBER 1956 to JANUARY 15, 1957

Buffet luncheon every Thursday noon at the Portland Chamber of Commerce, 824 S.W. Fifth Avenue, second floor. One dollar.

MEETINGS

Friday Dec.14 — Auditorium, Multnomah College, 1022 S.W. Salmon Street, 7:30 P.M. Mr. Robert Brown, Geologist, U.S. Geological Survey, will give an illustrated talk on the "Geology of the Northern Portion of the Olympic Peninsula."

Friday Dec.28 — No meeting.

Friday Jan.11 — Room A, Public Library, 7:30 P.M. Mr. Herbert Schlicker, Geologist, State of Oregon Department of Geology and Mineral Industries, will talk on "The Reconnaissance Geology of the Western Cascades."

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

NEW MEMBERS - GSOC - DECEMBER 1956

				Phone
Burke, Melvin H.	1129 S.W. Washington Street	Zone	5	CA 3-7133 Ext. 219

Junior Members

LeBlond, Richard J.	4631 North Amhurst Street	"	3	BU 9-7784
Schnefftan, Kim	Reed College	"	2	PR 4-9498
Van Horn, James E.	7823 North Jersey Street	"	3	AV 6-0814

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CONTEST

In accordance with a suggestion at a recent luncheon meeting the News Letter is initiating a contest to find a more dignified name for a rockhound than rockhound. The suggestion "philopetrost" (philo-love, petros-rock) came from the nimble brain of our luncheon chairman. Any others?

The contest is limited to members of the society. First prize will be a piece of Columbia River basalt, which the winner has the privilege of selecting himself from any place in its native habitat.

* * * * * * * * * * *

CHANGE OF ADDRESS

Ruff, Mr. and Mrs. Lloyd L. 810 N.E. 52nd Avenue Zone 13, Phone AT 2-3664

Congratulations are due to two of our fellow members as Mrs. Virginia Brown and Mr. Lloyd Ruff were married October 27, 1956. The best of luck and happiness are the sincere wishes of all of us to them.

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BOOK REVIEWS

Petrographic Modal Analysis

Felix Chayes, Geophysical Laboratory, Carnegie Institution of Washington.

This book is the outgrowth of a series of lectures delivered to a graduate seminar in petrography at California Institute of Technology, some of which had been in magazine articles before appearing in book form.

As a matter of definition, the mode of a rock is its composition expressed in terms of the relative amounts of the minerals comprising it. The mode is frequently obtained by making a chemical analysis of a specimen and from this calculating the probable minerals and their quantities in the original specimen. Other methods are by crushing to sufficient size to enable the different minerals to be separated and counted, microscopic examination of thin sections, or by close occular scanning of a polished surface.

This book presents a geometrical basis of modal analysis by measuring areas of individual minerals in thin sections with respect to the area of the whole. Devices and methods for making such estimates are described and explained with discussion of probable errors and means of balancing and reconciling them.

The system of modal analysis was first advanced about a century ago but development of a method was slow and spasmodic. In this book the author seeks to bring together and correlate such information as has appeared previously, with much original matter, so as to present a method that the petrographer may choose as best adapted to his researches.

113 pages. John Wiley and Sons, Inc. $5.50.

L.A.P.

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Man in Search of His Ancestors - The Romance of Paleontology - By Andre Senet.

The startling exposure of the Piltdown fraud in 1953, the discovery of a "living fossil," the Coelacanth, in the sea of Madagascar, the uncovering of the remains of "Apemen" in South Africa - all these have created new interest in our biological origins. This vivid and dramatic popular history of the science of paleontology tells the fascinating story of man's exciting search for his ancestors and for the ancestors of all living things.

Is there anyone who has never asked the exciting question: Where do we come from? The study of paleontology, the science of life on earth during the complete geological epochs, attempts to supply answers to this question. The author begins at the last of the evolutionary stages, and gradually takes you back through paleontological history, to the dawn of time - from modern man's emergence back to primitive man, from the mammalian, reptilian, and amphibian conquests of the earth, back to the first appearance of the most primitive forms of life. Along the way he gives a stimulating picture of the exciting clues and discoveries which have thrown new light on this whole field and shows how modern scientific methods have brought to bear on sciences of the past.

(Continued on page 122.)

KRAKATOA

By

Gregory A. Davis

(Continued from November issue)

On the 29th of August the Batavian steamship G. G. Loudon left its anchorage in Lampong Bay where it had sailed out the mammoth tidal waves and inspected the west, south, and east sides of Krakatoa. The voyage was difficult, for Sunda Strait was covered quite heavily with floating pumice rock. Viewers on the Loudon observed that the entire northern part of the island was missing. Between Krakatoa and Sebesi Islands they noticed that "a reef had formed and that various craters planted on that reef were sending columns of smoke on high."[5]

Later investigation confirmed this report; Perboewatan and Danan had disappeared, as had two-thirds of the original island. Rakata had been split asunder, and only its southern half remained. Verlaten Island had increased in size considerably, as had Lang to a lesser extent, from the addition of ejected material. Polish Hat had vanished. Soundings of the ocean floor revealed that, at the former approximate location of 1400-foot Danan, the explosions had excavated rock to a depth of 1,000 feet below sea level. It was also recorded that the sea bottom had risen as much as 60 feet over a 10-mile radius from Krakatoa due to the accumulation of ejected rock and ash.

Sea disturbances caused by the great explosions are by far their most frightening aspect. Tidal waves were the principal destroyer of life, and it is therefore fitting that they, of all the phenomena associated with the eruption, be considered first. It is likely that the initial wave to hit the Javan shore, 6:00 p.m. Sunday, marked the first entrance of sea water into the focus of igneous activity. This and other waves of similar size and origin were of small proportion compared to those that were to follow the four great morning explosions. At 6:30 a.m., Monday, the Javan town of Anjer, 26 miles from Krakatoa, was almost swept away by a wall of water 33 feet high. The destruction was completed by other great waves which followed, and which destroyed two of the five lighthouses in the Strait.

Reports of waves 100 feet high are widespread, but this figure is believed inaccurate. At Telok Betong, Sumatra, the highest wave reached a level just 6 feet below the summit of a hill 78 feet high. It was here from its dock that a wave lifted the man-of-war Berouw, carried it almost 2 miles inland, and left the unfortunate ship 30 feet above sea level. As tidal waves do not take form until they enter shallow water, the Loudon and other ships anchored or sailing in the open sea were not affected by them. Strange as it may seem, waves which piled up to terrifying heights engulfing entire villages and thousands of people were not even detected by most ships in deep water.

These waves lasted in form for incredible distances. The southern tip of Ceylon was struck by a wave 10 feet high. Table Bay in South Africa, 5,000 miles from Krakatoa, was hit 10 hours after the Monday, 10:02 a.m., blast by a wave 18 inches high. In the English Channel, 11,000 miles distant, instruments recorded that the 10:02 a.m. wave had traveled even to that great a distance. Incidentally the speed of this and similar waves, on the open sea, exceeded 400 miles per hour. Sea disturbances to the east of Krakatoa were limited in extent because of the narrow eastern mouth of the Strait of Sunda, and because of shallow water and numerous shoals in the Java Sea.

5/ Royal Society of London, Krakatoa Committee, Krakatoa, ed. G. J. Symons (London: Trübner and Company, 1888), p. 28.

There is some speculation as to the causes of these tidal waves. The Royal Society of London in their official report on Krakatoa has advanced the following theory:

> The missing mass of Krakatoa may be roughly estimated to be at least two hundred thousand million cubic feet (200,000,000,000). A fiftieth part of this mass dropping suddenly into the water would, by its displacement alone, furnish sufficient liquid to form a wave circle 100 miles in circumference, 20 feet high, and 3:50 feet wide.[6]

Sudden underwater explosions would also have displaced great volumes of water, as would have the gradual upheaval of the sea floor.

On August 28, Mr. James Wallis, Chief of Police on the island of Rodriguez, recorded the following information:

> On Sunday the 26th the weather was stormy, with heavy rain and squalls; the wind was from S.E., blowing with a force of from 7 to 10, Beaufort scale. Several times during the night (26th-27th) reports were heard coming from the eastward, like the distant roars of heavy guns. These reports continued at intervals of between three and four hours, until 3 p.m. on the 27th. . .,[7]

These sounds were the distant detonations of Krakatoa, and this report is of extreme interest because Rodriguez lies 2,968 miles west of the sounds' origin; never before, nor since, have sounds been carried to such a distance.[8] Other reports, from lesser distances, are as interesting as is Mr. Wallis'. Acheen, Sumatra, 1,100 miles northwest of Krakatoa reported: "It was supposed that a fort was being attacked, and, in consequence, the troops were put under arms."[9] South Australia heard the blasts as the following account from Daly Waters, 2,023 miles from Krakatoa, proves: "On Sunday, the 26th, at midnight, we were awakened by an explosion resembling the blasting of a rock, which lasted for a few minutes."[10] On the 27th at Manila, Luzon, 1,800 miles from Sunda Strait, sounds were heard which were thought to be signals from a ship in distress; rescue operations were organized.

The explosions were deafening in the immediate vicinity of Krakatoa, but after 10:00 a.m., Monday, they ceased to be heard. It is known, however, that explosions of great sound intensity occurred after this time. Although it may appear unbelievable, it seems as if a low-lying strata of dust-laden air had sufficient density to exclude from areas within 30 miles of Krakatoa, sounds of detonations heard 3,000 miles away.

Two other types of air disturbances resulted from the 10:02 a.m. explosion. Shock waves were sent outwards which blew in windows, extinguished gas jets, and cracked walls in settlements

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6/ Ibid., p. 98.

7/ Ibid., pp. 80-1.

8/ The distance from Seattle, Washington, to Miami, Florida, is only 2,734 miles. Lisbon, Portugal, is 2,970 miles across the Atlantic from New York.

9/ Royal Society of London, op. cit., p. 81.

10/ Ibid., p. 84.

as far away as Buitenzorg. An air wave, detected only by instruments, also originated at this time. A pebble dropped into a quiet pond gives rise to a wave circle which moves outward in ever increasing concentric circles. The 10:02 a.m. blast disturbed the atmosphere much in the same manner as a pebble disturbs a pond; an air wave was sent out from the island in a circular front of increasing size. This air wave, after moving over half the globe, began to converge upon Krakatoa's antipole, Central America. Upon reaching its point of convergence here, the wave again diverged and traveled back to Krakatoa. Subsequent confluences and divergences continued until the great air wave had been reduced to nothing by friction. Traveling at the speed of sound, this air wave was detected time and time again by barometers in its passage over the earth; London recorded it no less than seven times. [11]

As previously mentioned, two hundred billion cubic feet of Krakatoa had been blown away. Much of this displaced mass can be accounted for by wind-borne particles. Pumice dust and volcanic ash fell over a minimum area of 1,100,000 square miles in the Indian Ocean. Ships in the immediate vicinity of Sunda Strait were besieged by falls of mud and ash most of Sunday and Monday. On Monday afternoon 6 inches of mud fell on the decks of the Loudon in 10 minutes. Buitenzorg witnessed a fall of dust so heavy that at Monday noon the town was in complete blackness, and lamps were needed to provide light. This total darkness persisted until about 1:00 a.m. when the fall of particles began to ease up.

It is estimated that one cubic mile of rock ascended as fine, almost microscopic, dust to form a thick layer 80,000 to 120,000 feet above the earth. This layer of dust so refracted light rays that the world experienced, for 3 years, the most spectacular sunrises, sunsets, hazes, and sky phenomena man has ever seem. [12] Two of the sightings which follow are quite fascinating, yet typical of the atmospheric conditions which were widely observed. Reverend W. Manley wrote from Ongole, India, in 1883, that:

> On September 10, 11, and 12, the sun had a greenish-blue tinge, and was somewhat dimmed by a haze in the afternoon. At 4 p.m. the colour was bluish. This gradually passed into a greenish colour. . . .At night the moon, just past the first quarter, was surrounded by a pale halo about 30° in breadth. [13]

Windsor Observatory, New South Wales, described on the 15th of November, 1883, the following occurrence:

> Last evening, Nov. 14, the sky was almost cloudless after sunset, and the usual brick-red light again made its appearance along the west-south-west horizon. . . .About 7 o'clock the red glow was at its maximum, when a solitary cloud. . .presented itself at an altitude of 25°. The cloud, which was at first white, quickly changed to a beautiful green, its borders being of a deeper tint. [14]

So colorful were these atmospheric displays that throughout the world, fire departments raced through the streets of large cities looking for nonexistent conflagrations.

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[11] This is the only natural phenomena of this kind on record. Man-made nuclear explosions have since, however, produced similar air waves.

[12] The Royal Society of London, in its Krakatoan report, has devoted almost two hundred pages to a study of atmospheric phenomena resulting from the suspended dust layer.

[13] Royal Society of London, op. cit., p. 154.

[14] Ibid., p. 158.

In evaluating Krakatoa's claim of pre-eminence over all other recorded volcanic eruptions, several factors must be considered. It is certain that the explosion of Tambora, an East Indian peak, in 1815, blew away a far greater volume of material than did Krakatoa. It is in the production of such vast sea and air disturbances, however, that Krakatoa appears to have no parallel in the records of volcanic activity. The conditions which led to the volcano's demise may never again be equalled in future volcanic eruptions. Had it not been for the unusual geographical location of the island, and its crater's peculiar relationship to the sea, the world might still know of Krakatoa as a verdant, tropical isle of little significance or interest.

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"IT'S AN ILL WIND--"

This one didn't get in in time for the liars' contest at the picnic. It was during a session of "bunkhouse mining" among a group of oldtimers and the subject had turned to high winds. "Biggest wind I ever knew," chipped in one O.T., "was up Windy Gulch, blamed good name for the place, too. Well this wind hit a prospect tunnel so hard it turned it clean inside out and left it lying on the dump. Kinda tough, too, 'cause two brothers had been runnin' that tunnel and they'd put every spare minute and every spare dime into it and they was broke when this happened. But those boys had plenty of viscera - I think that's the six-bit name for it - and they didn't let that faze 'em for a minute. They just took that good-for- nothin' inside-out tunnel and cut it up into little pieces and sold 'em to the farmers in the valley for postholes. More than broke even on the deal, too.

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Geology is by tradition an agnostic science. - - Felix Chayes.

RELATION OF FORESTS TO SOIL, WATER, AND EROSION

By
Melvin Burke
Lecture - November 9, 1956

Mr. Burke's duties are with the Division of Water-Supply Management of the U. S. Forest Service and his illustrated talk was most interesting and instructive.

He used the term "geologic erosion" quite often and this was a bit puzzling to some of us until he explained that it is to differentiate between erosion in which only natural agencies play a part and "accelerated erosion," in which acts of man, such as overgrazing or denuding of timber, hasten the erosive process.

We saw many illustrations of the latter. There was the hillside with a lush grass covering which absorbed moisture and checked erosion and a similar area from which the cover had been grazed off and gullies formed by the unchecked runoff, some of these just started and still small, while older ones were so deep as to be almost impassable, as once the erosive action starts it continues even if the original cause is removed. Furthermore, an area once overgrazed is not easily restored as, with the forage gone, the weeds take over and choke out the nutrient grasses that try to reoccupy the space.

We learned that domestic animals are not the only culprits that cause overgrazing. In some cases an area has been closed to cattle and sheep only to have the deer take over and do just as much damage. In this connection the coyote is not the pest that he is generally charged with being as he helps to keep down an overpopulation of deer.

There were illustrations of how apparently insignificant causes may start serious erosion. In one case a log dragged across a small stream breached the bank and changed the channel, in another a tractor tread cut out a shallow channel in a road cut with the final result a gully several feet deep and still another where a foot trail offered a starting place which resulted in a serious damage. Then we were shown samples of contour plowing on a hillside by which moisture was retained instead of collecting in streams that could start erosion channels. The importance of retaining rainfall as much as possible was demonstrated by an experimental tract. One portion was left with the natural vegetation and another purposely denuded. The latter showed the erosion of 82 cubic feet of soil over the test period, that from the area left with its protective covering was imperceptible.

We were somewhat surprised to learn that the underground reservoirs of the country have a greater storage capacity than all of the surface bodies of water, including the great lakes, emphasizing the desirability of checking wasteful runoff and allowing the water to percolate to these underground storage basins.

The destructive Mitchell flood of last July is directly traceable to overgrazing of the tributary watershed. A similar flood occurred 52 years before, almost to a day, but the lesson it pointed was not heeded. The severity of the Mitchell storm can be judged from the fact it is estimated that 4 inches of rain fell in an hour and a half at the edge of the storm and that this would indicate 8 to 10 inches in the same time at the center. There were many more interesting facts brought out in Mr. Burke's lecture but space limitations prevent our mentioning them at this writing.

L.A.P.

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BOOK REVIEWS
(Continued from page 116)

Here is the exciting story of man's search for his ancestors in all parts of the world, for the remains of those creatures that have long since disappeared from the surface of the earth, and for a picture of how life itself may have emerged on this planet and the forms it first took.

274 pages. McGraw-Hill Book Co. $5.50.

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LUNCHEON NOTES

THOMAS JEFFERSON, PALEONTOLOGIST. Robert Wilbur, November 8, 1956.

Thomas Jefferson, perhaps the most versatile man ever to occupy the President's chair, was a pioneer in American paleontology and started a collection as early as 1782, a collection which later occupied a room in the White House. In 1784 he joined Adams and Franklin in a diplomatic mission to France and while there pursued his studies on European fossils. In 1797 he published a description of the remains of a ground sloth that was found in a cave in what is now West Virginia.

From an early date he advocated an expedition to the West and, early in his administration as president, authorized not only the Lewis and Clark expedition to the Northwest but also the exploration by Zebulon Pike of the plains country and the Rocky Mountains. The explorers were instructed to observe scientific features in their travels as well as those of an economic nature. It was Jefferson's belief that sloths and mammoths had been quite numerous in pre-historic days and he hoped to have evidence of this and of other ancient life but in this he was disappointed as fossils were found only in three localities and none of these proved to be of importance.

Jefferson was attacked for "wasting his time" on such matters and for having expeditions financed at government expense give attention to them. One of the most bitter diatribes was from the pen of William Cullen Bryant but, at this date, we venture to say that more of their countrymen remember the statesman than the poet.

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TRONA IN WYOMING. Tom Matthews, November 29, 1956.

In the course of exploration for oil in Northwestern Wyoming drillers encountered, at a depth of 1500 feet, a bed of trona of such purity and extent that oil development at this locality has been set aside and attention turned to developing this unusual deposit. Further exploration demonstrated the deposit to be of an average thickness of 10 feet and an areal extent of 10 square miles. While an estimate at this time is premature it probably contains in the neighborhood of 100,000,000 tons.

Trona is a hydrous sodium carbonate and is one of the most useful of the alkali minerals, its principal use the manufacture of soda ash. The exceptional purity of this deposit makes it outstanding. Attempts were made to mine by forcing water into the deposit so as to dissolve it and produce a solution that could be pumped out but these failed because the mineral refused

to go into a solution that could be handled. Then, as the physical properties of the bed are similar to those of a seam of coal, resort was had to coal mining methods. A shaft was sunk, a gangway driven and galleries turned from it. A main conveyor belt a mile long running in the gangway receives ore from belts in the galleries and delivers it to the shaft. The belts in the galleries are fed by jeeps converted to use of trolleys.

The ore is hoisted to the surface and delivered to the treatment where, due to the purity of the ore, its treatment is very simple. Treatment consists of pulverizing and subjecting to sufficient heat to drive off the carbon dioxide and moisture. Present output is at the rate of 2,500 tons daily.

This is the only deposit of its kind known. Its purity and very simple composition give it an advantage over others utilized in the manufacture of soda ash. Most of these contain impurities and frequently consist of a complex association of various alkalis. These make it necessary to recover the soda ash by the ammonia process or by solution, evaporation and differential crystallization. One drawback to working the Wyoming deposit is that it lies between two beds of carbonaceous shale which exude methane, thus presenting a problem in ventilation and a possible explosion hazard.

L.A.P.

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TALES FROM THE LUNCHEON TABLE

The Great Diamond Hoax

It was well timed, 1872, and well located, San Francisco. California had not yet settled down entirely from its early hectic days, the Big Bonanza of the Comstock Lode was pouring out its millions in silver, there was lots of money, speculation was rampant, one could always get a bet on anything, and anything could happen.

William C. Ralston, president of the Bank of California, who had made millions on the Comstock, was the financial tycoon of the era and it was at Mr. Ralston's bank there came one day two men, in weather-beaten clothes, with "prospector" written all over them who, with a feigned secretiveness, designed to attract attention, deposited a sack of uncut gems for safe keeping.

As they had planned, news of their unusual deposit reached the officials of the bank and leaked out to the mining fraternity about town. The two, Philip Arnold and John Slack, remained in town, minded their own business, and were distant and unapproachable but finally, after sufficient coaxing, agreed to a conference with Ralston and some of his associates. Here they were very cagey but finally admitted they had found a large deposit containing not only diamonds but other gems as well, notably rubies, sapphires, and emeralds, and, after overcoming reluctance agreed to transfer their find for a cash sum and a block of stock in the corporation to be formed to work the deposit.

By agreement, Arnold and Slack accompanied two men chosen by Ralston to the property and, also by agreement, the two were blindfolded during the critical part of the horseback ride from the train. The two agents picked up some stones themselves and returned enthusiastic. Then a selection of the stones was sent to Tiffany's in New York to be appraised. Tiffany's pronounced them genuine and set a value on the samples from which it was estimated that the lot on hand in the bank was worth about $1,500,000. The next move was to engage Henry Janin, then the leading mining engineer in the country, to make an examination. As the result of a two-days' examination Mr. Janin pronounced the deposit genuine and estimated its value at many millions of dollars. Satisfied by now, the banker and his associates organized a $10,000,000 corporation, the stock of which was parcelled out to a select few, who participated only on invitation.

Arnold and Slack received $360,000 in cash and a stock interest which they soon sold to the principals for an additional $300,000. Most of the $660,000 thus obtained wound up, some way, in Arnold's hands and Slack dropped out of the picture.

It was just at this time that Clarence King, then only 30 years old, was making his famous Survey of the Fortieth Parallel and, naturally, with all of the public excitement he heard of the great discovery. Apparently he was the first to note the inconsistency of diamonds, rubies, sapphires, and emeralds occurring in the same deposit. From such information as he could glean from Janin and others who had been on the ground he was convinced that it was within the area that he had surveyed, and comparing notes with some of the men who had worked with him in the field he succeeded in locating the spot. A two-day examination convinced him that the ground was salted and a telegram to San Francisco brought Janin and three company officials to the ground where King showed them irrefutable evidence of the fraud.

The excitement in San Francisco can be imagined but, be it said to the credit of the original promoters, all money paid for stock in the company was refunded to the investors, Mr. Ralston contributing $300,000 from his personal fortune.

When the facts came out it was learned that Slack and Arnold had made about $50,000 in legitimate mining ventures from which they expended $35,000 in Europe in the purchase of uncut gems, which they smuggled into this country and used to salt the ground.

Slack dropped out of sight and Arnold, before the exposé, went back to his home in Kentucky with most of the $660,000. One of the dupes followed him there and instituted suit which, eventually, was settled for $150,000 cash and agreement of immunity from further prosecution.

When the excitement died down the spotlight fell on Clarence King. The importance of geology as something more than a hobby began to be recognized and there is no doubt that this episode had its effect in the creation, a few years later, of the U.S. Geological Survey with Mr. King as its first director.

The above is condensed from "Diamond Fraud Exposed" by Paul Averitt in GeoTimes, October 1956.

L.A.P.

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IN OUR LIBRARY

Chayes, Felix — Petrographic Modal Analysis.

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FAULTS - GEOLOGICAL AND OTHERWISE

The president of the mining company was congratulating the company geologist on the successful solution of an intricate problem by which the faulted segment of a profitable vein had been located. "Yes," sighed the company geologist, "my wife says I am the greatest fault finder she has ever known."

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