GEOLOGICAL NEWS LETTER

Geological Society of the Oregon Country

Volume 26, 1960

GEOLOGICAL NEWS LETTER

OFFICIAL PUBLICATION OF THE

Jan 1960 PORTLAND, OREGON Vol. 26, No. 1

GEOLOGICAL NEWS-LETTER
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Geological Society of the Oregon Country
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State of Oregon
Dept. of Geology & Mineral Industries
1069 State Office Bldg.
Portland 1, Oregon

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Officers of the Executive Board
1959-1960

		Zone	Phone
President: Dr. Paul W. Howell	9130 S.W. Borders	23	CH 4-5728
Vice-Pres: Franklin M. Brown	211 S.E. 53rd Ave.	15	BE6-3658
Secretary: Miss Rose Hamilton	5412 S E. Powell Blvd.	6	PR5-9762
Treasurer: Mrs. Rudolph Erickson	249 S.W. Glenmorrie Drive, Oswego		NE6-1873

Directors: Dr. Francis G. Gilchrist (1960) Mr. Murray R. Miller (1961)
Dr. James Stauffer (1961) Dr. Ruth Hopson (1960)
Dr. John Hammond (1962)

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Editor:	Mr. J. R. Rentsch	St. Francis Hotel, 11th & Main	5	CA 3-2161
Bus. Mgr.	Mr. Robert F. Wilbur	2020 S.E. Salmon St.	14	BE 5-7284

COMMITTEE CHAIRMEN

Program	-	Mr. Stephen W. Blore	Telephone	-Mrs. Amza Barr
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Publicity	-	Mrs. Paul W. Howell	Public Relations	-Mr. Clarence Phillips
Museum	-	Mr. Lon Hancock	GSOC Libr. Night	-Dr. John Hammond
Service	-	Mr. Franklin Davis		

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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(See "Calendar of the Month")

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

Library Night: Once a month. Lewis and Clark College, Biology Bldg.

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

Buffet luncheon every Thursday noon, second floor, Portland Chamber of Commerce, 824 S.W. 5th. $1.25.

Friday January 8 — Dr. Arthur Jones will be the speaker. Subject: "Areo Glimpses of the Geology of the Columbia Gorge and Basin."
Slides will be shown, taken from the ground and the air. Discussion.

Friday January 22 — Dr. John Allen, of Portland State will be speaker. Subject: "Cracking Davy Jones' Locker." Also a discussion of the recent developments in submarine geology.

Friday March 11 — Annual Banquet

Sunday January 17 — Field Trip

ANNUAL BANQUET

The Annual Banquet of the Geological Society will be held March 11th at St. David's Episcopal Church, 2800 S.E. Harrison St. The price of tickets will be $2.00, and they will be on sale after the first of January. Chairman-Mr. Irving Ewen, AT1-7098.

Mr. Leo Simon will be in charge of ticket sales and seating arrangements. His home phone number is BE6-0549.

- JANUARY FIELD TRIP -

Meet at 12:30 p.m. Sunday, January 17th, at Mt. Tabor Crater in Mt. Tabor Park. Two very interesting collections will be visited.

- FEBRUARY FIELD TRIP -

A bus trip to the sand dune area near Tillamook is planned for February. The Telephone Committee will inform you of the time.

- - BALLOT FOR THE NEW YEAR

In accordance with the instructions of Dr. Paul Howell, President, the Nominating Committee hereby nominates the following persons for the office specified for the ensuing year:

President	Mr. Franklin M. Brown
Vice-President	Mr. Robert F. Wilbur
Secretary	Mrs. Ruth E. Prentice
Treasurer	Miss Rose Hamilton
Director	Mr. Ralph S. Mason -(3 yr. term)
Editor, News Letter	Mr. J. R. Rentsch

Each of these candidates has signified a willingness to serve the Society in the capacity to which nominated.

Nominating Committee -
Mrs. Eleanor C. Peirce
Mr. Albert J. Keen
Mr. H. Bruce Schminky
Mr. Leo F. Simon
Mr. Fay W. Libby, Chairman

(cont. next page)

Nominations - continued

Other nominations may be made by members of the Society by filing with the Secretary, a list of such nominations, which shall be signed by at least ten members of the Society. Persons nominated must have expressed a willingness to serve in the capacity to which nominated.

* *

DUES FOR 1960

Dues are now payable. Make checks to the Geological Society of the Oregon Country, or just G.S.O.C. Mail to -

Rose Hamilton, Secretary
5412 S. E. Powell Blvd.
Portland 6, Oregon.

ADVANCING PRICES

Our hosts at the weekly luncheon propose to raise the price of meals from $1.00 to $1.25 after January 1, 1960.

- NEWS OF MEMBERS -

DR. ARTHUR JONES ELECTED DOCTOR OF THE YEAR

Members of the GSOC were particularly pleased this month to learn that one of our group, Dr. Arthur C. Jones, had been selected by the Medical Society of Multnomah County as the Doctor of the Year. Our feeling is that Dr. Jones well deserves this accolade, and we extend to him our heartiest congratulations. In addition to his private practice, Dr. Jones is Medical Director of the Rehabilitation Institute of Oregon and is also Professor of Physical Medicine at the University of Oregon Medical School. His unselfish efforts in the reclamation of the physically disabled is well known. Notwithstanding these multitudinous duties, the good doctor and his gracious wife, Doris, have given unstintedly of their time over the years to forward the interests of the GSOC both scientifically and socially. This interest is shown by the display of fossils and minerals in the windows of his office.

Dr. Jones, we of the GSOC salute you.

CHANGES OF ADDRESS

Mr. and Mrs. Chester A. Wheeler, 3055 SE 174th Ave, Portland 36, Ore.
Mr. and Mrs. Kenneth C. Hammill, 1905 NE 77th Ave., Portland 13, Ore.

NEW MEMBERS

Mrs. Thora Baker, 1831 S.W. Park Ave., Portland 1, Ore. Tel: CA8-7861
Mr. and Mrs. Myer Avedovech, 2214 NE Brazee, Portland 12, Ore. AT2-0645
Mr. and Mrs. Ford Lewis, 11015 SW Collina Ave., Portland 19, Ore. NE6-5970

RENEWAL

Mrs. Everett Elliott, 1530 N. 99W, McMinnville, Oregon

ANNOUNCEMENT OF NEW PUBLICATIONS - By FRANKLIN L. DAVIS

Adventure is Underground by William R. Halliday, M.D., Director Western Speleogical Survey, 206 pp illus., published by Harper & Bros. 1959. $4.50. Portland Library Call No. 551.44, H18a.

The text is well documented. Caves of the northwest receive appropriate attention both in the text and illustrations.

(cont. next page)

New Publications --

From Galaxies to Man A story of the beginnings of things by John Pfeiffer who states that the book was made possible by a Fullbright grant from the Department of State. In the preface the author states: "To a greater extent than ever before, physicists, astronomers, geologists, chemists and biologists are finding common interest in the development of the solar system, and the origin and spread of life." 234pp illus., published by Random House, 1959. $4.95. Portland Library Call No. 523.1, P52f.

The Study of Rocks in Thin Sections, by W. W. Moorhouse, Professor of Geological Sciences, University of Toronto. Harper & Bros., New York, 1959, 514 pages. Portland Library Call No. 552. 8 M82s.

The author states that the book has been planned with the purpose of providing in a single volume a brief review of the methods of optical mineralogy (with a minimum of optical theory), descriptions of the rock forming minerals encountered in the more common rocks, identification tables to assist in the identification of these minerals, and descriptions of the common types.

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METALLURGISTS ACQUIRE NEW RESEARCH TOOL

New York, N.Y., -- The nuclear reactor has recently provided man with the first new technique for altering the properties of metals to be discovered in 5,000 years, according to Dr. Douglas S. Billington, director of the Solid State Division of the Oak Ridge National Laboratory

"Until the advent of ionizing radiations in plentiful supply," he explained, "the metallurgist depended upon the same three methods for changing the properties of his materials that were known to the smiths of the Bronze Age. The three classical methods consist in introducing impurities into the melt, or alloying; deforming the metal by hot forging or cold-working; and heat-treating it by slow cooling or fast quenching. Now irradiation gives the art and science of metallurgy a fourth technique, one that can accomplish some of the same effects as each of the others but one that affords unexampled control over the variables.

"Metals derive their characteristics -- their hardness, ductility, tensile strength, electrical conductivity and so on -- from the size and geometrical perfection of the lattice structure into which their atoms settle or, conversely, from their crystalline imperfections. The minute crystals lie just beyond the resolving power of the eye and become visible at magnifications of 100 to 200 diameters. In the perfect crystal of pure metal atoms are found arrayed as ranks and files in three dimensions. Each atom clings to its appointed location although the lattice is maintained in perpetual vibration by heat. Whirling tightly about each atom is a complement of electrons.

"A metal in this pure state exhibits certain characteristics. If the lattice is now modified, broken into several pieces by mechanical impact for example, a change occurs in its properties. Thus, steel gains hardness under the blows of a hammer. Metals can also be 'hammered' by atomic particles, by speeding neutrons, electrons and energetic electro-magnetic waves such as X-rays. When high energy particles from an atomic reactor, or waves from a high voltage X-ray machine, impinge on a crystal or metal, atoms are dislodged from their lattice sites by billiard-ball-like collisions, some with force enough to knock still other atoms from their sites. After the structure has settled down following these events some sites are vacant and some dislodged atoms come to rest between rows of the lattice, distorting its orderly structure and altering its properties. The metal's ability to conduct electricity may thereby suffer. Electric current consists in the drift of free electrons between the rows of the lattice. Atoms wedged between the rows act as obstructions to the smooth flow of current and the metal loses effectiveness as a conductor.

"Vacated sites similarly affect the characteristics. When blocks of zinc and copper are placed in contact and heated, for example, thermal agitation causes neighboring atoms at the interface to exchange sites and a weld is formed. Blocks of irradiated copper and zinc weld at much lower temperatures because vacant sites encourage the migration of atoms between the two. Some atomic migration occurs in metals even at room temperature. But the process is slow. An alloy of copper and beryllium, for example, can assume one of two crystalline configurations and can change from one to the other at room temperature. The change proceeds at a sluggish pace, however, and may require as much as 1,000 years. Irradiation cuts the time to hours!

(cont.)

"Unfortunately, the cost of atomic energy is high. It is therefore unlikely that the new technique will displace the classical methods of altering metals on a commercial scale. The value of irradiation rests in its great power as a research tool. Studies have already shown that some commonly accepted ideas about the nature of solids are incomplete and in some cases erroneous. They have accordingly inspired new lines of study. Since the demands of technology now exceed our basic understanding in this field, it is plain that every addition to knowledge achieved by radiation techniques will find speedy application in industry."

Based on the Article,
"Ionizing Radiation and Metals",
Scientific American

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BROWSINGS --

During the Glacial Age the water level of the Pacific was perhaps 200 feet lower than at present. The Columbia therefore emptied many miles farther West. Also, the river deepened its channel far inland. Borings, for instance, at Interstate Bridge show that the bed of the river was 154 feet lower than today.

Lloyd Ruff

How can we know about earth's core without drilling? Soviet scientists are probing the earth by artificial quakes. They claim to have penetrated 12 miles deep.

HOW THE YEARS MULTIPLY

Some 100 years ago most all were saying that "Creation" began about 5600 years ago. Those thousands today have become billions.

The Scientist

QUARRIES

The largest sand stone quarry in the world is near Cleveland, Ohio. It is called the Buckeye Quarry and owned by the Cleveland Quarry Company. At maximum it is 600 feet wide, 230 feet deep, and 1800 feet long.

Elyria Chronicle

- Charles Darwin Centenary -

When we think of Darwin and his publishing his Origins of Species in 1859, we should also think of the Galapogos Islands. Darwin's visit here in 1835 set his mind in motion to formulate his famous theory of evolution. (The fifteen islands of this group are composed entirely of lava flows.)

- Former Residents -

Stone age hunters were roving this country and cooking their game here 24,000 years ago.
Stuart Chase.

CONSERVATION

Test of Plan to Cut Evaporation - -

Washington, Dec. 5 -- New tests in the Reclamation Bureau's Research program aimed at reducing evaporation from large reservoirs are being undertaken at Lake Mead in Arizona and Nevada and at Lake Sahuaro on the Salt river project in Arizona.

The rearch involves use of a thin film that is formed by applying a mixture of Hexadecanol and Octodecanol to the surface of the water. The chemical is colorless and odorless. It forms a thin film when properly applied by dusting in dry powder form.

(continued)

(Browsings)

Plan to Cut Evaporation - cont.

An estimated 13 million acre-feet of water is lost annually by evaporation from the larger western lakes and reservoirs.

The Oregonian

BLACK GOLD FROM THE OCEANS

By Lawrence A. Armour

Houston, Texas -- Last month, the State of Louisiana and the federal Government declared a truce in their prolonged legal squabble over property rights in the Gulf of Mexico. For the first time since 1955, they gave the petroleum industry a chance to take out new leases in the "no man's land" lying from three to 10-1/2 miles offshore. (Receipts are to be held in escrow until the Supreme Court ultimately decides whether the U.S. or the state owns the underwater property.) Since the 39,000 acres offered all border on producing fields, the bidding was spirited. The state and federal agencies jointly collected $88 million in bonus payments, over and above the annual rentals and whatever royalty proceeds may develop. For one 2,500-acre parcel in the rich South Pass section, Shell Oil paid $26 million, setting a new price record of $10,442 per acre for offshore land. Altogether, some $2.5 billion has been invested in the Gulf. Less than $500 million worth of oil and gas, however, has been taken out.

Wells are being drilled to a depth of some 12,000 feet in water from 30 to 100 feet deep. Some of the drilling is conducted from veritable man-made islands which cost up to 6-1/2 million dollars. Some mobile rigs for wildcatting are built at a cost of $3 million.

Of 2433 wells completed in July off the coast of Louisiana and Texas, 697 were dry holes. As compared to drilling on land, the chances of making a strike of oil are about four times as good.

Offshore drilling is also going on off California, Florida, Venezuela, and in the Persian Gulf.

Barron's, Sept 21, 1959

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GEOLOGY STUDY CLASS LEARNS LESSONS FROM THE LEAVES

For the last two months the topic for discussion on Library Nights has been paleobotany and botany. Many of us had numerous leaf prints and we were desirous of finding out what we could about them. Dr. Francis Gilchrist was asked to lead this project.

The first phase was the collecting of leaves from trees and shrubs in this area. Several members of the Geological Society met with Dr. Gilchrist at Hoyt Arboretum and were able to make a fine collection.

Following this collection, the leaves were pressed and later mounted on sheets of paper and labeled as to genus. On careful study we found that the most consistent characteristic of a genera was the character of venation. Most of the leaf prints that we had collected in the past all showed to a greater or lesser extent the ramification of veins within the outline of the print. If we had been fortunate we might have a complete print of the leaf, but if the angle of cleavage of our sedimentary rock denied us this we had to settle for a fragment of the leaf.

How could this study of modern leaves help us with the study of leaf prints of ancient plants? In the first place, we learned a great deal about the individual characteristics of leaves from different genera. Secondly, we found that the genera that we were studying was represented well into the Cenozoic era. We noted that there was some variation as to species but at this time we were concerned only with the larger classification---the genera.

Some of the characteristics we listed as important were:

1. Leaves showing parallel or netted venation.
2. Pinnate or palmate types.

(continued)

3. Nature of the mid-rib or primary veins.
4. Characteristics of the secondary veins:
   a. Those that are straight and parallel
      (1) Extend to margin
      (2) Do not extend to margin
   b. Those that extend laterally and apically in an even gentle curve.
      (1) Extend to margin
      (2) Do not extend to margin
   c. Basal secondaries extending in a sweeping curve toward the apex
      (1) Extend to margin
      (2) Do not extend to margin
   d. Those showing an uneven or irregular course as they extend from mid-rib toward the margins
   e. Those joined near margins by loops of tertiaries.
5. Leaves whose tertiary veins are found at right angles to the secondary veins.
6. Characteristics of leaf margins. (Entire, serrate, dentate, crenate, incised, lobed, etc.)
7. General leaf shapes. (Linear, ovate, elliptic, cordate).
8. Nature of base and apex

Following these considerations an attempt was made to develop a key that would be an aid in the study of prints of fossil leaves. This was destined to prove difficult for to date no evidence of such a key has ever been made. This has been a most interesting challenge. We are finding the task a very interesting but intricate one. We have developed an awareness of minute leaf details and of constants within many of the genera.

From time to time we shall extend our study to genera found in other geographical areas. We have been and will continue to refer to the works of Chaney and Sanborn and others. Their illustrations include many leaves from plants extinct or now having an Asiatic origin.

John Hammond

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ATOM ON JOB IN BRITAIN

With Calder Hall reactors feeding into its national power grid and several other stations nearing completion, Britain now leads the world in the peaceful application of atomic energy, it was declared this week by Sir Christopher Hinton, director of design and construction of the United Kingdom's atomic power plants.

"Our first power reactor," said Sir Christopher, " 'went critical' in May 1956. By the following October, when power was turned into the distribution network, the reactor was working at practically full-rated capacity. On December 13 of that year the Central Electricity Authority placed orders with the industrial combines for the first two industrial nuclear power stations. One of these is at Bradwell on the Thames estuary while the second is at Berkeley on the River Severn. These two plants are now well advanced. Six months later a station was authorized for the Scotland Electricity Board and this is also proceeding. A few weeks later the largest station of all was ordered by the Central Electricity Authority and work on it is starting. The total value of all these orders amounts to something over a half billion dollars; the capacity of the stations will approximate 1.4 million kilowatts.

"Technically, we have thus passed our first crisis in the utilization of atomic power. This was surmounted in 1956 when the successful operation of Calder Hall established that our plans were well founded. The next hurdle will be encountered in 1965, primarily one involving economics.

"Reduction in capital cost per kilowatt of generated and delivered power is essential if the atom is to serve peaceful power purposes. Nuclear power has been given a temporary advantage which it cannot hope to hold indefinitely. These early nuclear plants are being used as base-load stations, that is, they are operated continuously. Obviously when a power plant has a high capital cost and a low fuel cost it is most economical to keep it in operation on full load for as many hours as possible during the year. By 1965 it will be impossible to give this advantage to the nuclear plants. Then the total installed capacity of nuclear power will be such that nuclear stations will have to carry a share of the peak loads, and it will be impossible to run them steadily at their designed capacity. --- (continued next issue.)

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CALENDAR

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Friday February 12 — 7:30 p.m. Multnomah County Library
Professor James Stovall, Professor of Geology, University of Oregon, will present a talk entitled "LAND FORMS of EASTERN OREGON."
It will be an interpretation of the Geology of Eastern Oregon based on its land forms and will be illustrated with slides. Professor Stovall is a long time resident of Oregon and is thoroughly familiar with its Geology.

Friday February 26 — Multnomah County Library, 7:30 p.m.
Dr. Francis G. Gilchrist, Professor of Biology, Lewis and Clark University, and former President of this Society, will give a talk entitled,
"THE MORNING OF LIFE and the COMING OF THE VERTEBRATES."
His talk will be illustrated with slides.

Sunday February 21 — Field Trip

Friday March 11 — Annual Banquet

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Editor, News Letter	Mr. J. R. Rentsch

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Rose Hamilton, Secretary
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Portland 6, Oregon

FEBRUARY FIELD TRIP

Bus trip to Cape KiWanda and sand dune area. Round trip fare $2.50, payable in advance. Meet at Portland State College, Sunday, February 21. Bus departs at 8:00 a.m. Bring lunch. Trip leaders: Dr. Ruth Hopson and Dr. James Stauffer.

Get tickets from Franklin Brown.

-REPORT OF JAN. 17TH FIELD TRIP-

The group met at the Crater, Mt. Tabor Park, 12:30. A caravan of 8 cars made the trip. Our first stop was at the home of Lon Hancock where we saw a fabulous collection. Later we arrived at Peter Dick's, whose collection can be called exquisite, consisting mostly of agates and minerals.

NEWS OF MEMBERS

Dr. James Stauffer and Mr. Leo Simon have been elected to the Board of Directors of the Oregon Museum of Science and Industry.

Dr. E. M. Baldwin is now in the midst of his first year teaching at the University of Decca, East Pakistan. His teaching in the Dept. of Geology is with graduate students and he is leading them on several field trips, seeing much of that interesting country so near to the world's highest mountains.

Louis E. Rydell has joined the staff of Harza Engineering Co., Chicago, on an assignment in Pakistan. He has been chief of the planning branch of the Walla Walla district of the Corps of Engineers. In his new position Mr. Rydell serves as resident manager In Pakistan preparing plans for a development of the Indus River. He has been with the Corps for 25 years and has also served on the Oregon state hydro-electric commission.

(Engineering News Record, Jan. 7, 1960)

NEW MEMBERS

Miss Rowena Hoven	2829 S.E. Belmont St., Portland 14, Oregon	Telephone-BE4-9005
Mr. Wayne M. Haglund	28250 N.W. Cornell Rd., Hillsboro, Oregon	Telephone-MI8-3851
Mr. David W. Ford	6457 S.E. 77th Ave., Portland 6, Oregon	Telephone-PR1-4095
Mr. & Mrs. S.E. Lovett	14975 S.W. 74th Ave., Tigard, Oregon	Telephone-ME9-2065
Mr. Stuart Hopkins	1650 S.E. Hawthorne Ave., Portland 14, Ore.	BE2-5897

* *

TWENTY-FIVE YEARS - PLUS?

The history of the Geological Society of the Oregon Country these 25 years just passed has been remarkable, or so it seems to one like myself who dates back about 10 years. Its strength has been the eager scientific curiosity and commitment of a comparatively few people, mostly amateurs, who under the guiding tutelage of some of our professional geologists have explored and endeavored to explain the rich geology of the Oregon Country. Numerous others have enjoyed the fellowship of these enthusiasts and have gained much in appreciation and understanding from the lectures and field trips of the society.

Now a new leadership is developing, and we welcome it. It would be a mistake to sharply contrast the older members who have largely led during the first twenty-five years with the newer members to whom we look for leadership in the years which are ahead. Nevertheless there are some points worth thinking about.

The men who founded the Society were students in the extension courses taught by Dr. Edwin Hodge. They were not masters of Oregon geology when they started, but they had the drive to study and explore until the story of our Northwest came alive to them. Perhaps some of the newer members of the Society are awed by the seeming erudition of some who are older, and they may feel that they do not have the background to take leadership. But right here is the challenge. The younger men have the same opportunities and can have the same rewards.

Twenty-Five Years - Plus? (cont.)

Indeed they have more opportunity, for a ground plan has been laid, and they can add their labor to what has already been done. The last word has not been said. The geology of the Oregon Country is still open to interpretation.

What a wonderful hobby geology, or any aspect of nature for that matter, especially if one takes it seriously enough to try and master it. Look around our Society. One need not look far to discover that there are those who have retired or are about to retire from the demands of earning a livelihood, some whose lives have been made rich and full by their life-long interest in nature. Can you imagine that time will ever hang heavily on their hands?

But is our Society running out? Are our younger members having the same opportunity to acquire and mature in geology as a hobby that the older members had? Perhaps we need to plan for them. Some of our meetings could well have a classroom atmosphere. The older members went through this in their day. The younger members have not, and they often find the subject technical and not easily understood. We still need the instruction of the professional geologists among us. Then why not some field trips for the younger members, trips further from the beaten path and more exploratory in character, or further afield as in the earlier days of the Society?

It is gratifying to see that the Society has broadened its base. Geology is by nature a very broad subject. It overlaps astronomy, meteorology, physics, chemistry, and wide fields of biology. One may note that on field trips and sometimes in the lectures great interest has been shown in trees, flowers, and animal life. Some of the most attractive lectures have been those in which we have enjoyed the sheer beauty of the world about us as portrayed by colored slides.

Our Society in the next twenty-five years will have opportunity to further share in the development of the Oregon Museum of Science and Industry, and in its scientific endeavors such as Camp Hancock. We can be proud of the part it has played in the past and can look forward to continued service and contribution.

The next twenty-five years will be exciting years for everyone who tries to understand what is going on in science. The many "break-throughs" of the last two or three years give promise of surprising new scientific insights in the years which are to come. A great door is open to G. S. O. C.

- - - Francis G. Gilchrist

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THE PLOT BUTTE CAVE

By Phil F. Brogan -

Bundles of bones pose one of the mysteries of Oregon's much-publicized cavern, the Plot Butte cave of the Fort Rock country southeast of Bend and directly east of Newberry Crater.

Actually these bones are not neatly tied in packages and stowed away on cavern shelves. But they are found in compact piles. Each pile represents some creature. There is no intermingling of bones back in the lightless cavern, discovered by fire fighters in the 1959 season and later set aside by the U. S. Forest Service as a place of scientific interest.

Under what circumstances were these bones so neatly deposited in the lava tube, as far back from the entrance as a third of a mile?

Prof. A. C. Waters of John Hopkins University has come up with a possible answer. The eastern geologist visited the newly-discovered cave this past autumn and made a number of discoveries of interest, including the manner in which lava rosettes on the cavern floor were formed.

It is the belief of Prof. Waters that the bones now found in isolated "bundles" in the cave represent the remains of creatures that were carried into the tunnel in flash floods. The opening of the cave is in a slight depression, on a broad flat near Plot Butte, a landmark of the area. Occasionally through the centuries the area has been visited by flash floods following heavy electrical storms. As the water swept into the mouth of the cave, through a ceiling opening, it apparently carried considerable material from the adjacent nearly-flat area. Such material could have included animals caught in the torrential downpours.

Prof. Waters mentioned that the flood in the cave, following the gentle slope of the cavern, could have carried the carcasses back into the tunnel intact. Now old bones remain to mark the spots where the floating carcasses came to rest.

One of the strangest carcasses found in the cave was that of a river otter. Certainly such a creature would have been out of place in the Plot Butte area of the semi-arid Fort Rock country today. But, it was noted by Dr. Arnold Shotwell of the University of Oregon, conditions were not always like this. In pluvial days great lakes spread over much of south-central Oregon. There is evidence of an old lake bed near Plot Butte.

Rabbit remains are abundant in the cave. Part of a skeleton of a fox has been found. There is considerable rodent material, and bones of a few birds still native to the area have been reported.

Most striking features of the cave, recently extended through discovery of a 2,000-foot tunnel that is a part of the main five-eighths mile bore, are its "lavacicles"--delicate lava stalagmites hanging from the ceiling. On the cavern floor are many stalagmites, some of them massive, but most of them delicate.

Prof. Waters found the lava rosettes, well back in the rugged bore, of primary interest. He advanced the theory that these were formed by hot lava bubbling up from the cavern floor, with each "burp" of lava-laden gas forming a leaf of the rosette. A study of the rosettes proved that the theory was correct.

The cave explorers discovered evidence that the newly-discovered section of the cave was once filled with water. Both caves are typical lava-river tunnels. Earth-science students will find Plot Butte cave of much interest. Tourists will find them rugged. Entry is only by U. S. Forest Service permit.

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FORMATIONS AND FOSSILS IN THE VICINITY OF BRUNEAU, IDAHO

By L. F. Heuperman
P. O. Box 140-K, Yachats, Ore.

The data for this article were obtained from
"SKETCHES OF IDAHO GEOLOGY" By Edward F. Rhodenbaugh, M. S.

The town of Bruneau, Idaho, is reached by traveling southeast from Boise on Highway 30 a distance of 43 miles to Mountain Home, then southerly on State Highway 51, a distance of 16 miles, to a bridge across the Snake River and continuing southerly 5 miles to the town of Bruneau where the Owyhee Mountains from the southwest merge into the Bruneau Plateau.

Bruneau is situated on the Bruneau River, a local road runs southeasterly and climbs from Bruneau to the town of Hot Springs continuing on the Bruneau Plateau. Here the Bruneau River runs through a narrow canyon, 1000 feet to 2000 feet deep, the lower part of this canyon cuts through rhyolite and the upper part through basalt.

The Bruneau River is a tributary of the Snake River coming from the South and running northwesterly past Hot Springs and Bruneau to its junction with the Snake River.

Before the Miocene the Snake River ran through its valley in the vicinity of its present course. The location of the present town of Bruneau is somewhat north of the southerly edge of this ancient Snake River valley.

In the Miocene the ancient Snake River was blocked by lava flows in Hell's Canyon which backed up the river flow to form a large lake, known as Payette Lake, which is estimated to have had a surface elevation of about 4500 feet above sea level covering the present site of Boise to a depth of some 2000 feet and probably reaching a somewhat lesser depth at the present site of Bruneau.

In this lake sediments accumulated later hardening into sandstones, shales, fresh water limestones and tuffs, intercalated in various places with thin lava flows. These beds are known as the Payette Formation and contain fossils of conifers, deciduous trees, clam and gastropod shells, fish bones, all fresh water forms.

In the course of time the lake water overtopped the basalt dam in Hell's Canyon and wearing this down by erosion lowered the level of Payette Lake until the lake had disappeared and Snake River with its tributaries began cutting new channels in the beds of the Payette Formation. The Bruneau Dunes occupy an area of several square miles about 2 miles southeast of the bridge across the Snake River between Mountain Home and Bruneau. These dunes

Formations and Fossils in Vicinity of Bruneau, Idaho - cont.

are about 300 feet high and are built of sand carried by the winds from soft sandstones of the Payette Formation

After an interval of erosion a series of new lava flows again blocked the lower Snake River, in the Pliocene, resulting in the formation of a new lake over the Payette formation, known as Lake Idaho, the surface of which reached an elevation of about 2700 feet above sea level with a depth of water of over 100 feet at the site of the bridge between Mountain Home and Bruneau, the water becoming very shallow or tapering off at the present site of Bruneau. Beds of Upper Pliocene age, known as the Idaho Formation, accumulated in Lake Idaho. These beds are generally light-colored and are largely composed of volcanic ash and soft white shales intercolated with thin flows of lava. They contain a great deal of fossilized plant material, opalized and agatized wood, and the bones of horses, camels, bison, beaver, fish, birds, etc. The remains of ancient one-toed horses (?) are found in the beds on the Bruneau River.

In the Pleistocene glacial deposits were formed at elevations higher than 5000 feet above sea level with glacial outwash and stream deposits at lower elevations. In these deposits many mammalian fossils are found including musk ox, sloth, mammoth, mastodon, horse, camel, giant ox, bear, beaver, carnivores, etc.

Through the Courtesy of Eleanor Gordon, Salem, Oregon

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ATOM ON JOB IN BRITAIN - (continued from January issue)

This will result in an increase in the capital charges per unit of electricity sent out, and unless the capital and operating costs of nuclear plants have been brought down they will no longer be able to compete with conventional plants. On that date nuclear power will meet its second crisis.

"It would seem reasonable to say that, starting from nothing in 1946, the British are, temporarily at any rate, ahead of the U. S. in the industrial-reactor field. The real reason for this would appear to lie in the well-known relation between necessity and invention. British supplies of coal are running short and all of our oil is imported. From the outset we realized that we would need nuclear power and need it soon.

"There is no reason to believe that Americans could not have organized with equal success, but you did not have the same need. Now that your first industrial reactor is in operation, we look forward to competition and collaboration, not merely between teams working in the United Kingdom, but between teams working in our two countries."

Scientific American, March 1958 issue.

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BRIDGE OF THE GODS LEGEND, ITS ORIGIN, HISTORY AND DATING

By Donald B. and Elizabeth G. Lawrence, Dept. of Botany,
University of Minnesota

(Reference: Please review GSOC article in News Letter of 1937, 3:78-83, "Drowned Forests of the Columbia River Gorge," by D. B. Lawrence.

This abridged article by Donald B. and Elizabeth G. Lawrence is provided through the courtesy of the Mazamas from their issue of December 1958.)

When Bonneville Dam was completed and the Columbia River rose behind it, Cascade Rapids, one of the scenic attractions of the Pacific Northwest, disappeared beneath the waters of the new lake. Up to that time a fine view of the rapids could be seen from the modern highway "Bridge of the Gods" which crosses the river near the town of Cascade Locks, three miles above the Bonneville Dam. The name of the bridge might remind persons using it that the legendary "Bridge of the Gods" was said to have crashed into the river at that very spot, its wreckage being responsible for the beautiful cascades. (Fig. 1, P. 13)

Daniel Lee (1844). "The Indians say these falls are not ancient, and that their fathers voyaged without obstruction in their canoes as far as The Dalles. They also assert that the river was dammed up at this place, which caused the waters to rise to a great height far above and that after cutting a passage through the impeding mass down to its present bed, these rapids first made their appearance."

Since the first historic records were set down by Lewis and Clark 153 years ago over fifty articles have been written which bear entirely or in part on this fascinating problem of the formation of the Cascade Rapids and the drowning of the submerged forest.

It is interesting to recall that although Lewis and Clark were the first to record observations on the submerged forest (1805, published by Thwaites, 1904-05) their idea as to the origin of the Cascade Rapids was correct; but they thought the river had been dammed only twenty years before their journeys through the Columbia Gorge in October 1805 and April 1806. From the time of Lewis and Clark, as long as river surface travel was popular, thousands of drowned trees, some of them twenty-five feet tall, arrayed along the river banks and plainly visible at low water stage, were subjects of endless controversy among explorers, missionaries, early settlers, geologists, and boatmen.

Let us review now the events which led up to the drowning and preservation of the submerged forest trees.

About 800 years ago the Columbia River flowed from Celilo Falls 200 miles to the sea, peacefully, without obstruction. Celilo Falls, now submerged by impoundment behind The Dalles Dam, was then even more spectacular than the great falls we can remember, being sixty feet high at low water stage, and too high for salmon to pass at any season, so that the arid country along the river above that point was, according to Indian report, a very inhospitable land capable of supporting only a few nomadic Indians who were usually on the verge of starvation. From a place about one mile northwest of the present town of North Bonneville, the north bank of the river rose steeply to an elevation of perhaps 3500 feet, for there existed then a southeastward continuation of the top of Table Mountain extending probably three quarters of a mile beyond the great scarp which forms that mountain's present southeastern face. There was probably a cinder cone about 2500 feet high located somewhat to the east of the present face of Red Bluffs, and southeast of the summit of Greenleaf Peak. Both these structures rested on the easily eroded Eagle Creek formation whose bedding planes slope in a southeastward direction toward the river. The summit of Table Mountain was, as its remnant is today, capped by a layer of Columbia River Basalt 1500 feet thick. The river's north edge was located approximately on a straight line from Stevenson to Beacon Rock, and it was gradually cutting into the soft Eagle Creek rock foundation, undermining the basaltic cap.

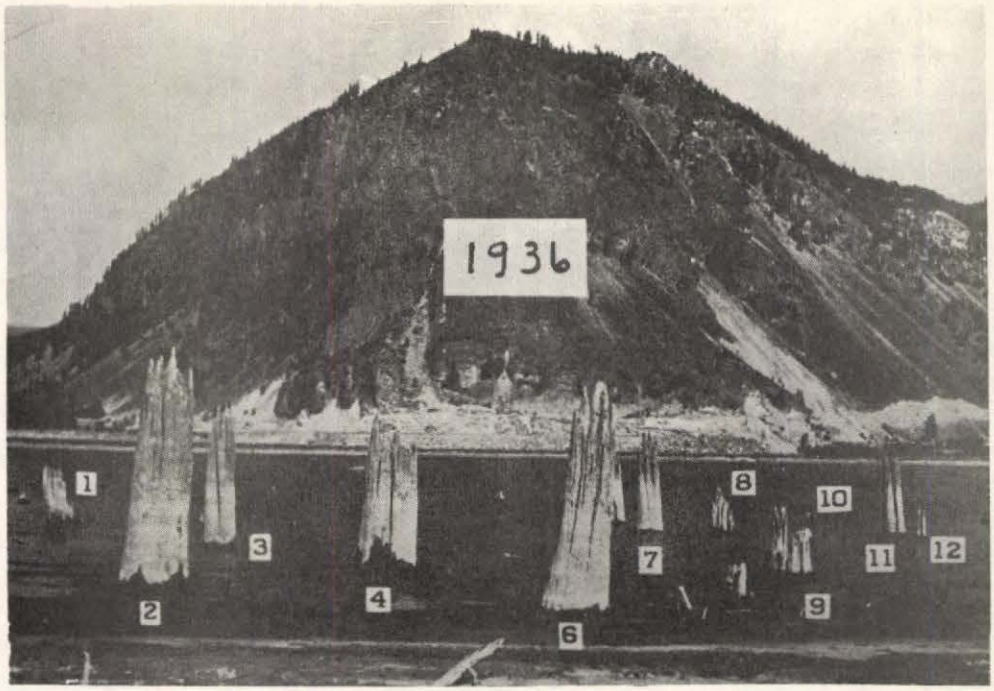
Finally, there came a time, near 1250 A.D., when the undercut extension of Table Mountain could no longer sustain itself and, quite possibly with a final stimulus of volcanic earthquake, toppled over into the channel at a point about two miles west of the present town of Cascade Locks, initiating a sudden landslide that carried millions of tons of rock and soil into the channel, across the floor of the gorge, and even a little distance up the south wall, completely damming the river.

This "Cascade Landslide" or "Dam of the Gods," as Hodge (1934) called it, was quite surely cataclysmic in nature along its main axis and not a slow creeping slide as some authors have suggested.

To judge from present topography along the main axis of the Cascade Landslide, the crest of the great dam that was thrown across the river must have been between 200 and 300 feet above present sea level. If the dam held water until it overflowed at the 200-foot elevation, the lake above the dam must have been at least ninety miles long, its area more than eighty-eight square miles, and its volume more than 5,200,000 acre feet.

Whether the lake burst through the dam within a few months or years after the landslide or waited about 525 years to 1775, as Barry thought, we do not know but it persisted long enough to permit sediment to accumulate to a depth of at least twenty-five feet around the trunks of many of the drowned trees, especially at the mouths of tributary streams where alluvial fans were built up.

The search for information as to how long the submerged forest trees have been dead has required twenty-five years and many man hours of labor. Large trees growing on the landslide over the location of the former river channel had been cut in 1912 to provide an open strip for the Northwestern Electric Company power line. Ring counts of the stumps showed that the slide had occurred before 1562 A.D. No similarities between ring patterns of the



Drowned Trees - 1936

Fig. 1. Aerial view eastward across the Cascade Landslide before Bonneville Dam had been built. Arrow shows direction of slide and thick white line indicates present site of dam. The approximate course of the river before the slide is shown by the dashed lines ~~(compare Fig. 4)~~. (Brubaker Aerial Photograph No. 33096) Reprinted by courtesy of the Geographical Review.

(Bridge of the Gods) - cont.

oldest parts of these stumps and the younger parts of the submerged forest stumps could be discovered, so that it was not possible by cross-dating to push back the date of the landslide beyond 1562. Indians told William Mansell Wilder that the landslide occurred "twenty old squaws ago," but we could not interpret that phrase in terms of years.

It was not until the recent development of radiocarbon dating that a method became available whereby the death of the submerged forest trees could be dated more exactly.

Two samples were analyzed. One, M-722, was dated at 670 years plus or minus 300 years ago. This was the large Douglas fir stump excavated from the East Wyeth group. The other, was a Garry oak stump excavated near the town of Bingen east of the Washington end of the Hood River-White Salmon Bridge; it was dated at 700 years plus or minus 200 years ago.

In the process of excavating about the stumps at Bingen, the old forest floor of pre-Cascade Landslide days was exposed and much of the forest litter including blackened pine needles and even grass blades still green were found intact.

The age of the landslide dam and the forest which drowned as a result is of special interest because we have wanted to know how long the wood of our common tree species could resist the ravages of decay organisms under these conditions of annual wetting and drying along the banks of a fluctuating river. The remarkable preservation of the portions of the stumps which had been buried beneath the silt and kept wet and away from air all these 700 years or so since the trees were drowned shows that here is an inexpensive method by which we might preserve for the use of future generations wood for which we now can find no economical use. The Japanese took advantage of this technique of preserving wood when, before World War II, they bought from us tremendous stocks of large Douglas fir timbers and buried them in Japanese salt marshes so that they would have suitable wood on hand when war began for making their inexpensive and efficient assault aeroplane, the Zero, with which they inflicted heavy losses on our armed forces.

Another reason for special interest in the date of the great Cascade Landslide is that Indians have reported from their orally kept histories that before the landslide the Celilo Falls were too high for salmon to jump over. Therefore the major portion of the valuable salmon fisheries industry was directly dependent upon the cataclysmic slide which produced two natural fish ladders, one at Cascade Rapids, the other at Celilo, and so greatly extended the salmon spawning grounds into the upper tributaries of the Columbia.

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HERE AND THERE

Correction -

In the last issue of our publication it was noted that our universe was said to be about 6 billion years old. Sorry, "not according to Hoyle."

Professor Fred Hoyle of Cambridge University and now visiting professor at the California Institute of Technology is now making the claim that the Milky Way Galaxy of which our system is a part is 24 billion years of age.

PLEASE, Dr. Allen!

Many members missed a fine lecture by Dr. John Allen January 22nd. In the course of the lecture Dr. Allen was measuring in "billions of light years." It was here this writer became somewhat lost, knowing a light year is "umpteen" trillion miles. (No offense, Dr. Allen.)

The Editor

GEODES -

The largest (?) geode yet found was turned up by Mr. and Mrs. John Glass of Weiser, Idaho. It is composed of agate crystal and weighs 367 pounds. When lightly chipped it showed blue-carnelian beneath.

The Oregonian

EXISTENCE OF LONG UNDERSEA CRACK

The existence of a continuous undersea crack 45,000 miles long in the earth's surface has been confirmed by Columbia University scientists.

The rift averages 20 miles wide and one and a half miles deep. It coincides with a world-wide active earthquake zone along its entire length, indicating it is a youthful geological feature that is growing, changing, or being pulled apart.

Dr. Maurice Ewing, director of the Lamont Geological Observatory, a division of the University, said that virtually 100% of the earthquake shocks along the 45,000 mile line occur almost exactly within the limits of the rifts.

"The main line of the world-wide rift system," he said, "extends through the North and South Atlantic Oceans, around the tip of Africa into the Indian Ocean, then branches through the Arabian Sea connecting with the famous African Rift Valleys, long studied by geologists.

"The other branch passes between Antarctica and New Zealand, running toward the Macquarie Islands into the Pacific Ocean, where it again branches near Easter Island. The northern branch continues toward the Gulf of California, which is considered a related feature. The rift belt passes from Cape Mendocino toward Lynn Channel, Alaska."

Referring again to the North Atlantic, Dr. Ewing said, "there is good evidence of a connection through the Norwegian Sea and the Arctic Ocean."

Thus traced, the zone is about 45,000 miles long.

Singificance of the findings, result of a five-year study, is that they may help to determine the origin of the major surface features of the earth and of changes that have taken place in its geological history.

Some of the mountains along the rift line reach a height of about 12,000 feet and are about 75 miles wide, but even the highest peaks are from 3,600 to 7,200 feet under the ocean's surface.

Deepest point in the rift line is about four miles below the surface, and the average depth is about two miles.

Marie Tharp and Dr. Bruce Heezen and their associates of the Lamont Geological Observatory collaborated with Dr. Ewing in the study.

Science News Letter, February 16, 1957

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CLASSIFY FOSSIL FINDS - -

Sonia Ruth Anderson, of Omaha, Nebr., and David Bachrach Adams of Neosho, Mo., are both lucky in that they live in regions where the upper layers of the rock formations are rich in traces of living creatures imbedded there millions of years ago.

Sonia, now a senior at Technical High School in Omaha, has been collecting Nebraska fossilized rocks ever since she was 10 years old. But the real labor began when she started to classify them. After it was accomplished, she found she had a neatly classified collection of over 42 eastern Nebraska fossils, found mostly along the Missouri River basin. Sonia also determined some of the organisms and conditions that existed there during past geologic ages. Her conclusions were that among others, gigantic turtles, camels and rhinoceroses must have existed in her neighborhood.

David, a senior at Neosho High School, found that the very hill on which he lived was a chert formation, full of fossil remains. From there and elsewhere he built up a collection of around 2,500 specimens and made it his project to identify and classify them. He found that there were very few descriptions of the local chert fauna in existence. David had to compare his specimens with descriptions of the fauna of that era in other parts of the country.

David concentrated his efforts on 10 species and one variety of Neosho productidae, a shell with two valves.

Science News Letter, March 2, 1957

GEOLOGICAL NEWS LETTER

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1959-1960

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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 Secretary.

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 Avenue and Yamhill.

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

Library Night: Once a month. Lewis and Clark College, Biology Bldg.

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

Buffet luncheon every Thursday noon, second floor, Portland Chamber of Commerce, 824 S.W. 5th. $1.25

Friday March 11 — Annual Banquet

Sunday March 20 — March Field Trip

For the benefit of new members we will take a trip around the Portland area to review the close-in geology. We will meet at the Mount Tabor volcano Sunday, March 20th, at 10:00 a.m., and look over gravel pits, quarries, roadside cuts and topographic features on the east side first. If we can we will eat lunch in the Oaks Park or nearby. In the P.M. we will review the geology of the west side. Those who have one, bring either Treasher's or Trimble's map of the Portland Quadrangle.

Bring lunches, notebooks, geo-picks, and cameras. Trip leader will be Paul Howell, with help from others who know the area better.

Franklin Brown

Friday March 25 — Betty Rae Dodds, amateur geologist and research worker in paleontology will present an illustrated talk entitled, "Brief History of Astoria, Oregon." It will include a discussion of the Type Tertiary of the West Coast with special reference to the geologists and the re-establishment of their collecting locales

NEWS OF MEMBERS

A salute to Emily Moltzner, City Chairman of the Dog Control Committee. At the coming election you may register your preference of whether dogs shall continue to run at large in this large and congested city. May 20th is the date. (N.S. has 26 million dogs on which was spent $150 million last year.)

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To Dr. John Hammond we extend our sympathy on the recent passing away of his mother.

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Hollis Dole is General Chairman for the 1960 Pacific Northwest Metals and Minerals Conference April 28, 29 and 30. The place - the new Sheraton Hotel. You may attend by making reservations.

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Rudy Erickson spoke on February 18 at the noon luncheon. Subject - "A Great Flood Atop Mt. Hood 1700 Years Ago."

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Dr. John Allen has a new mystery story, "Quick Frozen Elephants."

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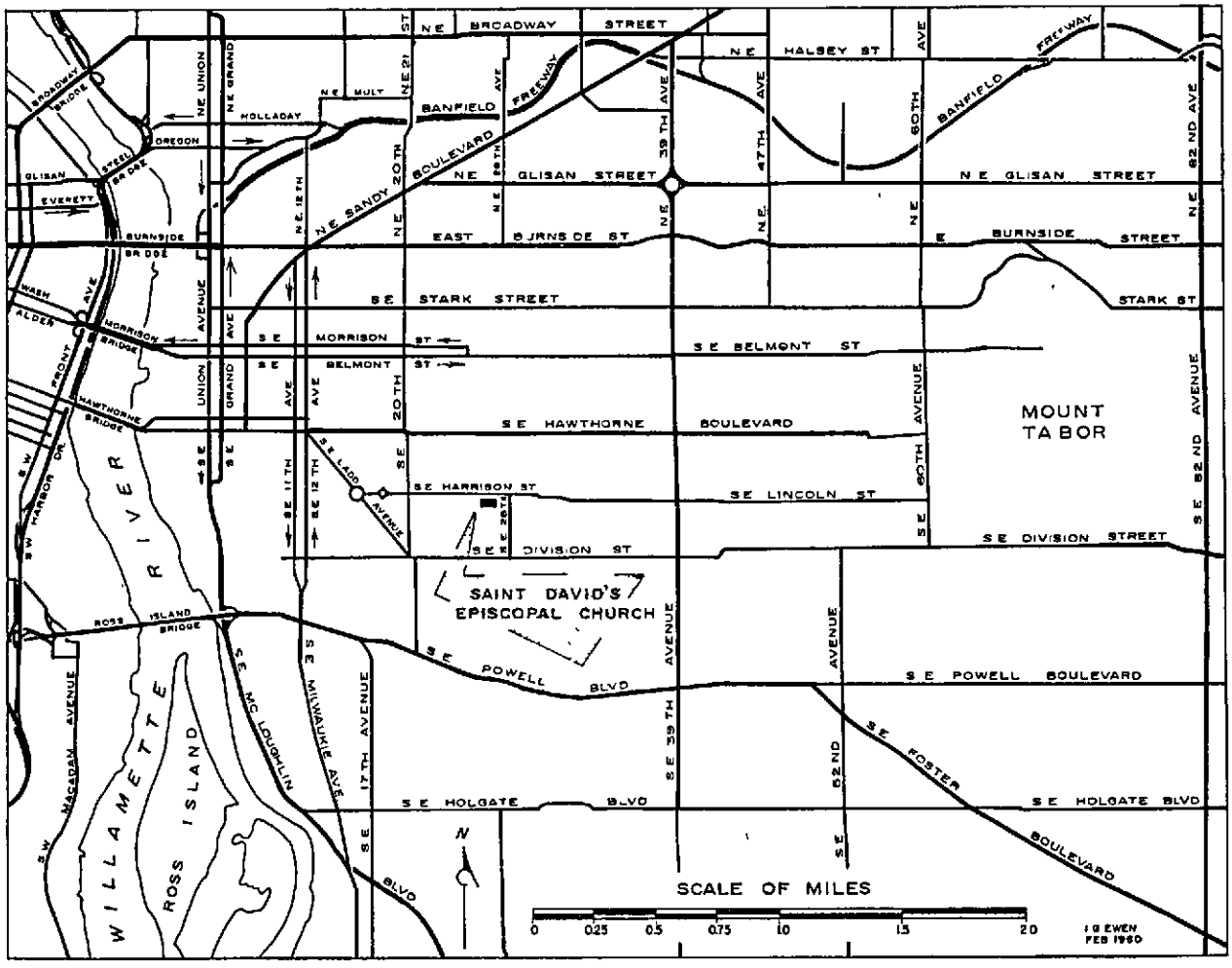
G.S.O.C. BANQUET NEWS -

Plans are nearing completion for what promises to be a very memorable occasion, the twenty-fifth annual banquet of the Geological Society of the Oregon Country. Special preparations are being made for celebrating this Silver Anniversary. The Chairman, Irv Ewen, reports several changes over previous banquets. It is hoped that these "departures from the established norm" will be favorably received by the society members. The changes made have been carefully considered and are intended to reflect the best interests of the society.

More -



VICINITY MAP SHOWING LOCATION OF
SAINT DAVID'S EPISCOPAL CHURCH

LOCATION

As previously noted in the GSOC Newsletter, this year's banquet has been changed to a more central location. The site selected was Saint David's Episcopal Church at 2800 S. E. Harrison Street on Portland's East Side. Harrison Street parallels Hawthorne Boulevard and Division Street and is situated approximately halfway between the two arterials.

TRANSPORTATION

The vicinity map shows the mainly travelled arterials within a two mile radius. The area may be reached via the Fifty Second Avenue Bus (via Harrison) which stops directly in front of the church. However, any buses travelling Hawthorne Boulevard or Division Street still stop within a walking distance of about four blocks.

Senior GSOC'ers who might not attend the Banquet for lack of adequate transportation are encouraged to avail themselves of the service provided by the new Transportation Committee. This group is undertaking to coordinate transportation to and from the banquet, especially for those without good bus connections (or "wheels"). For information call Miss Hamilton, PR5-9762.

TIME AND PROGRAM

The festivities will commence at 6:30 p. m. in the Parish Hall at the west end of the Church Building. Mr. Ralph Mason, Mining Engineer for the State of Oregon, Department of Geology and Mineral Industries, is master of ceremonies for the evening. The guest speaker will be Dr. Walter Youngquist, Professor of Geology at the University of Oregon, his subject, " A Delightful Surprise." The program will close with the presentation of a skit especially prepared by Mrs. Rudolph Erickson.

Banquet (cont.) -

TICKETS

Mr. & Mrs. Leo Simon are again handling ticket sales. The new price for adults is $2.00. Children's tickets are also available at $1.25. Phone reservations may be made by calling BE 6-0549 evenings. All seats are reserved.

MENU

The evening repast will be prepared by the women's guild of St. David's Parish. The menu includes a main dish of Roast Beef, baked potato, green peas, accompanied by rolls, coffee (or tea), salad, and dessert. GSOC'ers desiring fish in lieu of roast beef are requested to indicate their preference at the time of purchasing tickets. Milk will be provided for children.

CUSTOMS

Most customs, as observed in the past, will continue. The wearing of corsages (or buttonieres is encouraged. However, this year the Society will not provide the customary camelia corsages.

PARKING

A welcome feature for those attending this year's Banquet is the large parking lot just west of the Church.

ROCK RICHES IN NORTHERN OHIO

Up in northern Ohio, not far from the shores of Lake Erie, is one of the largest sandstone quarries in the world; it may be the largest. One can easily believe this if he stands on the brink and looks down into the gigantic pit below. It stretches out before him as long as six football fields and as wide as two (1800' x 600') and is eight times as deep (240') as the Willamette River at Portland. In this part of the United States the quarries extend downward from the even land surface about them. This may seem unusual to folks here in the Oregon Country, for our quarries almost exclusively extend inward into the sides of hills. Not so in the Midwest and the East. In those sections of the United States much of the desirable quarry rock is in strata below and nearly paralleling the earth's surface, so quarries must go downward to get it. The great stone quarry mentioned above is appro known as the Buckeye Quarry and is part of the properties of The Cleveland Stone Company. In times past, especially in the late 1870's, there were many small quarries and quarry operators in this area, but, as the years went on and competition became too keen for most, the properties were gradually consolidated until now there are only The Cleveland Stone Company and The Ohio Cut Stone Company.

The reason for the large and continued quarry stone industry in this area is the presence there of one of the most easily cut and yet durable sandstones in the world. This is the Berea sandstone or Berea "grit", named by Newberry (the same after which Newberry Crater is named) for a small town in the vicinity. Another sandstone much sought after is the "Euclid-bluestone", but it is thinner than the Berea and not as easily cut and shaped. The Berea sandstone comes in various shades of buff and gray, and some of it is crossed by darker bands, so that in all many beautiful patterns can be worked out using this stone alone. It also has many industrial uses, and the stone sawdust is sold for making mortar. The purity of normal sandstones is often surprising, and that of the Berea is no exception. The following analysis is given by The Cleveland Quarries Company:

Silica	93.00%
Alumina	4.00
Ferric Oxide	1 25

Lime	0.75
Titania	0.50
Magnesia	0.50

Pecific gravity is given as 2.14, absorption as 6%, and crushing strength as 8,000 to 10.000 psi. Weight per cubic foot is given as 144 lbs.

United States Geological Survey Bulletin 818 has this to say about these two sandstones:

"The Berea sandstone or "grit" is a medium to fine-grained, gray, faint yellow, or bluish-gray sandstone, generally very evenly bedded. Yellowish to buff colors are always found in the upper parts of the quarries, where the iron compounds have been oxidized to limonite.

This sandstone is the great quarry-rock of northern Ohio and ranges from 30 to 135 feet thick within the Cleveland district, although at Amherst, in the Oberlin Quadrangle a thickness of at least 225 feet is reached. The rock, although commonly called Berea "grit", differs considerably in hardness, texture, and structure in the different strata. Quarry types are called shell rock, spider webb, split rock, and liver rock.

In this rock, as in the "Euclid bluestone", there is considerable pyrite that oxidizes to limonite, which stains the rock yellow to brown."

-----"Near Cleveland the Bedford Shale is replaced by a lenticular mass of bluish-gray argillaceous sandstone which was named by Prosser the Euclid sandstone lentil. It has been quarried under the name of "Euclid-bluestone". It is 20 to 30 feet thick, thinly and evenly bedded, dense and fine-grained. and is much harder, stronger. and less friable than its better-known neighbor, the Berea sandstone. It is still used for flagstone without being sawed. In one locality twenty layers 2 to 6 inches thick were noted in one 15 foot section. The rock is cemented by lime and iron carbonates."

The Euclid sandstone is of late Devonian age and was deposited in freshened waters after the deposition of previous black muds (the Cleveland Shale). The sediments apparently came from uplifted areas to the north. west. and east. The Berea sandstone is of later age, early Mississippian, and was deposited by streams flowing from the northwest under conditions of cool, moist climate. The source of the sediments was very possibly the pre-Cambrian highlands along the southern edge of the Canadian Shield.

We in the Oregon Country are not familiar with cut stone quarries, though a few do exist hereabouts. One of the closest to the Portland area is the Fern Ridge tuff quarry just south of Silver Creek Falls State Park. Another is the sandstone quarry at Tenino. Washington. Neither these quarries nor their business are even closely comparable to the great cut stone operations in the East, however. Interest in decorative stone is on the increase here. but our esthetic appreciation must be stimulated considerably before we can support such an industry.

-- P. W. H.

PARK PROJECT UNDER STUDY

BEND (2/7/30) -- The proposal that a volcanic national park be created along the crest of the Cascades from Mt. Jefferson south to Diamond peak was discussed at a meeting here by A. A. Poust. Deschutes National Forest supervisor.

The proposal was aired recently in an issue of the California Sierra Club Bulletin and received national attention.

Poust noted that the park would include a considerable area now within the Deschutes National Forest. He said creation of a park, withdrawing from use billions of board feet of timber, would have a heavy impact on the economy of the area.

The Deschutes supervisor compared the U. S. Forest Service concept of multiple use of forest areas with the restricted, single-use program of the park service.

The Oregonian

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Volume 25, 1959
Compiled by Robert Wilbur

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Compiled by Robert Wilbur

GEOLOGICAL NEWS LETTER

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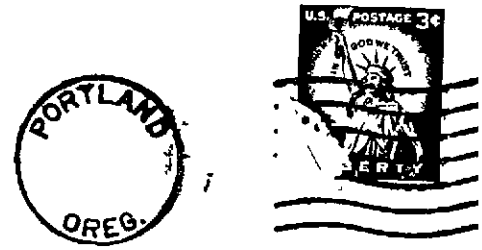

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1959-1960

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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 Secretary.

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 Avenue and Yamhill.

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

Library Night: Once a month. Lewis and Clark College, Biology Bldg.

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

Buffet luncheon every Thursday noon, second floor, Portland Chamber of Commerce, 824 S. W. 5th. $1.25

Friday April 8 — Lecture
"A Key to the Past", by Dr. John Allen

Sunday April 10 — Field trip to Leif Erickson Drive, along the east slope of the Tualatin Mountains in northwest Portland. Trip leader is Mr. Bruce Schminky who has given much study to the area and the stratigraphic relationships exposed there.
Due to the restricted road conditions it will not be a bus trip. To aid the trip leader we will consolidate passenger arrangements at the rendezvous point, which will be the south parking lot at Montgomery Ward. Rendezvous time will be 10:00 a. m. Bring your lunch, G-pick, camera, collecting bag, etc.

Friday April 22 — Lecture
"The Earthquake at Hebgan Dam", by Mr. Gerald McFarland, News Editor of the Salem Capital Journal.

May 14 - 15 A trip is proposed to Cove State Park?

Condon Lectures - 1960

By Robert P. Sharp - his subject "Streams of Ice"

The lecture, which will be given with a companion talk on "Blue Glacier" of Washington, will open the Condon series in Eugene on March 29 and March 31. The two talks will be repeated in Corvallis on April 5 and 7, and in Portland on April 11 and 12 at Portland State.

YOU ARE INVITED - -

The Mazamas cordially invite the Geological Society of the Oregon Country to their Clubrooms at 909 N. W. 19th Ave., at Kearney St. (second floor), on Wednesday evening, April 27th, at 8:00 o'clock, at which time Mr. Randall E. Brown will speak on "The Role of Geology at the Hanford Works."

Mr. Brown states: "It is the story of geologic and hydrologic research at Hanford in support of Hanford's quite famous practice of disposal of radioactive liquid wastes to the ground. It is similar to a talk I was asked to give this last November to the International Atomic Energy Conference onDisposal of Radioactive Wastes, in Monaco. It will be keyed to your interests, and illustrated with slides. The talk describes the ways that the General Electric Company uses natural resources to assure that their disposal practices do not and will not present a hazard, but also the ways in which those natural resources are being conserved against possible future need."

(Mr. Brown will be remembered as the very able and instructive guide and cordial host who made the G. S. O. C. trip to Hanford and the Pasco Basin last April so delightfully interesting.)

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Library Additions

Relation of Certain Jurassic and Lower Cretaceous Formations in Southwestern Oregon, By: Hollis M. Dole, Ralph W. Imlay, Francis G. Wells and Dallas Peck

Directory of Washington Mining Operations, 1959

Journal of Paleontology - January 1960

Mazama - December 1959 and 1960. Also map Mt. Hood

This Sculptured Earth, By John Shimer

Klamath County Museum Research Papers No. 2, From Samuel A. Clarke Papers

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NEWS OF MEMBERS

Al Keen has done it again. See his repeat show of rocks, minerals and gem-stones at the Central Library.

Franklin Davis is on the sick list. We miss you, Franklin.

Orrin Stanley as a City Engineer was once helping plot out a new street in Portland, but no name was suggested. His Chief asked Mr. Stanley if he might name it for him -"Stanley"? No, was the answer. It was the crookedest street of all. So they named it for Leif Erickson, not present to object.

Honors for Irv Ewen, for a fine job as Chairman of our 1960 banquet committee.

Science has put man in his place: one among the millions of kinds of living things crawling around on the surface of a minor planet circling a trivial star. - Marston Bates.

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RECOVERY OF OIL - Atoms in the Earth

In Northern Canada, sometime during 1961, the dull thud of an underground explosion may be the only outward evidence of a tremendous convulsion far beneath the earth. The explosion may unlock some 300 billion barrels of oil trapped in a strange deposit known as the Athabasca sands. The importance of this experiment can be judged from the fact that the entire proved oil reserves of the world presently amount to some 275 billion barrels.

In this Athabasca deposit, each grain of sand is coated with oil so sticky that no way has been found to separate it, so that it can be pumped from the earth. Now an oil exploration company is drilling a 36-inch hole, 1200 to 1400 feet, through the overburden and some 200 feet of oil sand and rock, down into the underlying layer of limestone. An atomic explosion, of from two to ten kilotons in size, will be set off at this point.

It's expected that the surrounding mass of rock will be instantly vaporized and a hollow ball, some 250 feet in diameter, will be formed. As this collapses, the oil sand formation is expected to tumble into the cavern. It is believed that the heat from the blast, which will continue to seep upward for months, will raise the temperature of the oil sufficiently to cause it to flow free of the sand. Then, the deposit can be drilled and the oil pumped to the surface.

-- Daily Journal of Commerce

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PLEASE NOTE!!!

Attached to this month's issue of the Newsletter you will find another Index to replace the one sent last month. You will note that the first Index sent you in March was misprinted.

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ROOTS OF OUR MINING LAWS

by
Fay W. Libbey*

Introduction: Pre-Gold Rush Conditions

English and Mexican mining laws and customs provided background for the United States in setting up mining laws, but the greatest contributions came from the miners themselves in the early days of the California boom camps. Before discovery of gold in California, the National Government acquired no property rights in the thirteen original states or in the territories claimed by these states lying west to the Mississippi River, which were eventually added to the United States. The Federal Government started a leasing system for lead mines in Missouri in the absence of applicable mining laws, but apparently there was confusion and dissatisfaction in the operation of the leases. The final result was that the Government sold these lands, with a few reservations, to private bidders and the lands became privately owned.

Public Domain

The public domain of the country was carved from the Louisians Purchase, the Florida cession, California territory, and the Gadsden Purchase from Mexico. In all, this vast empire comprised more than one and a half million square miles.

California Gold Rush and District Codes

The California territory was seized by our Navy in July 1846 and then news of the discovery of gold at Coloma in January 1848 hit the world. As has been related many times, immigration of all varieties of humans from all parts of the world swarmed into the foothills of the Sierras. There were no laws in California at that time to govern acquisition of mineral lands. According to the treaty with Mexico, title to these lands was vested in the United States and jurisdiction was in the hands of the military until California was admitted as a state in 1850, but there was little, if any, interference or supervision by the military authorities with the over-running of the country. Thus to prevent or overcome complete lawlessness, local committees adopted rules or codes for the various mining camps. Some of these codes legislated on civil and criminal laws as well as possessory rights in mining claims.

There was no appeal from most of these civil and criminal regulations. Primarily the miners' codes governed the staking and maintenance of possessory rights in the gold gravels, and the system of setting up district mining codes followed the prospectors into Oregon, Idaho, Montana, and British Columbia.

Framework of District Mining Codes

The basic ideas of the mining codes came from the Spanish and Mexican laws - that is, discovery is the source of title, and development or working of the claim is the condition of possessory right.

At first, only placers were of concern in the miners' district codes. Then, of necessity, the right to possession of quartz or lode claims became equally or more important and, in this regard, the rule of property was adopted that, with certain restrictions, the miner could work his vein to an indefinite depth regardless of whether or not in so doing he went outside his surface boundaries. This was the Law of Extralateral Rights, or commonly called the Apex Law. There was no similar rule in mining laws of other countries which universally adhered to the principle of vertical boundaries. The only exception was in the custom of lead miners in Derbyshire, England, in following rake veins.

California was admitted as a state in 1850 with no reference to mineral lands in the act of admission, so the new state retained in full force the local rules and customs of the

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*Mining engineer, Portland, Oregon.

mining districts, and these rules and regulations received the sanction of State courts and the Supreme Court of the United States. For 18 years - from 1848 to 1866 - the regulations and customs of miners as enforced and moulded by the courts and sanctioned by the Legislatures constituted the law governing property in mines and water on the public domain.

Creation of Interior Department

In 1849 the Congress created the Department of the Interior and placed supervision of mineral lands in the General Land Office of the Department.

It was first recommended by the Secretary of the Interior that the California mineral lands be leased by the Government and a part of the gold produced be retained as seigniorage but nothing came of his recommendation.

Act of 1866

Some feeble attempts to pass a general mining law were made by Congress but they were unsuccessful. In 1864 and 1865, laws were passed regulating sale and disposal of coal lands as well as sale of town site property on public domain. In 1866 a law of some local significance was passed concerning Nevada boundaries and referring to mining claims. Then on July 26, 1866, Congress passed the first general law under which title to public mineral lands could be obtained in what was then known as the precious metal-bearing states and territories. Even though this law was crude and was in the main superseded by later laws, it was a step in the right direction, but only a step. It did establish a basic Government policy as follows:

(1) That all mineral lands on the public domain should be free of entry and open to exploration and occupation.
(2) That rights acquired under the system of local rules should be recognized and confirmed.
(3) That title to at least certain classes of mineral deposits or lands containing them might ultimately be obtained.

Deficiencies in the 1866 Act

This 1866 law was limited in operation. By its provisions, all mineral lands were thrown open to exploration but only lode claims could be patented. Just why the law was concerned with lodes, to the exclusion of placers, is not clear. Perhaps a principal reason was that the rich placers were on the decline and rich lodes, as represented by the Comstock and veins in California, Montana, and Idaho, were in the ascendancy. Much litigation had developed over mining property rights, and a law giving some certainty of mining titles was urgently needed. Many millions of dollars were spent on litigation on the Comstock alone.

In the act of 1866, as well as in local rules, the lode rather than the surface was the important feature. By this law, possession of and title to the lode or vein were given rather than to the land containing the lode or vein. Only the lode was located, the location notice calling for so many feet on the vein. No rules were set up for side lines and the locator could follow the lode wherever it went on the dip.

As would be expected, many patents were issued specifying weird areas and boundaries, and many difficulties were experienced by the General Land Office in interpreting the law.

Placer Law of 1870

The law of 1866, as stated above, made no rules for placers, and until the Placer Law of 1870, the local rules entirely governed rights to placers. The 1870 Placer Law defined placers as claims usually called placers including all forms of deposits excepting veins of quartz or other rock in place. The act stated that placers should be subject to entry and patent under like circumstances and conditions as provided for lode claims, except that a survey was not necessary where the entry conformed to legal subdivision.

Act of 1872

The Placer Law of 1870 remained in force only two years. It was superseded by the general mining act of 1872 which, while preserving the principal features of the preceding laws, provided the basic provisions of the law as it exists today, although there have been many

Roots of our Mining Laws -(cont.)

additions to the law itself and a multitude of court decisions and administrative orders, all of which have the force of law.

The 1872 law established the surface containing the lode as the essential feature of the mining claim rather than the lode itself. In other words, the claimant locates and patents the surface of the claim on which a legal discovery has been made and, insofar as possible, lays off his boundaries so as to include the maximum apex rights of the vein or veins of the surface. To obtain these maximum rights, the end lines of a claim must be parallel to each other and perpendicular to the course of the lode; otherwise the end lines may become legal side lines, and side lines become legal end lines as far as the Apex Law is concerned. Incidentally, apex litigation has dwindled to almost nothing in recent years compared to the mass of lawsuits in the heyday of the boom mining camps of the West.

A lode claim is normally a maximum of 1500 feet long by 600 feet wide. A placer claim is 20 acres for an individual, and 160 acres for a group. Under certain conditions, fractions of a claim may be located.

State Laws

State laws supplement Federal laws but may not conflict with them. Of course State laws as well as Federal laws must be strictly observed in the several steps by a mineral claimant leading to possession and ownership of mineral land of the public domain.

Leasing Act of 1920

Another important step was taken in the construction of the basic mining law by the passage of the Leasing Act of 1920, by which certain minerals - namely, coal, oil, oil shale, gas, phosphate, and sodium - previously locatable under the mining laws, could be acquired only by leasing from the Government. In 1926 Congress placed sulphur in Louisiana under the leasing law and in 1927 extended the law further by including chlorides, sulphates, carbonates, borates, silicates, or nitrates of potassium.

Government Bureaus May Sell Certain Materials

In recent years the Bureau of Land Management, which succeeded to the duties of the General Land Office, and the Forest Service have been authorized to dispose of common varieties of sand, stone, gravel, pumice, pumicite, cinders, and clay when such disposal is not detrimental to the public interest. The legal definition of "common varieties" may determine whether or not such materials may be located under the mining law.

"Valuable Mineral"

Colby[1] says, "Now it is generally recognized that any substance, other than organic, which possesses a special economic value for use in mercantile or commercial enterprises and in the arts and sciences, is a mineral within the contemplation of the mining laws. And if this substance is found in the land in sufficient quantity and value to warrant a prudent man in the expenditure of time and money in the reasonable expectation of success in developing a paying mine, such land is disposable only under the mineral land law. The extremely general nature of this test is indicative of the difficulties and uncertainties of the problem. As we approach the dividing line, juries, courts, and experts will naturally differ as to whether the deposit should be classed as mineral or not. The greatest differences of opinion have arisen over deposits of sand, gravel, gypsum, cement rock, limestone,

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[1] Colby, William E., Mining Law in Recent Years; California Law Review, Vol. 33, Sept. 1945, No. 3, pp. 368-387. Reprinted in California Journal of Mines and Geology, Vol. 44, No. 3, July 1948.

brick clay, granite and, in fact, all superficial deposits of low value, especially where the substance in question exists in large quantities and extends over considerable areas. Unless it has some unique quality and is confined to a comparatively limited area, so as to differentiate it from surrounding country, and unless it can be shown to have some special quality making it valuable in manufacturing or in some of the arts and sciences, it is generally regarded as not meeting the test of 'valuable mineral' and hence is not subject to acquisition under the mining laws."

Recent Laws

Since enactment of the leasing laws mentioned, there have been many laws passed by Congress which affect mineral lands of the West but listing of such laws is beyond the scope of this paper. One such law, Public Law 167, Act of July 23, 1955, generally called the Multiple Use Mining Law, is of first importance to prospectors and mine owners. Information concerning this and other public land laws and regulations may be obtained from the Bureau of Land Management, U. S. Department of the Interior. Information concerning Oregon mineral laws, including oil and gas regulations, may be obtained from the State of Oregon Department of Geology and Mineral Industries.

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Lindley, Curtis H., A Treatise on the American Law Relating to Mines and Mineral Lands within the Public Land States and Territories; 3rd ed., Bancroft-Whitney Co., 1914.

Ricketts, A. H., American Mining Law, California Division of Mines, Bull. 123, Feb. 1943.

Colby, William E., Mining Law in Recent Years; California Law Review, Vol. 33, Sept. 1945, no. 3, pp. 368-387. Reprinted in California Journal of Mines and Geology, Vol. 44, No. 3, July 1948. Succeeding papers by Mr. Colby in California Journal of Mines and Geology, Vol. 45, July 1949, No. 3; and Vol. 46, October 1950, No. 4

Mining Laws of the State of Oregon, Bull. 1, State Dept. of Geol. and Min. Ind., Portland, Ore., 4th revision, 1954.

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THE IMPACT OF THE AGES

Foreword - -

The writer of this report hereby gratefully acknowledges that the geology given in it is largely that of Drs. G. E. and B. R. Untermann, former Ranger and Ranger-Naturalist of the Dinosaur National Monument. They are now the Directors of the Utah Field House of Natural History at Vernal, Utah. Direct quotations from their literature will be enclosed in quotation marks, but not otherwise as the composition of the report is the original effort of the writer. Supplementary geological literature consulted is listed in the Bibliography at the end of the report. This, however, does not imply that the geological errors, if any occur, are theirs, but rather those made inadvertently by the writer.

T. Herbert Laurence

****

"Old ocean beds, whose waters never ebb -
Too long dried up, eons before our knowing.
Deep and devious are the gorges the rivers trace -
How much of time is here; how much of space! ".

From: "West of the Brown Missouri", by Elijah L. Jacobs

The Impact of the Ages-

Although cut by deep canyons, Utah's northeastern and Colorado's northwestern semi-arid wilderness plateau is a rather drab landscape to most tourists. At the same time they cannot help but admire with great enthusiasm the striking bright colors of the castellated rocks and abrupt precipices of the Uinta Mountains. Together these features are a contradiction that usually perplexes the average person. Yet to those with some understanding of time and space this paradox imparts an awareness of what the writer will call, THE IMPACT OF THE AGES As one observes these rugged Uinta Mountain rocks and basin badlands, he gets some realization of the repetition and continuity of the geological processes over the eons of time, and a cognizance, at least in an elementary way, of the millions of years of time involved. The oft-repeated description of the intermountain region, "It looks just like an old sea bed.", is more correct than those who idly repeat it ever realize, for the landscape to a considerable degree exhibits those features which existed prior to the time that the present surface was created According to the Untermanns (1954), the present surface is made-up largely of fluviatile, lacustrine and eolian sediments which were deposited on the older folded and eroded rock formations. These older formations also consist almost entirely of sedimentary beds. A further study will show that the rock formations of the Uinta region consist of a long almost continuous series of sedimentary beds ranging in age from the Archean to the Tertiary and Recent Four, and probably five of the great Eras and some ten rock systems are present, and are represented by approximately 30 exposed formations. Space here will not permit a detailed description of them, but a few pertinent facts about them should be mentioned.

The oldest rock in the Uinta Mountains is a highly metamorphosed quartzite, and is believed to be of Archean age. The second oldest; a series of quartzites, conglomerates and slaty shales, is known to be of Algonkian age. Both are intruded in places by igneous dikes. These Archean and Algonkian rocks are considered the core of the Uinta Mountains. In addition to being part of the core, the Algonkian rocks likewise form the crest of the Uinta Range. This is because the Paleozoic and Mesozoic formations, which once overlaid it, were removed by erosion. These paleozoic and Mesozoic formations are now found only on the flanks of the mountains, where progressively younger beds occur from the core outwards into the adjacent synclinal basins. The Tertiary formations, while progressively overlying one another, unconformably overlap the older formations. The number of times in which ancient seas inundated the land may be seen in the fact that 12 of the formations are largely of marine origin. Although there aren't any strata for the Ordovician, Silurian and Devonian Periods, the long series of sedimentary beds exposed in the Uinta Mountains have a stratigraphic history of remarkable continuity. Deposition was almost continuous, hence, formational boundaries exhibit strong transitional characteristics. From the Algonkian to the late Cretaceous diastrophic movements of the Uinta region apparently were epeirogentic rather than orogenic. As there were no orogenies during this long time, profound erosion with angular unconformities are lacking. Such unconformities which existed prior to the late Cretaceous deformations are therefore of the erosional stripping or deletional type. The missing Ordovician, Silurian and Devonian strata produce a scarcely noticeable break. The really conspicuous breaks occur: 1) in the pre-Cambrian between the Algonkian and the Cambrian; 2) in the Paleozoic between the Mississippian Humbug and the Pennsylvanian Morgan formations; and 3) in the Mesozoic between the Triassic Moenkopi and Shinarump formations.

During all of the Paleozoic and essentially all of the Mesozoic, what now is the Uinta region was a geosynclinal basin; this basin was an east - west arm of the larger Wasatch geosynclinal basin, which with other larger and deeper marine basins lay somewhat further west. As the Uinta basin was deeper toward the west, the sediments deposited in it are also thicker towards the west, and, as the basin was not subject to fluctuations, a shelf of wide foreland type was produced. The marine sediments that were deposited in the basin interfingered and graded into the continental ones where the basin became more and more shallow towards the east. The sediments, therefore, show "a persistent change of facies from west to east." Eventually in the late Cretaceous, basin depths and depositional conditions were reversed with a resultant reversal in facies trends. As the marine basins became deeper to the east, marine sediments from the east intertongued with continental ones from the west. These western continental sediments consist of the debris resulting from the uplifting, folding and eroding of the mountains yet farther west. This orogeny resulted from "the gradual

migration eastward of the progressive deformations of the intense Sierra-Nevadan diastrophism." It was a cycle of diastrophism which began in the late Jurassic in what now is California and culminated in the early and late Laramide deformations of the Rocky Mountain Revolution at the close of the Cretaceous and the beginning of the Tertiary. It is believed that the early Laramide deformations which reversed the depositional conditions in the area were the same as those that initiated the very first uplifting and folding movements of the Uinta Mountains, for they produced, in part, the Uinta depositional basin. The geologic basis for the above conclusions has been established from field evidence.

Vigorous erosion removed these rising folds, the rudimentary anticlines of the primary Uinta Mountains, almost as rapidly as they were elevated. Forrester (1937) states that they would have been elevated to some 10,000 or 12,000 feet. Nevertheless, it was these first uplifts and foldings that produced the adjacent synclinal basins. These basins are: the Uinta on the southern side, and the Bridger and Washakie on the northern side. The debris resulting from the erosion of the rudimentary anticlines of the primary Uinta Mountains formed the sediments of the early Tertiary formations, which were deposited unconformably on the older rocks. This cycle of erosion was brought to an end at the close of the Eocene Epoch when late Laramide activity for the second time, uplifted and folded the Uinta Mountains. As this deformation was much more extensive than that of the earlier activity, it is considered to be "the major uplift of the Uinta Range and maximum warping of the adjacent basins." According to Forrester (1937), uplift was some 25,000 feet in the center of the range. There was also much large scale faulting, and many large displacements It is Forrester's (1937) opinion that large folds (anticlines), such as those of the second uplift of the Uinta Mountains, are formed by a batholithic intrusion. In support of his opinion he cites the following evidence: 1) the batholithic intrusion of the Wasatch Mountains (they are known to have a core of igneous rock); 2) hydrothermal alteration of the Mississippian limestone in a few places; and 3) the usual accompanying deposit of a few economic minerals in some of these places. The Untermanns (1954) call attention to the few minor exposures of igneous dikes that were mentioned above, scattered along the crest (the main ridge) of the range. Inasmuch as dikes usually occur in association with larger intrusive masses, these probably do also, supporting the concept of a batholith at depth.

It may be said that the elevation and folding of the Uinta depositional basin resulted in the present relief of the region, which relief consists of the main Uinta range and lesser accompanying ridges along its flanks. Due to the semi-arid climate, vegetation doesn't keep the relief from reflecting the geological structure, which consists essentially of the main Uinta arch (anticlinal fold) and several minor anticlines, synclines and benchlands. Many of these minor folds are next to the faults occurring along the flanks of the main anticlinal fold. A wide anticlinorium was thus produced, and it represents the only major east-west trending mountain system in western North America.

Even while they were being elevated the Uinta Mountains of this second uplift were vigorously eroded, and their greater elevation eventually caused them to be much more eroded than the earlier mountains. Likewise, the debris of their erosion formed the sediments of the mid-Tertiary formations which were deposited in the region. When the general surface had been eroded more or less to a mature totpography, this cycle of erosion was also brought to an end by an uplift. It was the widespread continental uplift of the early Pliocene. By it the Uinta Mountains and surrounding areas were elevated between 8,000 and 10,000 feet (Forrester, 1937). Among the many significant geological events was the rejuvenation of the streams. This resulted in their rapidly degrading their beds and depositing their sediments in the adjacent basins. Those deposited in the Uinta region during this late Tertiary time (the first half of the Pliocene) are known as the "Browns Park formation". Some time after it was laid down there was an interval of considerable faulting in the eastern end of the Uinta Mountains. At this time the eastern Uinta Mountains were greatly downfaulted, and a graben was formed in much of this area. The graben included a part of the Browns Park basin, so it too was lowered with the rest of the depressed area. Accordingly the sediments of the Browns Park formation that were in the graben were thereby shielded from the erosion which largely removed them elsewhere. Again during the close of the Pliocene or early in the Pleistocene renewed activity along old faults took place. This produced some uplifting and westward tilting of the eastern Uinta Mountains.

(continued next month's issue)

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Volume 25, 1959
Compiled by Robert Wilbur

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Compiled by Robert Wilbur

GEOLOGICAL NEWS LETTER

OFFICIAL PUBLICATION OF THE

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1959-1960

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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 Secretary.

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 Avenue and Yamhill.

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

Library Night: Once a month. Lewis and Clark College, Biology Bldg.

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

Buffet luncheon every Thursday noon, second floor, Portland Chamber of Commerce, 824 S.W. 5th. $1.25

Tuesday May 17 — Library night. Annual Spring Picnic - at the picnic area near the swimming pool on the Lewis & Clark campus. 6:00 p.m.
Bring your own food and utensils. Coffee will be furnished. (In case of rain, we will eat in the Biology lab.)

May 14 and May 15 — Field Trip.
This trip will be by private car. The distance there and return about 350 miles. Cove State Park is at the junction of the Deschutes and Crooked Rivers. Tents should be set up by noon of the 14th at the camping area. For further information call Paul Howell, our Trip Chairman.

May 21 and May 22 — Field Trip.
This will be our Annual Pilgrimage in support of Camp Hancock. A big year is expected, according to Mr. Hancock; in fact, many applicants cannot be accommodated.
Bring digging and carpenter tools to help make improvements to the premises. The usual hike and frolic will follow the work period.

FIELD TRIP NEWS

The following trips are proposed for the forthcoming GESOC year. The list is subject to some changes depending on the kind and amount of response to this list. Please let your trip chairman know what you think of the list and particularly the trips that you would most like to take.

The avowed policy of this year's chairman is to take as many of these trips as possible by bus, even the two and three-day trips if it can be arranged. Negotiations are now in progress and trip costs will be published as soon as the information is available.

As you can see, trip leaders are urgently needed. Tentative leaders are signed up for the trips to the Lower Columbia River, Oregon and to the Wallowa Mountains. Mr. Schminky is definitely the trip leader for the Leif Erickson Drive trip. Otherwise the list is entirely open. Two trip leaders are needed for most trips, so, if you want to help someone else, join up together. Check the list below and see your trip chairman, Paul Howell.

GESOC FIELD TRIPS FOR 1960-1961

Date	Area	Trip Leader
March 20	Portland and Vicinity	Paul Howell
April 10	Leif Erickson Drive	Bruce Schminky
May 14 - 15	Cove State Park	Dr. Francis Gilchrist
May 21 - 22	Camp Hancock	
June 17, 18 & 19	Grand Coulee	
July 17	Abiqua-Silver Creek	
August 13 - 14	Upper Crooked River, or Bird Creek Meadows	

CONT. -

Date	Area	Trip Leader
Sept. 3, 4 & 5	Wallow Mountains	
October 9	Silver Star Mountains	
November 13	Lower Columbia River, Oregon side.	
December	No trip planned. Maybe basement trip	
January 15	Northern Willamette Valley clay industry	
February 11 - 12	Lower Columbia River, Washington side, and Chehalis River valley	

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LECTURE SERIES IN GEOLOGY 1960-1961
Central Library Hall

Key to the Past	April 8, 1960	John Allen
Geological Forces	May 13, 1960	Ralph Mason
Vulcanism	June 10, 1960	Delores Gregory
Stream Erosion	July 8, 1960	
Glacial Action	August 26, 1960	Ruth Hopson
Rock Weathering & Soil Formation	September 9, 1960	Lloyd Ruff
Sedimentation	October 14, 1960	Paul Howell
Stratigraphy	November 11, 1960	Ken Dodds
Wind Erosion	December 9, 1960	Phil Grubaugh
Wave Action & Shorelines	January 13, 1961	Jim Stauffer
Ground Water	February 10, 1961	
Historical Geology	March 10, 1961	

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1959-1960 FIELD TRIPS

March 28, 1959 -	Fossil collecting trip to Mollala area, Rudolph Erickson and Murray Miller - leaders
April 18-19, 1959	Trip to Hanford area in Washington, Mr. Randal Brown - leader

Field Trips.-(cont.)

May 23-24, 1959	Work trip to assist in preparation of Camp Hancock for classes, also time out to examine interesting geology, Dr. Howell and Lon Hancock - leaders
June 20-21, 1959	Saddle Mt. State Park and Oregon shoreline, Leo Simon and Dr. Gilchrist - leaders
July 12, 1959	Missoula or Spokane flood evidence in vicinity of Portland is explained by trip leader Dr. Stauffer
August 22-23, 1959	A trip to the dam sites and lava fields in the McKenzie Pass area, Doug Williamson and Leo Simon - trip leaders
September 13, 1959	Clackamas River trip to examine various contact exposures, Dr. Paul Howell - trip leader
October 25, 1959	Columbia River gorge east to Wind Mountain, Dr. Howell and Ralph Mason - trip leaders
November 15, 1959	A continuation of Dr. Howell's series on the Clackamas, Mollala and Butte Creek geology, Dr. Howell and Murray Miller - trip leaders
December 1959	No trip
January 17, 1960	A visit to Mr. Pete Dyke's agate and mineral collection and a trip to Lou Hancock's museum, Ray Golden - trip leader
February 21, 1960	A trip to Cape Kiwanda and the sand dune area, Dr. Ruth Hopson and Dr. James Stauffer - trip leaders
March 20, 1960	Dr. Howell leads a trip in the Portland city limits to explain local geology

Both the October 25, 1959 and February 21, 1960 trips were by bus and met with great favor. This method of field trip transportation is to be encouraged.

Again, I wish to thank the many trip leaders for their wonderful cooperation and efforts in making all these trips such a great success.

Respectfully,

Franklin M. Brown
Trip Chairman

THE RAY BALDWIN MEMORIAL FUND

This fund is still open for your donation. This year your money will buy stainless steel tableware for use at Camp Hancock.

An Annual Tea and Trillium Show was started by the Baldwins' at their place in 1958. Mrs. Baldwin asked that the Society come again this year, and a splendid afternoon was enjoyed there by a goodly number of the members.

A complete report of the fund will be given next month. Meanwhile, mail your checks to G. S. O. C., 5412 S. E. Powell, Portland, Oregon.

NEW MEMBERS

Mr. and Mrs. Edward P. Drais — 1702 S.E. 52nd Avenue, Portland, Oregon
Mr. Emory Strong — 2155 N. E. Multnomah Street, Portland, Oregon

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DUES ARE NOW PAST DUE

MAKE CHECKS TO G. S. O. C. - Mail to 5412 S. E. Powell, Portland, Oregon

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(CONTINUED FROM LAST MONTH) - THE IMPACT OF THE AGES - T. Herbert Laurence

With the re-elevation of the surface there was renewed headward erosion, as well as piracy and capture among the tributary streams and superimposition of the master rivers. In addition, the continued general uplift during the Pleistocene caused all of them to entrench their channels. In doing so, they established the present drainage pattern. It is, to a large degree, due to this entrenching that the strikingly bright colors of the mountains are brought out, because the streams have cut 1,000 to 2,500 foot canyons through several highly-colored formations. At the same time they are cutting old age meanders in the floodplains of valleys where local base-level has been reached as the valleys are somewhat older in age. As great as their downcutting power is, the streams aren't restricted to this action. Corrasional erosion has and is playing a very definite role in sculpturing the folded and faulted Uinta Mountains and adjacent badland basins.

In spite of all this description, the Uintas actually must be seen to be appreciated. Upon earnestly observing them, one gradually becomes aware of the IMPACT OF THE AGES. He becomes cognizant, although probably somewhat limited, of how much time and how much space are within the fleeting moments of his vision. This is particularly true in certain specific areas, such as those within the boundaries of Dinosaur National Monument. In them are exposed some remarkable and very interesting cross sections of the stratigraphy. For example, in the Dinosaur Quarry - Split (Black) Mountain Area, there are exposed some 20 formations, representing three Eras and seven Periods of geologic time. It is while scrutinizing these formations that the observer feels most poignantly the IMPACT OF THE AGES. Besides the stratigraphy as a whole, there is in this area the deposit of abundant dinosaur fossils in the world-famous Morrison formation. They may be seen in place, since one entire side of the Monument's new museum (built by Mission 66) is formed by the quarry wall, where the fossils are being made to stand out from the sandstone matrix. Much more could be said about both the stratigraphy and fossils, but space will not permit a detailed description of them.

T. Herbert Laurence

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"VOLCANIC DEBRIS FLOWS IN WESTERN WASHINGTON"

By Don Mullineaux, U. S. G. S.

The volcanic debris flows of this region are of both hot and cold types. The hot types are the result of direct ejection of hot mud, etc. from calderas, or of hot debris falls damming stream valley. The cold debris flows are the result of slides of previously deposited material the equilibrium of which has been upset by oversaturation, oversteepening or both.

Criteria for Recognition of the Material and the Deposit:

1. The volcanic debris flows flow around obstructions (small hills) instead of blanketing them as glacial till does.
2. The flows normally have a very even upper surface.
3. The contained material is wholly monolithologic or nearly so.
4. There is a distinct lack of sorting, but there is often a gradation from dominantly fine material at the top to dominantly coarse material at the bottom.
5. The voids ratio of the material is normally very high.
6. Charred wood is often present and if surrounded by brown coloration, the charring took place within the flow.
7. The color of the Cascade Range mudflows is normally a grayish brown, but some of those with a low content of fines are gray.
8. If the water content was high, some grading is present and there can be direct transition into typical alluvium.

Examples: Oceola Mud Flow - White River Washington. Material came off slopes of Mt. Rainier and flowed 60 miles down river to the vicinity of Osceola (see Cedar Lake and Tacoma 1:125,000 quads).

Its lower lobe is 10 x 20 miles in extent and covers most of the Osceola 7-1/2' quadrangle. It averages 75 ft. thick and overlies a sheet of Vashon till. The gradient of the upper surface of the lobe is 35 ft/mile. There is little or no stratification, but there is a high preponderance of coarse material at the bottom. Fines (silt and clay) are normally 40%; clay alone is 20% and consists almost solely of montmorillonite. It probably was thrown out from an older Mt. Rainier crater. Wood fragments are common and are not charred (cold type of flow). On the basis of radio-carbon dating the flow is 5,000 years old.

Mount St. Helens Mud Flows. Toutle River Flow. This flow came down the North Fork of the Toutle River, traversed the length of the main stream valley and debouched into the Cowlitz River valley. Total length of flow exceeds 40 miles. Its main surface has a gradient of 30 ft. per mile near Castle Rock. The over all fragment size is small (much smaller than the Osceola material) and it contains only 5% fines. The flow almost completely filled the lower Toutle River valley and created Silver Lake. Very little wood is present and considerable grading and transition to normal alluvium is evident.

Kalama River Flow. The material of this flow came from the west side of Mount St. Helens and flowed down the Kalama River valley to Merrill Lake, a distance of 8 miles. It was a hot mud flow and completely charred logs up to 3 ft. diameter. Radio-carbon dating on the charred wood gave an age of 2,000 years $\pm$ 250. The lithology of the debris indicates that it came from an older Mount St. Helens crater, now largely buried by recent volcanic debris. The present cone is less than 2,000 years old, probably near 1,000.

Other references: GSA Bull 1957 Abstracts. Abstract on debris flow criteria by Crandall.
Am. Jour. Sci. 1957 The Osceola Mud Flow.
Author not known, but probably is Crandall or Mullineaux.

A DIVING BELL AND DEEP-SEA SALVAGING IN ALASKA IN 1933-34

Recent accomplishment of the Trieste in its history-making 37,800-foot plunge off the Marianas recalls to mind the personal experience of this writer in an earlier deep-sea venture, the salvaging of the Steamship Islander in Alaska. While of much simpler nature and what might be termed "primitive" compared to the new bathyscape, our diving bell and its operation marked an engineering accomplishment, nevertheless.

The Islander, a crack Canadian-Pacific steamship, sank in Stephen's Passage, Alaska, about 20 miles from Juneau, approximately 1:30 a.m., August 15, 1901, in fog-shrouded circumstances that made her sinking one of the North-country's most famous marine disasters. When she sailed from Skagway the night before, she had on board a shipment of Klondike gold dust and nuggets in Railway Express strongboxes, substantial amounts of gold dust and valuables on the person of some of its passengers, plus a few other elements that culminated in its plunge to 365 feet of water off Admiralty Island the following morning. Total value of salvage was estimated to be from one to two millions.

A private syndicate of salvagers, with whom the writer was a crew member, newspaper man and photographer, left Seattle 32 years later with a World War I ferris-type wooden freighter as salvage ship in tow of a steam tug. On board was an assortment of steel cable, specially-constructed winches and gear and our diving bell. Head of the operations was Frank Curtis, of Portland, Seattle and Alaska with house and heavy machinery-moving experience. His organization included tugmen, logging riggers, sailors, and heavy machinery men.

The bell referred to above was simply a heavy steel sphere, with a smaller sphere atop the larger, and a mechanically-operated crab-claw arm. The diver needed a small bottle of oxygen for an extended trip to Davey Jones' Locker, but there was no pressure inside the bell--only the spherical steel construction to withstand approximately 165 pounds pressure per square inch at the Islanders' depth. While the writer never descended to any depths in the bell, because that was not permitted, dunking in shallow water was demonstration enough to show that underwater work was a serious proposition.

Our diver learned that the glacial silt which saturated the Passage water at depth prevented visibility beyond two arm length's, even with electric bulbs of approximately 100 watts. Photographs were impractical under those circumstances.

Locating the sunken ship in 1933 was a discouraging procedure. Even though an approximate location had previously been made and a buoy rigged on the spot in 1931, the buoy had moved before our arrival and groping with grappling lines was slow. With frequent trips for checking with the diving bell, the dragging and groping continued for more than six weeks before we relocated the sunken hulk.

Putting our lift lines under the sunken ship proceeded next. With donkeys on barges on port and starboard quarters from the salvage ship, our crew worked painfully to slip each line under the upturned stern of the Islander, settled in the mud in the darkness below. A length of anchor chain was slung between two three-quarter-inch cables and sawed back and forth by the steam and gas donkeys until angles of the cables indicated that they were under the Islander. A dive with the bell would be made and if the position was satisfactory, the end of one cable was attached to the end of a larger inch-and-three-quarter cable. The latter was "threaded" under the Islander and its ends attached to winches aboard the salvage ship. The process was repeated 20 times and the 20 lift cables secured to their respective winches. Each winch was on the opposite side of the salvage ship from which its lift cable emerged from the water. The lift cable passed over a "dolly" at deck's edge before crossing the lift ship at this point for attaching to the winch. The forty winches were hand operated by ratchets and gears and the cables were tightened at low tide.

Several tentative tryouts were made at lifting and when the first actual heavy lift was made, six lift cables broke with results that were discouraging again. The Islander, mired in the mud below, was not breaking easily from the suction of the long stay undersea.

To make a long story short, we got her in shallow water late that fall and the next spring in 1934, bringing another lift ship north we slung her between the two and put her on the beach with the lift of an extreme tide.

First brought to the air again with the mess of mud and huge barnacles aboard, the wrought-iron hull appeared in good condition and the twin steam engines were in fairly good condition. The air soon began to corrode both, however. The barnacles in the warm August weather soon smelled like rotting barnacles do, and we were all thankful when the majority of them had gone overboard.

(cont.)

Contrary to common belief, many materials were preserved very well despite nearly a third of a century under water. A number of articles in good condition that were recovered included silk, woolens, leather and some bronze objects. Apparently, most easily damaged by corrosion under water were cottons, iron and steel. Among the articles on this sunken ship, carpenters' tools, such as planes and other various tools, had all the steel or iron parts destroyed by corrosion. Leather shoes were brought up in good condition, but the cottons, iron and steel were almost destroyed, proving that good leather will outlast the materials that hold it together under such circumstances.

Some articles recovered by the writer included remnants of Irish linen; a pipe with the tobacco smell still in it; remains of some cameras used by the officers and various other materials that seemed to resist under-water corrosion. The fact that the wrought-iron hull of the ship was in reasonably good shape is an interesting comparison with steel, which would not have lasted.

Preservation of bottled goods in the well-stocked liquor store of the Islander depended upon the type of cork used, apparently. Those with corks which the pressure could push into the bottle were made useless by the salt water. Champagne and some wines with their flange corks were still excellent, as proved by those who tried them. Incidentally, use of the ship's liquor as well as that on shore at Skagway apparently had some effect on some of the Islander passengers and crew during the ill-fated voyage. Both the pilot and skipper were reported to have been "well soused"--a factor in the sinking. Official report listed her striking an iceberg, but our conclusion was that she hit Douglas Island, then sank in deep water when attempt was made to beach her across the straights.

Working under water at depths is a very difficult procedure and, in the instance of the Islander salvaging, the saturation of the water with glacial silt particles made visibility more difficult than normal. Suffice to say, we warn anyone going in for deep-sea exploration anywhere that he may be in for a few disappointments. Much can be written about this salvaging accomplishment and of the experiences of those involved, including those of the writer. For this publication, however, it is best to concentrate on pointing out some of the factors of the salvaging and the effects of time under water on various materials.

An intriguing thought to many of us who have been, or who will be, interested in deep-sea marine explorations, is the possibility of unlocking some of the secrets of the past with recovery of material preserved by the ocean over the years. Changing temperature of waters in various parts of the world is a big factor in some of this preservation or corrosion under water. Colder waters we would presume would preserve some articles longer than in temperate waters because of natural tendencies of corrosion of the latter and because of existence of marine life in temperate waters.

Salvaging and deep-sea exploration is very expensive, at least for the preliminary engineering and exploration. It parallels some of the expenses of space exploration. The Islander salvaging was prompted by search for the gold, but in so doing, other information was obtained. Many heartaches and harsh words were endured during the experience. Looking back on it now, one wonders how we got as far as we did. Looking ahead to the near future, we all hope for many new discoveries under the oceans. Who knows what may be found.

Leonard H. Delano

SUPERSUBMARINE

New York, April 10 -- An underwater vessel which routinely plunges 50 times deeper than conventional submarines and threatens to outperform even the fictional craft of Jules Verne was described this week by scientists currently exploring the ocean floor for the U. S. Navy.

The vessel, called the "bathyscaph," is the invention of the Swiss scientist, Auguste Piccard. Like most good inventions, the craft is beautifully simple in concept. It is built essentially like a blimp. Its cabin is a sphere of steel more than three and a half inches thick which weighs 11 tons and has a diameter of six and one-half feet -- large enough to carry two men. As in a blimp, the cabin hangs from a big "bag," some 50 feet long which provides the buoyancy. But in this case the buoyant filling is not a gas but gasoline, 30 per cent lighter than water. The float carries 28,000 gallons of gasoline, divided into 10 compartments. It does not need to be pressurized

(cont.) -

(its steel skin is only one-third of an inch thick), because water flows into it through holes on the underside so that the internal pressure increases to equalize the external as the craft goes down.

The ship carries 10 tons of iron pellets as ballast to help control its descent and ascent. It starts to submerge by taking water into two air tanks at the ends of the float. As the craft descends, the increasing pressure of the water compresses the gasoline which, of course, floats on top of the water entering the compartments. The compression of the gasoline reduces the buoyancy, so that ballast has to be jettisoned to slow the descent -- a ton of pellets for every 3,000 feet of descent. At the bottom of its dive the ship is held down by its remaining iron ballast; to rise to the surface again it merely drops ballast. The ship has electric batteries and two propellers to drive it horizontally. Thus it can move along the sea floor. It can descend to depths of 20,000 feet, where the pressure increases to more than four tons per square inch. So far, the cabin has not leaked a drop.

What does one encounter at these depths -- where man has never previously ventured? As the ship moves down, the scientists report, the sea grows increasingly dark and beyond 1,500 feet all traces of sunlight vanish. But in the beam of searchlights something resembling snow begins to stream past the windows -- only moving upward instead of downward. The "snow," which consists of tiny particles of debris and microscopic animals, reaches its maximum intensity near the zone of total darkness at about 1,500 to 2,000 feet. Lower down, living organisms are less abundant. At or near the bottom, however, the scientists have found a number of fishes, among them a species of deep-sea cod, the tripod fish, a grenadier or rattail fish, a six-foot eel and a deep-sea relative of the herring. They also discovered that certain deep zones have remarkable capacity for carrying sound--sometimes noises can be heard from sources hundreds or even thousands of miles distant.

The French Navy is currently building an improved version of the ship, one which will carry three men instead of two, will have greater cruising radius and be capable of reaching the most extreme depths of the sea--7 miles down! With this craft the scientists hope to discover new mineral resources and types of geological processes unknown at lesser depths. Certainly, they say, "We may well discover many new animals, including ancient forms now supposedly extinct, possibly even trilobites!"

- - - - Scientific American

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IMPORTS CLOSING MINES - SAYS MINING EXECUTIVE - (From Oregonian)

Foreign imports are closing up large segments of the American mining industry and already have had a serious impact on Oregon, Julian Conover, executive vice president of the American Mining Congress, reported upon arriving in Portland.

Conover said he was not too hopeful that Congress would take any effective action during 1960, particularly since the session will be short because of the presidential election.

Conover met with Hollis Dole, director of Oregon's Department of Geology and Mineral Industries, who pointed out that imports have closed down chrome mining in Oregon, costing the jobs of 1,000 people in the last year, and have put mercury mining at one of its lowest ebbs.

Conover came to Portland to consider recommending the city as the site of the national convention of the Mining Congress, which represents the entire industry in the U. S. He said the congress is considering holding a convention here in 1963 or 1964 that would bring more than 3,000 delegates, including leading congressmen and government officials to Portland. "I am tremendously impressed by what I've seen up to now," Conover said.

Conover was asked about the Mining Congress opposition to wilderness legislation. He said the Congress believes in "multiple use" of forest lands and wilderness areas.

"We can live with the wilderness people," Conover declared. He said the withdrawal of land from mineral exploration reduces America's vital mineral resources.

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ALBANY MAN GETS AWARD (The Oregonian)

Frank S. Block, supervisory chemical engineer at the metallurgy research center at Albany, has been chosen for a nationwide award, one of 10 made each year to federal government employes. He is the third scientist in three years names from the interior department's bureau of mines and the second from the research center at Albany.

Block will receive the award at Washington, D. C.

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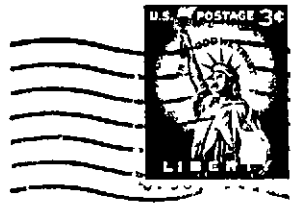
GEOLOGICAL NEWS LETTER

OFFICIAL PUBLICATION OF THE

June 1960 PORTLAND, OREGON Vol. 26 No. 6



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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Officers of the Executive Board
1960-1961

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Museum	- Mr. Lon Hancock	GSOC Libr. Night	Mr. Irving Ewen
		Luncheon	- Mr. Leo Simon

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 a 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 Secretary.

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 Avenue and Yamhill.

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

Library Night: Once a month. Lewis and Clark College, Biology Bldg.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.25 per plate.

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

CALENDAR

Buffet luncheon every Thursday noon, second floor, Portland Chamber of Commerce, 824 S. W. 5th. $1.25.

Friday June 10 — Lecture. Lectures at the Central Library; the hour always 7:30 p. m. Delores Gregory, speaker. Her subject, "Vulcanism." This is the third lecture in our series dealing with basic geology. Mrs. Gregory will soon receive a Master's degree in Geology.

Friday June 24 — On this date the Mazamas, our sister organization of mountain climbers, will present a film, "The Wilderness Alps of Stehekins."

Friday, Sat., Sun. June 17, 18, 19 — Field Trip

The June field trip will be to Grand Coulee and will be by private auto. Members will meet in Sun Lakes Park south of Coulee City at 4:00 p. m. on the 17th. The meeting place will be in front of the park supervisor's headquarters. Franklin Brown is tentative trip leader. Be sure to display your G. S. O. C. placards on the trip.

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CAMP ARAGO

In addition to the two family sessions at Camp Arago this summer, there will be one exclusively for adults. The dates for these are as follows:

August 14 - 20 Family camp, for adults and their children.
August 21 - 27 Second session, same as above.
August 28 - Sept 3 Adult camp, designed for persons of maturer age groups.

During each of these sessions studies of marine life and of geological history of the Oregon coast will be made. Camp Arago is a non-profit activity of the Oregon Museum of Science and Industry and is conducted at the Oregon Marine Biological Station near Charleston, Oregon. If interested contact the Oregon Museum of Science and Industry, Portland, Oregon.

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FIELD TRIP - MARCH 20th

On Sunday, March 20th, 25 GSOC members and guests met at Mt. Tabor for a field trip covering the east side of Portland and vicinity. Our very informative leader, Dr. Paul Howell, started the trip in grand style by arranging to have a perfect spring day, temperature in the 70's and most welcome of all -- SUNSHINE!

At Mt. Tabor we learned that it is composed mostly of Troutdale gravels, some Boring lava, and has a small cinder cone on the north slope. Stratification of material in the throat of the cone, which we saw in the cross-section of the exposed face, was explained by subsequent ejections of material being deposited and redeposited. Fragments of basalt and Troutdale formation have been found mixed in with ejected cinders. An attempt had been made at one time to locate the core of the volcano but this was discontinued for lack of funds.

After crossing over and getting on the wrong side of the railroad tracks, we saw a ledge of Troutdale gravels exposed on the bank of the Willamette River at the east end of the Steel Bridge. Quartzite pebbles, which are an index to the Troutdale formation and are foreign to this part of the country, were very much in evidence. This formation reaches a depth of 500 feet in this area.

From 10-50,000 years ago a unique and unusual flood, the Missoula (Spokane) Flood, caused by release of melting ice from the last Ice Age, swept down the Columbia River and spread across Portland and vicinity. Four distinct terraces, caused by meanderings of the Columbia and Willamette Rivers since the flood, are visible in Portland. The highest crests at 12 mile intersection on East Stark Street. The other three crest on East Glisan at 90th Street, 60th Street, and 36th Street, (equivalent), respectively. It is the consensus of opinion among geologists that the Missoula Flood occurred in several stages.

East of the intersection of N. Lombard and Killingsworth we stopped at a gravel pit and viewed material deposited by the flood. The material was well stratified and varied from fine sand, to gravel, to huge boulders. This particular gravel pit shows in a striking way the type of material deposited in the main channel of the torrent of water coming down at the time of the flood.

On King Road west of 82nd Avenue we visited another sand and gravel pit and saw the very finely divided sand and gravels which had been deposited on the fringe area covered by the Missoula Flood. This fine material was in great contrast to the heavy boulders seen in the previous quarry.

Just past 145th on S. E. Foster we stopped by the roadside to see a quarry where Boring Lava was exposed and overlain with a thick layer of early Pleistocene gravel. The Boring lava is a gray basalt characterized by minute intergranular cavities left by escaping gases which were previously diffused throughout the rock. It is further characterized by its widely-spaced jointing and huge columns, which in some cases reach a diamter of 10 feet.

- - C. L. B.

NEWS OF MEMBERS - -

Portland Leash Law Wins By Wide Margin -

Such were the headlines in the local press following the balloting May 20th. Again we say "Hats Off!" to our Emily Moltzner who worked so faithfully to achieve this goal.

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

Mr. Emory Strong, one of our latest new members, will be recognized as the same as the author of the excellent new book The Stone Age on the Columbia. Stone age man was also a geologist.

Hearty welcome, Mr. Strong!

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NEW MEMBERS -

Mr. Casper H. Magennis	P. O. Box 3635	Portland, Oregon
Mr. & Mrs. Arven P. Lindquist	Rt. 8, Box 203	Olympia, Washington

****

NEW DATA ON THE PORTLAND HILLS SILT

In a previous issue of the Geological News Letter (Vol. 24, No. 12, Dec. 1958) the writer presented evidence on and some conclusions as to the origin of the Portland Hills silt. Since that issue other more important evidence has come to light, some of it so revolutionary in implication that the writer hesitates to publish it without additional corroborating data. However, withholding the present evidence while waiting for corroborating data to be uncovered (which might not occur for several years) is uncharitable to others interested in the problem. It is hoped that divulging it now will stimulate thought and further investigation, not only of the Portland Hills silt problem, but of the whole recent geologic history of our area as well.

About 18 miles east of Portland and adjacent to the Banfield Freeway is the little settlement of Lower Corbett. Just west of Lower Corbett is a large rock quarry used to secure material for the widening of the Freeway. In this rock quarry is exposed a large face of Columbia River basalt overlain by Troutdale formation conglomerate, and Portland Hills silt. Until recently the physical relationships of the silt to the other two formations was obscured due to the intermixing of materials during the quarry operation. However, the heavy rains of this last winter have cut deep gullies into the upper quarry slopes, and during a recent visit the writer was able to observe and photograph the stratigraphic relationships. It was found that the silt overlaps old erosion scarps developed in both the Columbia River basalt and the Troutdale formation. The overlap relationships leave little doubt that the silt was deposited in and filled the Columbia River Gorge at the time of original deposition. Bedding in the silt is massive and horozontal and butts against the eroded edges of the older formations. Because of the extent of the quarry excavation, it cannot now be ascertained whether the silt extended down to river level, but there is little reason to believe otherwise. At present the contact on the basalt is about a hundred feet above the river.

A similar overlapping of the silt may be observed along the abandoned gravelled road leading from the site of the old Chanticleer Inn down to Rooster Rock, but in this case the exposures do not clearly show whether the silt is original deposition or reworked by slope wash action. The deposit at the lower Corbett quarry tops out on a bench at elevation 400, and, as one follows the road to Upper Corbett, the cuts reveal a similar overlap of the silts on the upper bluff. The summit at Upper Corbett is at elevation 675, but even this is not the top of the silt deposit. As Lowry and Baldwin (1952) pointed out, the Portland Hills silt covers the Corbett uplans to elevation 1300 at Ross Mountain (SE 1/4 Sec. 31, T 1 N, R 5 E). This elevation is closely comparable to the highest silt deposits known on the Tualatin Mountains (elevation 1500). Similar deposits of the silt are exposed in the road cuts on Mount Zion on the Washington side of the Columbia River at elevations greater than 1400.

A check on the distribution of the silt shows that it fans out on both sides of the Columbia River Gorge, beginning at points above Bridal Veil and Cruzatt, repsectively. The limits of the northern edge of the fan are not well known. It is thin and patchy on the Washougal uplands, but westward on Brunner Hill (Secs. 23 & 24, T 2 N, R 3 E) and the slopes of Mount Livingston it shows considerable thickness. From Mount Livingston the boundary swings off sharply to the north. The southern margin of the fan impinges on Sandy Lowland slopes along a line falling east of the Boring Hills, and trends off toward the Oregon City upland.

A recent reconnaissance along the S. P. &S. Railroad grade in the Tualatin Mountains where the railroad leads downward to the north from Cornelius Pass revealed the same post-canyon deposition relationships of the silt as at Lower Corbett quarry. This evidence supports suspected relationships seen in the new highway cuts along Canyon Road near the Museum. The relationships near the Museum were previously held in some doubt due to the landslide movements in that area, but these doubts can now be set aside.

Summing up the evidence, we can say with a fair degree of certainty that the age of the Portland Hills silt is younger than the cutting of the Columbia River Gorge and its tributary canyons to the west. The silt formed an immense fill in the Portland area, in places more than a thousand feet thick. This fill has been largely removed in the inner Willamette and Columbia River valleys, but much of it still exists in side canyons, on the surrounding uplands, and in the Tualatin Valley. Gravelly mica-bearing sediments exposed along the east bank of the Molalla River near Canby and along the north bank of the Willamette River from Champoeg eastward to Peach Cove may be correlative with or a gravelly phase of the Portland Hills silt. Gravel beds found in the Tualatin Valley fill are undoubtedly a similar gravelly phase of the silt. The most significant implication of these new discoveries is that the lower Columbia River valley and at least a large part of the Willamette Valley were inundated to a depth of 1300 feet or more, probably in the middle to late Pleistocene time.

-- Paul W. Howell

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Lowry, W. D. and Baldwin, E. M. (1952), Late Cenozoic Geology of the Lower Columbia River Valley, Oregon and Washington. Geol. Soc. Am. Bull., Vol. 63, pp. 1-24.

Howell, P. W. (1958), The Museum Mammoth Tusk, Geol. News Letter, Vol. 24, No. 12, pp74-76.

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GSOC SILVER ANNIVERSARY BANQUET

The Silver Anniversary Banquet of the Geological Society of the Oregon Country was held on March 11, 1960 at 6:30 P. M. in the St. Davids Episcopal Church, S. E. 28th and Harrison in Portland, Oregon. Erv Ewing was banquet chairman and deserves our thanks for his good work.

The 1959 president, Dr. Paul Howell introduced the Master of Ceremonies, Mr. Ralph S. Mason.

Dr. Howell then presented the members of his staff: Vice President, Franklin Brown; Secretary, Rose Hamilton; Treasurer Jane Erickson, Directors Dr. Gilchrist, Dr. Hopson, Dr. Stauffer, Murray Miller and Dr. Hammond; also Steve Blore, Program chairman; Franklin Brown, Trip chairman; Murray Miller, Display chairman; Lon Hancock, Museum chairman; Mrs. Paul Howell, Publicity; Mrs. Amza Barr, Telephone; Rudolph Erickson, Research; Mrs. Murray Miller, Librarian; Mrs. Elinor Pierce, Historian; Dr. John Hammond, as chairman of the Lewis & Clark research program and Erv Ewing, banquet chairman.

The Coriba Club of Portland State served and Ralph Mason recognized guests from the following organizations: Mazamas, Salem Geological Society, Tillamook Rock Hounds, North Marion Geological Society and the Bend Geological Society.

Dr. Arthur Jones and Dr. D. Ford Lewis led the group singing accompanied by Berry Hancock on the piano. The singing may not have been too good but it was loud.

Ralph Mason then called on Leo Simon to outline the history of the society. The society was formed from a group attending a geology class taught by Dr. Edwin T. Hodge and was formally organized on April 18, 1935 with the express purpose of furthering the study of the Geology of The Oregon Country. Dr. Hodge was the first president with Ken Phillips as Vice President. There were 100 charter members. Twenty-three charter members were present at this banquet.

Franklin Brown, president for 1960, then presented his staff as follows: Bob Wilbur, Vice president; Ruth Prentis, Secretary; Rose Hamilton, Treasurer; Dr. Hammond, Programs; Dr. Howell, Field trips; Social, Clare Bartholomay; Display, Murray Miller; Publicity, Emily Moltzner; Museum, Lon Hancock; Public Relations, Clarence Phillips; Telephone, Elinor Pierce; Research, Rudolph Erickson; Librarian, Ardna Brown; Historian, Elizabeth Lloyd; Business Manager, Bob Wilbur; Service, Bruce Schminky and last but not least Jess Rentsch as Newsletter editor. Mr. Brown also called to the attention of those present that there were several members of the Society who were "Important People". Mr. Mason followed up by pointing out that Mrs. Amza Barr had served faithfully and well on one committee or another for each of the 25 years since the Society was formed. Another "Important" person.

Ralph Mason then presented Dr. Howell with the customary "G" pick and Franklin Brown presented him with a Fellow membership. Mr. Mason then indicated that we should proceed with our excellent dinner now that we had "gotten rid of the old President and installed the new".

Next in order was the introduction of the speaker of the evening, Dr. Walter Youngquist, Associate Professor of Geology at the University of Oregon. Dr. Youngquist spoke of his experiences in Peru as an oil geologist. His color slides were superb and he proved to be an excellent speaker.

Last but not least was the skit written by our own playwright, Jane Erickson and going under the title "Scrambled Egg-heads". A certain Professor Aristotle Whingdiffer (Ken Phillips) had worked out a machine that could transmit rocks and 'things' through great distance. With the assistance of his able secretary Miss Maisy Lovenest and the gadget they send Leo Simon, Leonard Delano, Dr. Hammond and Mrs. Simon to a cohort in England. According to the Professor they were supposed to be returned intact but instead they were very much scrambled. How do YOU prefer YOUR eggheads, plain or scrambled? The price is the same.

-- AGNES I. MILLER

* * * * * *

IMPORTANT PEOPLE - President address March 11, 1960

About three years ago when we were on a field trip to Saddle Mountain with a group from the GESOC, my young son Dick asked his mother if he could go on ahead and hike with the "important people." When asked who in the world the "important people" were, he replied, "You know, the ones like Dr. Gilchrist and Leo Simon who can answer my questions about the rocks and flowers as we hike along."

Think of our good fortune in having "important people" such as these in our Society.

Isn't the world so much brighter after attending a lecture by Dr. Allen or Dr. Stauffer or Dr. Howell. A field trip is indeed much more pleasant when our Dr. Ruth Hopson comments as we go along about the geological formations or digresses to point out a tree and tell how to identify it in the future. A trip through the Columbia gorge is beautiful, but isn't it so very much more interesting when Ralph Mason is along to explain to us about how it came to be. Visit Lon Hancock's museum classroom as he tells a group of twelve year olds about the hidden wonders of the world. See their eagerness as they begin to comprehend the knowledge they have just gained. Take a look at the mother or father who has lingered in the background after bringing their children to this classroom and hear their oft repeated, "Oh! this is wonderful. Why haven't I learned of these things before?"

Many in our group display this same eagerness for knowledge of the world around them while others of us do not yet know of the many opportunities offered by our Society. Geology may well be called the meeting place of the sciences, Botany, Biology, Physics, Chemistry, Meterology. All have some relation to geology and in our Society you will surely find someone who is well versed in one or many of these fields. You may become as technical as you wish or forever remain a novice but I know of no other group so well staffed with the "important people" who are so willing to help us. Believe me, our lives are so much richer because of them. I know many others, but time does not permit me to mention them. Here's to the "important people" and long may they be with us.

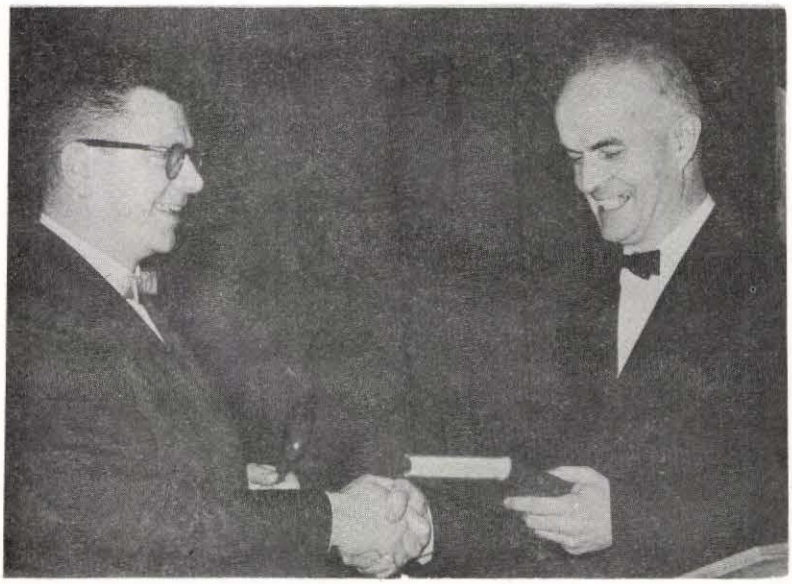
Thank you,

Franklin M. Brown

GSOC SILVER ANNIVERSARY BANQUET - 1960

"THE MASTER OF CEREMONIES"

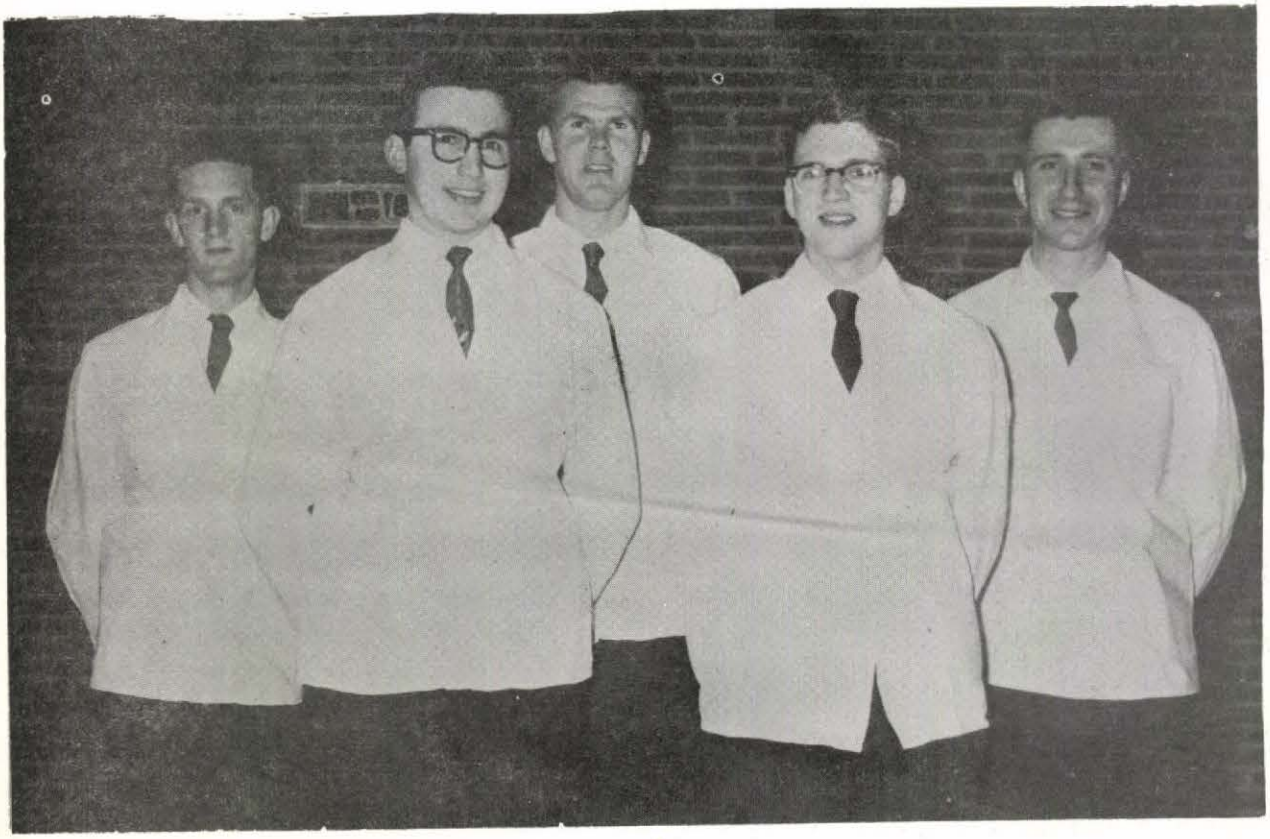
DR. YOUNGQUIST, OUR CAPABLE GUEST SPEAKER



PAST PRES HOWELL CONSOLING NEW PRESIDENT

RALPH MASON HAD 'EM SPELLBOUND

"SCRAMBLED EGGHEADS," OR "AIN'T SCIENCE WONDERFUL"

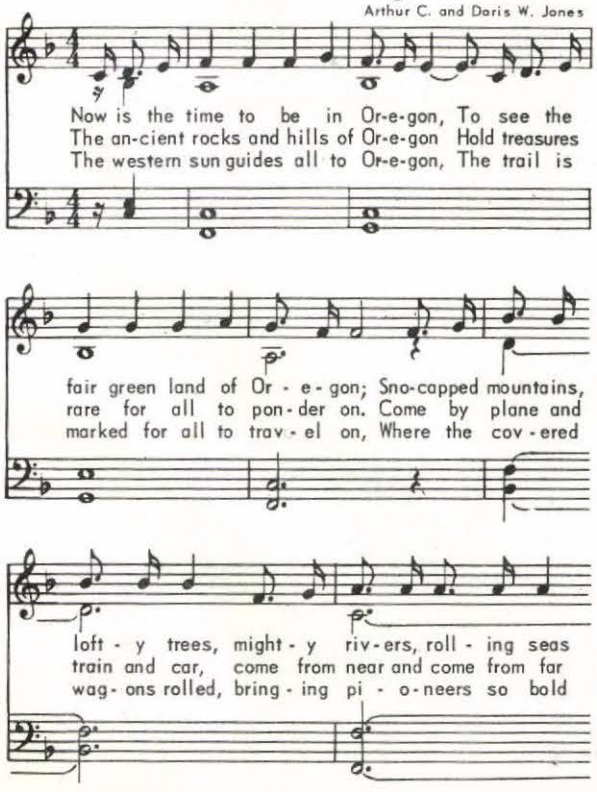


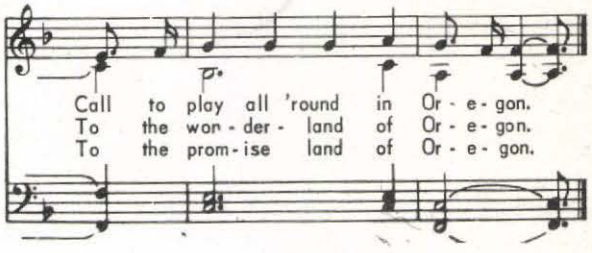
ERV EWING AND HIS STAFF

WHAT'S A PARTY WITHOUT SINGING?

Invitation to Oregon

Arthur C. and Doris W. Jones





Now is the time to look at Oregon
To learn the long, long of Oregon.
Volcanoes lifted up the lands
From the ancient seas and sands
Formed our fair, green land of Oregon

Now is the time to dig in Oregon
To learn the long, long of Oregon.
Fossil forms of life abound
For us to find beneath the ground
Of our fair, green land of Oregon.

PAST PRESIDENTS

SOME CHARTER MEMBERS

ACTIVE CHARTER MEMBERS

Dr. and Mrs. W. Claude Adams
Mrs. Raymond L. Baldwin
Mrs. Amza Barr
Mr. and Mrs. Franklin L. Davis
Miss Rose Hamilton
Mr. and Mrs. Alonzo W. Hancock
Dr. and Mrs. Edwin T. Hodge
Mr. and Mrs. Harry C. Jennison
Mr. and Mrs. E. Cleveland Johnson
Dr. and Mrs. Arthur C. Jones
Mr. and Mrs. Louis E. Oberson
Mr. and Mrs. William F. Paterson
Mr. and Mrs. Clarence D. Phillips
Mr. and Mrs. Kenneth N. Phillips
Miss Grace M. Poppleton
Mrs. R. R. Poppleton
Mr. and Mrs. Sam Reichen
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Mr. and Mrs. Leo F. Simon
Dr. and Mrs. J. C. Stevens
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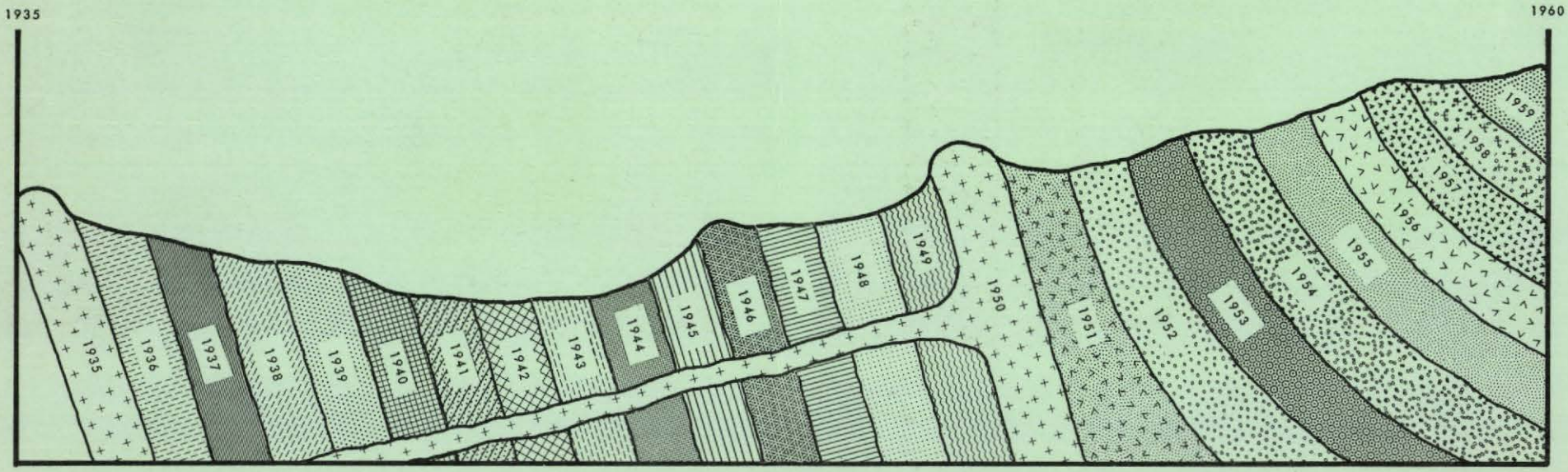
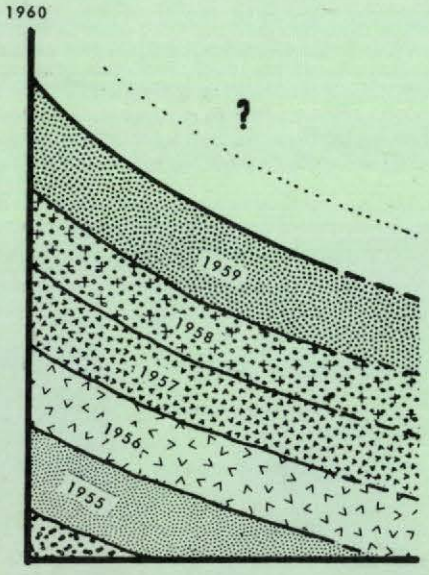
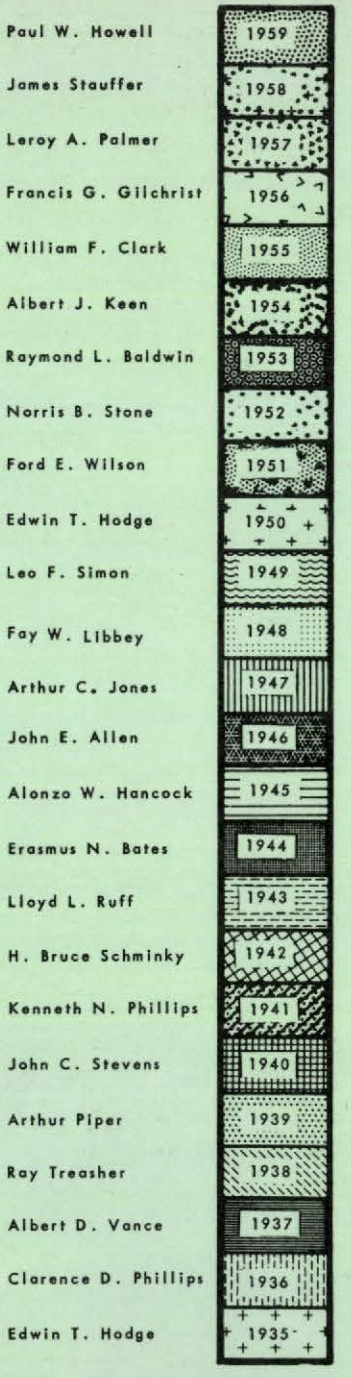
Mrs. Tracy Wade
Mr. Joseph Wimmer

ANNUAL BANQUET
SILVER ANNIVERSARY
Geological Society of the Oregon Country

St. David's Episcopal Church
Portland, Oregon
March 11, 1960







ACKNOWLEDGMENTS

DINNER
Prepared by the women's guilds of St. David's Parish

DECORATIONS

Tables and windows	Mrs. Charles Welty
Silver pieces	Women of St. David's
Place cards	Mr. David W. Ford

ENTERTAINMENT
Skit

Playwright	Mrs. Jane Erickson
Rehearsal coordinator	Mrs. Hayward Peirce
Stage settings	Mr. H. Bruce Schminky

PHOTOGRAPHY
Mr. Robert Foreman

TICKETS
Mr. and Mrs. Leo F. Simon

GIFTS
Mr. and Mrs. H. Bruce Schminky

TELEPHONE
Mrs. Amza Barr

TRANSPORTATION
Miss Rose Hamilton

PROGRAM

Cover Design	Irv Ewen
Menue geologica	Miss Margaret Steere

GENERAL CHAIRMAN
Irving G. Ewen

GOOD NIGHT

(Tune: Pop Goes the Weasel)

Tonight we've had a jolly good time
And learned a lot together
Resolved geologists are fine
Regardless of the weather
So now we bid good night to all
And plan some future meetings
That's the way we profit most
Along with pleasant greetings.

FINAL UPLIFT

(Tune: Goodbye My Lover, Goodbye)

Our banquet now is at an end
Goodbye, Rock Hunters, Goodbye.
We'll work a year and meet again
Goodbye, Rock Hunters, Goodbye.

Geodes and Fossils,
Banquets and Wassails
Campers with "Tossles"
Goodbye, Rock Hunters, Goodbye.

WE'RE HERE FOR FUN

(Tune: 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*

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.
Chorus*

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.
Chorus*

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.
Chorus*

*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.

'The Hancocks'

IN THE CLARNO

(Tune: Clementine)

In the Clarno, in the Clarno
Sixty million years ago
Waved the palm trees in their splendor
Knowing neither ice nor snow
Chorus*

To this land of calm and beauty
Came the breath of Nature's wrath
Ashes from a fiery mountain
Covered all within its path.
Chorus*

Buried deep beneath this blanket
Limbs and nuts and fruits galore
Were preserved in Nature's storehouse
On an ancient lake bed shore.
Chorus*

Years of wind and rain and sunshine
Have uncovered them at last,
Bringing forth to those who seek them
Records of that ancient past.
Chorus*

To this land of sun and sage brush,
Where the fossil nuts are found
Come the Geesocks with their hammers,
Breaking rocks upon the ground.
Chorus*

*CHORUS
Come the Geesocks, come the Geesocks
Braving wind, or rain, or tan,
You can hear their merry laughter,
It's the Clarno Caravan.

TWENTY-FIFTH ANNIVERSARY SONG

(Tune: I've Been Working on the Railroad)

Tonight we do some reminiscing
Around our banquet fare
Twenty-five years of happy fellowship
We can not find elsewhere
We've hiked up to the highest mountains
And fallen in the creek
But lessons learned by peppy G socs
We always can repeat.

I've been "picking" with the G socs
Near and far away
I've been "picking" with the G socs
And toted rocks all day
Planned to be so scientific
And label all the loot
But finally built a pretty rockery
And had some rock to boot.

PROGRAMME PERSONNEL

PRESIDENT
Dr. Paul W. Howell

SONGLEADER
Dr. Arthur C. Jones

PIANIST
Mrs. Alonzo W. Hancock

TOASTMASTER
Mr. Ralph S. Mason, Mining Engineer
State Department of Geology and Mineral Industries

SEDIMENTAUR
Mr. Leo F. Simon

GUEST SPEAKER
Dr. Walter L. Youngquist, Associate Professor
University of Oregon Department of Geology

CAST OF SKIT
(In order of appearance)

Prof. Aristotle Whingdiffer	Mr. K. N. Phillips
Miss Maisy Lovenest, Secretary	Mrs. Grace Lewis
Mr. Simon	Mr. L. H. Delano
Dr. Hammond	Mrs. L. F. Simon
Mrs. Simon	Dr. J. H. Hammond

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	1959	1960
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Dr. Ruth E. Hopson	Dr. James Stauffer
Mr. Murray R. Miller	Dr. John Hammond
Dr. James Stauffer	Mr. Ralph S. Mason
Dr. John Hammond	Dr. Paul Howell

MENUE

SALAD
Silica Jell with Inclusions of Brecciated Orpiment and Tourmaline
(molded salad with crushed pineapple)

ENTREE
Rolled Oreodont au jus
(beef)
or
Crossopterygian Creole
(fish)
with
Baked Volcanic Bomb
(potato)
and
Waterworn Emeralds
(peas)

Concretions
(rolls)

DESSERT
Wedges of Vein Filling in Felsite
(apple pie)

BEVERAGES
Fuscus Flood Water
(coffee)

Liquid Amber
(tea)

Diatoms in Liquid Suspension
(milk)

PROGRAMME

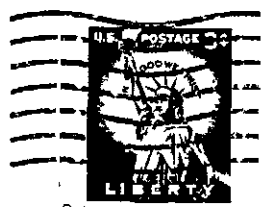
Welcome	President
Everybody Sing "We'reHere for Fun"	Songleader
Dinner	
Everybody Sing "In the Clarno"	Songleader
Introduction of Toastmaster	President
Introduction of Guests	Toastmaster
Installation of Officers History -- Retiring President's Message Prophecy -- Incoming President's Message	
Resume "The first quarter Century"	Sedimentaur
Everybody Sing "Anniversary Song"	Songleader
Intermission	
Address "A Delightful Surprise"	Guest Speaker
Everybody Sing "Invitation to Oregon"	Songleader
Skit "Scrambled Eggheads"	Cast
Everybody Sing "Good Night" "Final Uplift"	Songleader

Program notes on following page

GEOLOGICAL NEWS LETTER

OFFICIAL PUBLICATION OF THE

Vol. 26, No. 7 PORTLAND, OREGON July, 1960



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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

Officers of the Executive Board
1960-1961

President:	Franklin M. Brown	211 S.E. 53rd Ave.	15	BE 6-6658
Vice-Pres:	Robert F. Wilbur	2020 S.E. Salmon St.	14	BE 5-7284
Secretary:	Mrs. Ruth Prentiss	1923 N.E. Schuyler St.	12	AT 1-0341
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Mr. Murray R. Miller (1961)
Dr. John Hammond (1962)
Mr. Ralph Mason (1962)
Dr. Paul Howell (1962)

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Field Trips	- Dr. Paul Howell	Research	- Mr. Rudolph Erickson
Social	- Miss Clare Bartholomay	Library	- Mrs. Ardna Brown
Display	- Mr. Murray Miller	Historian	- Mrs. Elizabeth Lloyd
Publicity	- Mrs. Emily Moltzner	Publ Relations	- Mr. Clarence Phillips
Museum	- Mr. Lon Hancock	GSOC Libr. Night	Mr. Irving Ewen
		Luncheon	- Mr. Leo Simon

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 a 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 Secretary.

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 Avenue and Yamhill.

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

Library Night: Once a month. Lewis and Clark College, Biology Bldg.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.25 per plate.

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

CALENDAR

Buffet luncheon every Thursday noon, second floor, Portland Chamber of Commerce, 824 S.W. 5th. $1.25.

GEOLOGICAL SOCIETY OF THE OREGON COUNTRY PROGRAM FOR JULY 8 AND 22nd

NOTICE: Due to alterations at the County Library the meeting place will be changed to the Public Service Auditorium at 920 SW 6th St. for July and August.
TIME: As usual at 7:30 p.m.

Friday July 8 — Lecture. The fourth in the series of Basic Geology lectures, Stream Erosion.
Speaker: Mr. Ken Phillips
Mr. Phillips is the District Engineer for Oregon of the Water Resources branch of the Geological Survey.

Friday July 22 — Lecture. Rock Transformations in the Earth's Crust
Speaker: Mr. Robert VanAtta, Asst. Professor of Geology at Portland State Colleg
Mr. Van Atta holds a Master's degree in Geology, awarded at the University of Oregon.

Sunday July 17 — Field Trip.

* *

JULY FIELD TRIP
(July 17th)

Murray Miller is trip leader. We will go to the Abiqua Creek country to study the geology there. Trip will be by private auto. Meet at the Marquam Store on the Molalla-Silverton Hwy. at 9:00 a.m. Bring lunches, G-picks, notebooks, and cameras.

JUNE 11 and 12 TRIP TO CAMP HANCOCK - -

About 15 members made this journey to help make the Camp ready for the Summer Session Weather was ideal and road conditions were all that could be desired.

The work planned was dispatched with due praise from Mr. Hancock. Special honors shoulc go to Frank Merryman for assuming the brunt of the project and to Mr. Golden and Mr. Robosk for the use of their trucks. Don't forget Ardna Brown, Chief Coffemaker, for the toilers. Dicky Brown served as "scorpion catcher" and Bobby as "snake charmer."

CAPE KIWANDA SAND DUNES AREA FIELD TRIP, FEBRUARY 21, 1960 - -

By pure coincidence, the rock exposures between Portland and the Coast Range along State Highways Nos. 6 and 18 of northwestern Oregon include the various formations of all of the epochs and the two periods of the Cenozoic Era, except the Paleocene. Because of this fact our leaders, Dr. Ruth Hopson and Dr. James Stauffer, gave a brief interpretation of them, as we drove past them on the field trip of February 21, 1960. In addition, those interpretation: also served as an orientation of the Cenozoic geology for this minor part of the major northwestern region of Oregon. On this field trip in the Portland area the better exposures of the Quaternary rocks (strata) weren't seen. However, they are represented by the unconsolidated terrace and alluvial deposits of the Pleistocene and Recent epochs along the Willamette and Columbia Rivers. The Tertiary rocks that outcrop along Highways Nos. 6 and 18 consist essentially of continental sediments (in the Portland area only), basaltic lavas, and several thousand feet of marine sediments together with interbedded volcanic rocks. The named formations of them range from Pliocene to lower Eocene in age. In places those of the early Tertiary are intruded by rather numerous sills, dikes and stocklike masses of igneous rock. Although these intrusives show some variation in texture and composition, nevertheless, they are all of the

basic type, namely: basalt, gabbro, diorite and diabase. The Tertiary formations along this part of the northern Oregon coast (that which lies between Netarts Bay on the north and that of Cascade Head to the south) are more or less overlain by unconsolidated terrace and alluvial deposits of Pleistocene and Recent age.

Unlike the most northern part of the coast, this part of the coast does not have any coastal plain, such as the alluviated plain surrounding the city of Tillamook. Dr. Stauffer explained it was created by the alluviation of a much more extensive bay that was situated here during Pleistocene times. This former bay was created when the Wisconsin stage of glaciation depressed the sea level some 450 feet below its present level and caused the coastal streams to carve their valleys to a much greater width and depth so as to coincide with this lowered level of the sea. When the glaciers of the Wisconsin stage of glaciation melted the sea level rose again. Thus, the enlarged valleys were drowned, and in doing so the bay was created. Subsequently the bay was nearly filled with alluvium, which created the plain largely as it is seen today. The terrace along its southern margin probably was also formed during this time. The submergence, that drowned the valleys to create the more extensive bay, also destroyed most of the coastal plain for this part of the coast. Persisting is only a narrow strip of foreland mostly in the form of a terrace. It survived because the ridges of the western side of the Coast Range are almost at the shore. These ridges have been from youthful to maturely dissected, and are of moderate elevation which gradually increases towards the crest. The average elevation of the Coast Range is 3,500 feet. The narrow foreland consists of the same Tertiary formations as the ridges of the mountains, but for the most part they are overlain by unconsolidated terrace gravels, sand dunes and alluvium of Pleistocene and Recent age. Those of the Pleistocene are largely covered by vegetation, and are more or less stationary. The Recent ones have little or no vegetation on them. Also they are constantly shifting their position and changing their shape.

How do these facts apply to Cape Kiwanda? Undoubtedly as Cooper (1958) says, "Resting on the summit of Cape Kiwanda are a group of isolated remnants of a large sand dune". Dr. Hopson pointed out six soil horizons in the largest of them. It is some 80 feet thick with a forest growing on its slopes. Mr. Albert R. Kenney, a G. S. O. C. member from Tillamook, also called our attention to an igneous dike. It is in a direct line with an intrusive rock island, called Haystack Rock. He further stated that the rock platform on which this large dune remnant rests is of "the Astoria formation, a sandstone and siltstone of the Miocene epoch". In this location, the general area of Cape Kiwanda, according to Snavely and Vokes (1949), the Astoria formation is approximately 300 feet thick, and it overlies beds of Keasey age. The contact can be identified by a thin siltstone conglomerate stratum in which there is some glauconite. Due to slumping of the beds during their deposition the upper part of the Astoria formation has deformational deformation. In general, the Astoria formation is massive with carbonized wood disseminated throughout it. Mr. Kenney stated, "The sand dune, which overlies the bedrock of Cape Kiwanda proper, is of Pleistocene age". It is not consolidated, and the wind is carrying some of its sand away where it is not forested. Is Cape Kiwanda, therefore, a terrace remnant? Of the several terraces known to exist along the Oregon coast, according to Baldwin (1945), only the youngest and most widespread one has been traced for considerable distances. Also it is the one on which some of the most prominent dunes are situated. According to Snavely (1948), Cape Kiwanda is not a remnant of that terrace, which he claims is situated just to the north of the cape. At this location, the remnant of the youngest and most widespread terrace rises some 100 feet above the rock platform. The rock platform itself rises approximately 35 feet. This is what Cooper (1958) says, "Cape Kiwanda and Haystack Rock are the remnants of a once prominent headland that stood here during the earlier part of the period of submergence". This submergence was the eustatic rise in sea level that followed the Wisconsin stage of glaciation. As the thick sheet of Wisconsin glacial ice melted, the level of the sea rose higher and higher. In doing so, it abraded both the north and south sides of this former headland. For a time Haystack Rock took the brunt of the sea's erosive force and shielded the less resistant softer sedimentary rock behind it. But neither Cooper (1958) nor Snavely (1948) make any mention of the dike here at Cape Kiwanda. This dike, as stated above, is in a direct line with the lee side of Haystack Rock. This location of it creates the impression that it has also been a part of the headland. However, if the writer understood Mr. Kenney correctly, he believes that he said, "The dike is of Pleistocene age, and it has intruded both the Miocene Astoria sandstone and the overlying Pleistocene sand dune". Somehow this interpretation doesn't seem right to the writer; probably he meant to say Pliocene. As Dr. Hopson explained, "Most of the dikes that are more recent

FIELD TRIP CAPE KIWANDA - cont.

than Miocene in the Coast Range are thought to be Pliocene". According to Cooper (1958), erosion by the wind and waves abraded the headland in such a manner that it made possible for the severe winter storms to hit the softer sandstone behind Haystack Rock broadside. If the writer may express an opinion, he believes that the winter storms also could have struck the dike and shattered it. Likewise, the sand, which Cooper (1958) claims was lodged on the sandstone, could have been similarly lodged on the dike rather than intruding it. Since as Dr. Hopson explained, "A Pliocene dike in this location could have been exposed by erosion in time for it to be covered later by Pleistocene sand". This sand being the same as that of which the largest remnant of the sand dune resting on Cape Kiwanda consists of, because Cooper (1958) says, "The oldest remnant of the large dune resting on Cape Kiwanda has evidences of having originated in this manner". The other contiguous remnants of this large dune were deposited on the terrace, as mentioned above, is just to the north of Cape Kiwanda Nevertheless, the sand of which they are made first had to climb the hill that is now Cape Kiwanda before eventually coming to rest on the terrace. As a complete dune it was stabilized during a small drop in sea level with emergence of a rather brief duration. Following it the sea level rose again, and with it the sea vigorously eroded both the north and south sides of the peninsula of the former headland. Eventually it was severed by those erosive forces, resulting in Haystack Rock becoming an island, as well as, the large dune resting on Cape Kiwanda losing its supply of sand and it was also beheaded. As a group the remnants of this large dune have undergone some rejuvenation. Each one has active strip of advancing sand along their crests, and on the most westerly remnant the sand flow is climbing over the stabilized ridge. While the two easterly ones are smaller but higher have active slipfaces, according to Cooper (1958).

In addition to the sand dunes, there are also other evidences north of Cape Kiwanda, but still in the general area, are the occurrence of a period of down-cutting by the coastal streams followed by a period of filling of their channels during a submergence. That evidence is a Pleistocene estuarine fill, called the Coquille formation. A small outcrop of it can be seen along the sea cliff north of Cape Kiwanda. The location of this outcrop of the Coquille formation indicates that the estuarine deposits have filled an older valley of the Nestucca River. Similar estuarine deposits along the southern Oregon coast were named the Coquille formation by Baldwin (1945), and those north of Cape Kiwanda were assigned to it. Snavely (1948) describes the Coquille formation as follows: "A poorly sorted coarse sand and gravel with peat, carbonaceous shale and clay". He further states, "The sand is crossbedded and it contains considerable carbonized wood. Also outcropping on both the northern and southern margins of the exposure is a seam of lignitic material. At the Cape Kiwanda location the Coquille formation exposure is some 30 feet thick resting on an Oligocene mudstone (?Beds of Keasey age) with an angular unconformity, according to Snavely (1948). He also states, "The Oligocene mudstones are intercalated with quartzose sandstone and sandy siltstone which contain fuana fossils of Miocene age". Baldwin (1945) claims that the various depositions of terrace sand and gravel deposited on the youngest and most widespread terrace along the Oregon coast are the same as Diller s (1902) Elk River beds which are deposited on the youngest and most widespread terrace on the southern Oregon coast. Hence, Snavely (1948) presumes that the bedded terrace sand and gravel unconformably overlying the Coquille formation in the Cape Kiwanda area are the equivalent of the Elk River beds. When the former valley of the Nestucca River north of Cape Kiwanda became filled with the Coquille estuarine deposits and the Elk River beds, the Nestucca River shifted its mouth to the south of Cape Kiwanda. But it wasn't the present location where the Nestucca River enters the ocean. Field evidence indicates it was farther north somewhat closer to the southern side of the cape. Since Cooper (1958) says, "The spit was shorter and it did not stand as far to the seaward as now", and Snavely also claims, "The sand dunes of the Recent epoch and the spit have crowded the river's mouth southward to its present position".

Thus, according to Cooper (1958), "The sand dunes of Cape Kiwanda area are the most impressive of all the dunes on the Oregon coast, but no comprehensive investigation of the terraces and the events associated with them has yet been made". Therefore, it is an area where much geological research may still be done. So the writer urges the G. S. O. C. ers

to have more field trips in this area, that they may help solve some of the many problems associated with the marine terraces of the Oregon coast.

T. Herbert Laurence

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Preliminary Map No. 97, United States Geological Survey

1958 - Cooper, W.S., "Coastal Sand Dunes of Oregon and Washington"
Geological Society of America, Memoir No. 72

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

-- FRANKLIN BROWN FAMILY MOVING --

I regret to announce that I must resign as President of G. S. O. C., effective July 10, 1960. Because of business reasons my family and I will make our home in Seattle.

We will always treasure the many happy hours spent with the G. S. O. C. members, and it hurts us deeply to part from our many friends.

Thank you for the help you have given me and above all thank you for the many ways you have helped build character in my boys, Dick and Bob.

Sincerely,

Franklin and Ardna Brown

* * * * * * * * *

NEWS OF MEMBERS

Mr. Robert I. Clayton passed away on May 9th. We will miss this fine man. Our sympathy goes to Mrs. Clayton.

Mrs. Alice S. Schminky, mother of Bruce Schminky, passed away on May 23rd. Mrs. Schminky was well known to the Society for many years. Our sympathy goes to this family.

Mr. Elwin R. Lilly passed away on June 12th. Mr. Lilly surely did endear himself to many members of the Society. Our sympathy goes to Mrs. Lilly, his wonderful partner of 30 years.

-- THE RAY BALDWIN MEMORIAL FUND FOR CAMP HANCOCK

At last the final accounting of our tea held at the Baldwin home April 3rd. -- We received $150.00. We who worked on this feel very proud to have been so successful. Thanks to everyone.

We purchased 300 pieces of stainless steel flatwear for the Camp; also a Baby Ben alarm clock for the Camp, and Mrs. Hancock in particular. This will enable Mrs. Hancock to be able to beat everyone else up. We purchased a very good chemical toilet for the ladies who go up and assist during those long weeks of camp. They are wonderful girls. (We still have money in the bank for Camp Hancock.)

Rose Hamilton

CHANGE of ADDRESS

Mr. & Mrs. G. H. Clawson	3 Colden Avenue	White Plains, New York
Mr. & Mrs. Orvie Thompson	PO Box 154	Rockaway, Oregon

DENTISTS PAY TRIBUTE TO LONE CHARTER MEMBER - -

Dr. W. Claude Adams, 86, retired dentist and historian, receives key to Omicron Kappa Upsilon, honorary dental fraternity.

> Dr. Adams is a Portland dentist who retired 15 years ago after practicing for 40 years. Since retiring he has published a history of papermaking in the Pacific Northwest, as well as a history of dentistry in Oregon which has been adopted as a textbook at the University of Oregon Dental School.
>
> Dr. Adams was born in Missouri and came to Oregon in 1890. He graduated from Denver University School of Dentistry in 1905. That year he contributed a display in the Lewis & Clark Exposition, and he has been displaying dental exhibits ever since.

A grand salute, Dr. Adams, as a charter member of G. S. O. C. !

****

Miss Alice Schminky has just returned from a 17-day vacation to the Hawaiian Islands. This was a graduation present to her by her uncle and aunt, Mr. and Mrs. Eyrle Bills of Tillamook, who accompanied her.

WHO's WHO?

The 1960-61 issue of Who's Who in America lists two of our members, Dr. Jessie L. Brod and Dr. Arthur C. Jones.

Our society is real proud of them!

Mr. and Mrs. Leo Simon announce the arrival of a grandson, Douglas Lindley Miller, born May 1st, son of Dr. Wilmer J. and Lotus Miller.

CARL PRICE RICHARDS

Engineer, Astronomer, Geologist - Christian Gentleman
1881 - 1960

The Salem Geological Society lost, through death, on April 26, 1960, a charter member whose contribution to the interests of the Society and the community will be difficult to replace and whose position in the affections of his numerous friends will never be lost.

Carl Price Richards was born in Sheffield, England, July 11, 1881. Carl was by profession a civil engineer and as such, used his knowledge in the service of England's Great Western Railway, Canada's highway system, general contractors and, for many years, in bridge construction and research for the Oregon State Highway Department, which honored his retirement in Dec. 21, 1950. He was employed by the contractor constructing the Astor Column and the monument's cap is of Carl's designing. He also was engaged on the Oregon City bridge and while there assisted in the plans for the local Congregational Church.

Carl Richards was an ardent and capable amateur astronomer. He served the National Astronomical League of America as Treasurer and as Vice-president and was honored by the League at its 1955 Seattle convention with a certificate for "outstanding leadership and accomplishment" in the field of amateur astronomy. He also contributed to astronomical papers.

Carl was a member of the Portland Mazamas with articles contributed to its magazine and both Mr. and Mrs. Richards were charter members of the Geological Society of the Oregon Country and of the Salem Geological Society.

It was a pleasure to listen to one of Carl's lectures on subjects usually linking astronomy, geology and natural history. An article contributed by him was complete without redundancy and should never be abridged, enlarged or altered in publication.

The Geode - Salem, Oregon.

* * * * * * * * * *

CONGRATULATIONS!

Joan Ericksen and Jim Sevcik, of Hilo, Hawaii, were married April 23rd at Mizpah Presbyterian Church, Portland. Joan graduated this June at the University of Puget Sound, with a major in Geology. For the past two years Joan has been a laboratory instructor - she was also doing special research in 'pollen in rocks.' Last summer she took her 'field camp' with the University of Wyoming. The summer of 1958 she worked at the Olympia National Park and plans to teach science at Boston High School, beginning this fall.

Joan has said that she had to go to college in order to find out how much she had learned at Camp Hancock and G. S. O. C. lectures and trips.

G. S. O. C. and Camp Hancock are proud of "our Joan."

Happy Days,

C. Clark

IDEAS ON THE ORIGIN OF OREGON AGATE
(WITH SOME ARITHMETICAL NOTES ON SILICA & IRON)

By
John Eliot Allen, Portland State College

Oregon and the Pacific Northwest have long been known as a prolific source of the "quartz family minerals," indeed; the well-known and useful book of that name by Dr. Arthur Dake, a Portlander, was appropriately written in this region.

The geologic reasons for this relative abundance of most of the varieties of sedimentary or ground-water silica minerals, which range from nontronite to opals, chalcedonies and agates, is less easily explained. A few ideas are here expressed suggesting possible hypotheses for Oregon's richness in "thunder eggs," petrified woods, amygdaloidal agate, jasper, and all the other varietal kinds of cryptocrystalline and colloidal silica.

Since the beginning of Cenozoic time, 60 million years ago, the Pacific Northwest has been the scene of repeated and extensive outbursts of volcanic activity. Lavas and volcanic ash are found incorporated in almost every formation of the Tertiary geologic column in eastern Oregon; the Cascades are dominantly volcanic; west of the Cascades the sediments of the Willamette Valley and the Coast Range include abundant volcanic ash, and the history of the area is involved in at least three periods of extrusive and intrusive volcanic activity. Since volcanic ash is made up largely of glass, and since glass is a most unstable "solid solution" or "supercooled liquid," its decomposition under the chemical processes of weathering should supply a source of abundant silica to ground waters during much of the Cenozoic.

The climatic situation in the northwest at the present time is one generally favorable (west of the Cascades) to a high ground-water level and rapid run-off; both of which features permit rapid transportation by ground water of dissolved solids. There is reason to believe that during

IDEAS ON ORIGIN OREGON AGATE - cont.

much of the Cenozoic conditions were at least as favorable and, in the case of the regions east of the Cascades, even more favorable than today during the lower Cenozoic. This was before the Cascade climatic barrier had caused the present rain-shadow, and while semi-tropical conditions existed throughout most of the northwest. The volcanic aggradation of the entire area, due first to actual accumulation of volcanic piles, lava flows and mudflows, and, second, to repeated damming of the drainages which caused lakes that were rapidly filled with volcanic ash (John Dav, Clarno, and Mascall, etc.), all tended to provide conditions where the waters above and below ground could become overcharged with dissolved silica.

Volcanic rocks are also peculiarly designed to provide open spaces within which ground water can travel and deposit minerals. Sediments, which usually can be easily penetrated by ground water, will contain deposits in the form of concretions or interstitial fillings, and the pore spaces between the grains may become filled with silica. Organic materials within the sediments may be replaced by silica, as in the case of petrified wood and other fossils. But sediments (except in the case of limestones, which are not widespread in the northwest) seldom contain large open cavities. Volcanic rocks on the other hand, besides the usually fine network of joints which permit access of ground waters, contain vesicular openings (gas bubbles) in basalt, lithophysal openings (of similar origin) in rhyolites, and widespread open spaces in the lava-surface breccias between the flows and between pillows in submarine flows.

Although all the above factors are important, the deposition of silica in northwest rocks is more probably a result in large part of a period of tectonic stability which preceded the Cascadian revolution and which has not been sufficiently emphasized. This resulted, in upper Miocene times, in the now well-established period of laterization which produced the northwestern Oregon iron ores and bauxite deposits, the southern Oregon nickel deposits, and possibly, in eastern Oregon, at least one high-grade deposit of residual kaolin. Certainly not all the silica minerals were deposited during this period, and there is some evidence of a later (Pliocene) silification and laterization (Ross Mountain formation of Allen & Howell, opal in the Boring volcanics, etc.); but just as certainly, most of the silica is found in the earlier rocks. The coastal agate is largely derived from the Eocene Tillamook and Siletz lavas; the petrified woods of the Cascade foothills are from lower Cenozoic sediments; the thunder eggs and moss agates of central Oregon are in large part from the Eocene Clarno. The Unity opal, which is found in veins in a lithified ash is probably interbedded with Columbia River basalt, but may be later in age, as are some of the other petrified woods and thunder eggs east of Burns; but these are exceptions.

This upper Miocene period of laterization was widespread and probably continued for several million years. The land must have been close to sea level, and endless, featureless plain with perhaps a few occasional low rolling hills, eroded remnants of once mighty volcanos. The climate was still warm and moist, even semi-tropical, and most important of all, the water table was close to the surface and active mass wasting and erosion was subordinate to chemical weathering of the surface rocks.

That tremendous amounts of silica were leached from the volcanic rocks of the northwest during this period can be deduced from the analysis of the weathering process, in Reiche (1950, pp. 46-53). A few quantitative calculations, approximate as they must be, might be instructive.

Figure 1 indicates, from the evidence of analyses of three chemical components (alumina iron, and titania) in fresh basalt and bauxite, that it takes 2.5 feet of basalt to produce one foot of bauxite.

	1	2	3	4 (1 x 2.5)
SiO_2	49.3	9.48	9.36	----
Al_2O_3	14.1	34.68	38.63	35.0
Fe_2O_3	3.4 =2.4*	Fe 23 12	Fe 20.70	Fe 25.6
FeO	9.9 =7.8*			
TiO_2	2.6	4.85	5.83	6.5

(1) Ave. of 50 plateau basalts (GSA Bull. Vol. 33, p. 797, 1922)
(2) Ave. of Washington County ferruginous bauxites (Libbey, et. al., 1945)
(3) Ave. of Columbia County ferruginous bauxites (Libbey, et. al., 1945)
(4) Column 4 has been derived simply by multiplying Column 1 by 2.5

* Recalculated to Fe.

The average thickness of ferruginous bauxites in Washington County according to Libbey (1945) is about 12.5 feet. Therefore, the average thickness times 2.5 (column 4 above) gives 31 feet of fresh basalt, containing almost 50% silica (basalt weighs 185 lbs/ft^3), or 92 lbs of silica per cubic foot. This gives 2852 lbs (1.4 tons) per square foot for the 31-foot thickness. There are almost 28 million square feet in a square mile, so we can assume that the production of the 12 feet of bauxite involved the solution and carrying away of 39 million tons of silica per square mile.[1]

The Miocene is thought to be about 20 million years in length, but since the Columbia River basalt is considered to be upper Miocene in age and surely took several million years to accumulate, this narrows the period of laterization of the basalt to probably less than 5 million years. This reduces the amount of silica removed to a reasonable 7.8 tons per square mile per year, or only .00056 pounds per square foot per year.

It has been suggested by some (although not generally accepted) that the limonite deposits of Columbia County, which may contain as much as 5 million tons of 50% Fe, were deposited in lakes draining the laterite terrane. The averages of ferruginous bauxite from Washington County contains 23.12% Fe; that from Columbia County 20.70% Fe. The difference, 2.42%, if washed out of Columbia County laterites adjacent to the hypothetical lakes, could make up the 5 million tons in the deposits from an area measuring only 10 x 10 miles, or about 100 square miles! Figure it out yourself!

[1] We are neglecting, in our rough calculations, the 9% SiO_2 left in the bauxite.

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Reiche, Parry (1950). A survey of Weathering processes and products: U of New Mexico Pubs. in Geol., No. 3.

Libbey, Lowry, and Mason (1945) Ferruginous bauxite deposits in northwestern Oregon: Oregon Dept. of Geol. & Min. Ind. Bull. 29, p. 7.

May 1960

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SALT

This, the commonest mineral, is taken for granted. It is used the world over by all, each day and has been for ages.

It is found the world over and especially where Permian seas once existed. Such a place is along our gulf Coast where many salt domes are found. One on Jefferson Island, Louisiana, is being worked by the Diamond Crystal Salt Company. Here 100 feet below sea level a single blast loosens 1,000 tons which is processed in a single day. This salt plug is said to extend miles into the earth.

The United States uses 25 million tons of salt per year, and world consumption is 50 million tons, yet no shortage can be foreseen. The five oceans are estimated to contain four and one-half cubic miles.

"Salt for your soup" -- no need to be anxious.

GEOLOGICAL NEWS LETTER

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1960-1961

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		Luncheon	- Mr. Leo Simon

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 a 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 Secretary.

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 Avenue and Yamhill.

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

Library Night: Once a month. Lewis and Clark College, Biology Bldg.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.25 per plate.

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

CALENDAR

Buffet luncheon every Thursday noon, second floor, Portland Chamber of Commerce, 824 S.W. 5th. $1.25

Friday, August 12 — Annual Picnic.

Our annual Picnic will take place at the Crater, Mt. Tabor Park, on August 12th, beginning at 6:30. Bring your pot-luck dinner. The committee will furnish rolls, butter, milk, coffee and tea. Bring table service.

Mrs. Pierce will head the Telephone Committee, and Mrs. Leslie Davis, the Food Committee. Dr. Allen of Portland State will speak on the Wallowa Mountains.

For information call: Mrs. Hammond, General Chairman, OL 4-5570; Mrs. Leslie Davis, AL 3-6723; Mrs. Hayward Peirce, AL 3-8046.

-- By Mrs. Esther Hammond

Sat.-Sun., Aug 20-21 — Field Trip.

Leader, Leo Simon. We go to the Mt. Adams area.

Meet at Bird Lake at noon the 20th, elevation about 6200. From White Salmon go north to Trout Lake, observe markers, then to Bird Lake. This place is known as Bird Meadows and is a favorite spot to study wildflowers.

Friday, August 26 — Lecture. Central Library, 7:30 p.m.

Dr. Ruth Hopson will lecture. Her subject, "Glacial Action."

CAMP ARAGO

In addition to the two family sessions at Camp Arago this summer, there will be one exclusively for adults. The dates for these are as follows:

August 14 - 20 Family camp, for adults and their children
August 21 - 27 Second session, same as above
August 28 - Sept 3 Adult camp, designed for persons of maturer age groups.

During each of these sessions studies of marine life and of geological history of the Oregon coast will be made. Camp Arago is a non-profit activity of the Oregon Museum of Science and Industry and is conducted at the Oregon Marine Biological Station near Charleston, Oregon. If interested, contact the Oregon Museum of Science and Industry, Portland, Oregon.

Trip leader, Dr. Howell, cancels the trip to the Wallowa Mountains on Sept. 3-4-5. We shall go instead to the Lewis River area. More about that later.

* * * * * *

CHANGE OF ADDRESS

Mr. and Mrs. E. C. Johnson	5914 N.E. Fremont, Portland 14, Ore.

NEW MEMBERS

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Miss Marjorie Ann Fessenden	743 S.W. Maplecrest Ct., Portland 19	CH 6-2987

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NEWS OF MEMBERS

A BIRTHDAY AT GRAND COULEE

An outstanding celebration for one of the noted members of the Geological Society, on the occasion of his seventieth birthday, took place at the time of the recent field trip to Grand Coulee.

The G. S. O. C ers, who were camped at Sun Lakes State Park, secretly gathered one evening at the Franklin Browns' cabin and made great and sudden preparations for a party. Gifts were wrapped and impromptu refreshments prepared.

By the time that all was ready Leo Simon arrived, and with a fanfare of greeting everyone burst out singing Happy Birthday, accompanied by Paul Howell's guitar. A piece of cake, served by Ardna Brown, with a unique ornament of a lighted match in the center was presented to Leo on a tray. Surrounding the cake were gifts wrapped in colored paper napkins.

As we all enjoyed refreshments, Leo opened his presents, finding among them a cigar, a toy scorpion, an agate with his name on it, and a bright yellow coolie hat. Its becomingness made Dick Brown remark, that now Leo was indeed the GRAND COUL(IE)EE.

After ice cream and cake, inspired by Paul Howell's guitar, we all sang songs, and for one and all it was a happy birthday occasion.

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Hollis Dole, Director of the Oregon Department of Geology and Mineral Industries, was featured in the Oregonian of April 27th. He was shown with Richard Nixon and four others at Bougainville during World War II as one of the officers of an air transport outfit which carried in ammunition and took out the wounded. Mr. Dole still keeps in touch with his "old buddy-in-arms."

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Mr. Hugh Miller of our G. S. O. C. is 1960 president of the Oregon Geranium Society. Their annual show was held at the Auditorium on June 24th and 25th.

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Mr. Clarence Phillips is the new president of the Rotary Club of Portland.

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Mr. Claire E. Pense, former Deputy County Surveyor, has opened his office for private practice at 17021 S. E. Division Street.

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On the full page of pictures on the front page of the Women's Section of Sunday's Oregonian, July 10th, featuring activities of OMSI, was one of Dr. Jim Stauffer with a class of young people studying marine biology and geology on the shore at Camp Arago near Coos Bay.

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NEW PREXY SPEAKS

Was it King Solomon or Shakespeare who alluded to the risk involved in changing horses in midstream? I wouldn't know about that, having never tried it. But I can vouch for the fact that changing boats in midstream affords little time for meditation until you've landed safely on the deck.

Perhaps the same applies to an unsuspecting Vice President when told on the phone 'to brace himself for news to follow.' And so it was that I learned of our Franklin Brown having to resign as President July 10, and with his fine family, move to Seattle.

"Brownie" and Ardna have worked hard in the interests of the Society. He had lined up a devoted group of Committee Chairmen supplementing the work of our Executive Board and News Letter staff. We'll miss them--and how!

With this heritage of good will and accomplishments well under way I'll endeavor to carry on through the remainder of our year's activities. We've a fine group to work with.

R. F. Wilbur,
President

CROOKED FINGER-ABIQUA FIELD TRIP

On July 17, 1960 eleven cars containing about 30 of GSOC members and friends assembled at Marquam Store northeast of Silverton, Oregon. Led by Murray Miller and our Trip Chairman, Dr. Paul Howell, we travelled through Scotts Mills into Marion county, climbing an easy grade along the flat-topped ridge between Butte Creek and Abiqua Creek to the Crooked Finger country.

Our first stop was at the quarry of Jeanette Finnemore of Mt. Angel (about 2500 feet elevation) in the Cascade Andesite lavas. Platy, massive and columnar phases of these rocks were inspected. Laying below at this place and inter-fingering at other places we found the Fern Ridge formation of volcanic tuffs and conglomerates. These two formations are Plio-Pleistocene age and may have initial dips on the west side of the Mahama Anticline. Local dips are 0-90 degrees or more in the Cascade Andesite but a short distance away large columns had horizontal jointing.

These two formations are unconformable on the Stayton Lavas which were visited next at the Quarry of Mr. McLaughlin at the Crooked Finger grade school. The walls in these dark grey basalts contained northwest dipping cracks with vertical displacement up to six inch openings cutting across the columns. These cracks were empty and up to 75 feet long. Dr. Howell thought they might be formed by blasting rather than by earthquakes or horizontal thrust movements. These lavas are Miocene flows and are deeply weathered forming a rich brown residual soil.

A short drive over a winding road down to the Abiqua valley brought us to several exposures of the underlying Illahe formation. These are Oligocene sediments deposited in an "inland" sea. This includes several phases. At the green steel bridge about ten miles up the Abiqua creek from Silverton the Illahe sandstone with mica was exposed along the banks. At other places tuffaceous sandstone, shales and conglomerate were exposed. In some parts of the Lyons quadrangle this formation is rich with shells of pelecypods near the bottom and leaf fossils higher up.

Material for this trip and report were obtained from "The Geology of the Northern Third of the Lyons Quadrangle, Oregon," by Perry Neil Halstead, 1955, Thesis for Master of Science.

Murray R. Miller

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-- (Lunch time on Crooked Finger Ridge):

Joe Wimmer to Murray Miller, "How did Crooked Finger Ridge acquire its name?"

Murray Miller, "I swear I don't know, but I'm trying to put my finger on the crook."

Emily Moltzner has looked up the matter in McArthur's Place Names, and says it was named for a Molalla Indian chief.

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INUNDATION PLANS FOR EGYPT'S KATTARA DEPRESSION - by Geo. Weller

Alexandria, U.A.R. -- With the long view of the pyramid-building kings of Egypt, President Gamal Abdel Nasser is studying a plan to flood with seawater the famous Kattara Depression..

The depression, a brown-black waste sown with tricky quicksands and mapless minefields, is Egypt's western Maginot Line, 180 miles long from east to west and 85 miles wide.

Both British and German armies found its awful heat and steep walls -- two-thirds of the depression is 160 feet below the sea -- impenetrable to vehicles and tanks.

Flooding the Kattara will create a natural lake, less impassable than the deadly sands, possibly even a highway for amphibious vehicles. The lake will also change Egypt's weather bringing rain-clouds farther inland.

Small at first, the lake will grow vaster with the centuries, filling up more slowly than the cleft reservoir of the high dam, but bigger. About two million tons of salt will pour into the lake a day. Yet the salt will remain mostly in solution for about 160 years, after which it will precipitate out onto the bottom.

Inundation Plans -

Salt Pile Expected

By that time, presumably, the 330 KW electric turbines, with the salt margins growing around them, will be replaced by atomic power.

German engineers, before giving Nasser a power estimate for this enterprise, are studying closely the calculations of John Ball, a British geographer-engineer who first drew up this plan in 1930.

Long after its power-creating functions are over, the lake will go on filling up with salt. Finally, 1,230 years hence--only a few minutes in ageless Egypt--the lake will disappear. The sea will cease pouring in by gravity. What will be left is a huge seashell-shaped dish of salt, 600 feet deep.

Three Inlets Considered

The question of cost centers around whether there should be one huge inlet, 56 feet in diameter, or several small ones.

The British plan, which has yet to be bettered, called for three smaller pipes around 18 feet in diameter. But the tunneling costs are formidable. Two tunnels would be about 30 miles long and the easternmost about 45 miles, starting at a point near the lonely cemeteries of El Alamein. The Kattara's rim rises 600 feet high. The tunnels must pierce it like knitting needles on an omelet's edge.

Given the terrifying nature of the physical obstacles, the engineers studying the Kattara have felt satisfied that about 60 per cent of the power potential can be realized.

- - - Chicago Daily News Service

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OREGON GEOLOGIC SURVEY

More than one hundred field studies are expected to be under way in Oregon this summer. More graduate students are doing work in Oregon for degrees in geology, and the U. S. Geologic Survey and Oregon Department of Geology and Mineral Industries are concentrating on completing the state mapping projects. Only about two-thirds of Oregon's 96,000 square miles have been mapped geologically, and about half of this has been reconnaissance. Relatively few stratigraphic and mineral deposit studies have been completed.

- - Mining World, July 1960

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OPENING THE STEENS - -

Probably no state in the nation offers wider choice of scenic and recreational areas than does Oregon, ranging from seashore to mountains, from regions with heavy rainfall to deserts.

One of the least known, most scenic, and most primitive areas is the Steen Mountain area, about 90 miles southeast of Burns in Harney county. The Bureau of Reclamation has taken steps to classify 500,000 acres of public domain lands in the 1200-square-mile region as a multiple-purpose land management area.

This is a step in a program to work out long-term cooperative plans for the use and development of the area, including cooperative financing of the construction of access roads and public recreation facilities. Construction has been started on an access road from the county road in Catlow Valley east to the junction of Big Indian creek and the Blitzen river, with the first section to be completed by June 30 of this year.

It is planned to start construction on the second section after July 1. This will extend from Big Indian creek to the summit of Steens Mountain. This public access road, referred to as the Steens Mountain Loop, will connect with the BLM road at Fish lake 20 miles east of Frenchglen.

The summit of Steens mountain is 9354 feet. The scenery is wild and spectacular. Fishing and hunting are excellent. In addition, the Steens is rich in early history of Eastern Oregon, and the visitor feels he has stepped into the "Old West" as it has been popularized by novels, movies and television.

In spite of its isolation (in fact, largely because of it) it is quite possible that this area will provide a popular and different attraction in the state.

- - - Daily Journal of Commerce-4/26/60

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AUGUST 1960

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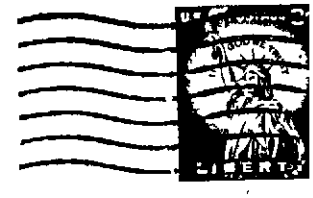

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1960-1961

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		Luncheon	- Mr. Leo Simon

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 a 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 Secretary.

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 Avenue and Yamhill.

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

Library Night: Once a month. Lewis and Clark College, Biology Bldg.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.25 per plate.

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

CALENDAR

Friday Sept. 9 — Lecture. By Lon Hancock, subject to be announced. Public Service Building.

Friday Sept. 23 — Lecture. By Lloyd Ruff, Subject: "Weathering". Public Service Building.

Notice:

According to announcement by Dr. Howell, trip leader, all trips for September have been cancelled, unless otherwise notified.

THE LUNCHEONS WILL START THE FIRST WEEK OF SEPTEMBER at the Chamber of Commerce, 824 S.W. 5th.

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CORRECTION

Correct phone number for Miss Eliza Stevens: PR 4-0439.

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HAPPY ANNIVERSARY

On July 30th, in the oriental atmosphere of the garden and patio of Mr. and Mrs Charles Gorter of 1514 S.E. Rex Street, many friends gathered to offer congratulations to our fellow member ber Orrin E. Stanley. Mrs. Joan Stanley, daughter-in-law residing at Salem, conceived the idea of having open house for this delightful young fellow who had just celebrated his 88th birthday.

Former associates recalled old days in the Engineers' office in the City Hall, where he served for 41 years, retiring at 80. Others ate cake and drank coffee, marvelling at Mr. Stanley's secret of eternal youth. His son, Howard, gave us a clue by saying that, "his father never got in a hurry, or seemed perturbed by the trifles that annoy so many of us." Perhaps his many facets of interest in life, geology, amateur photography, and (going to college, the University of Mexico, after 80) have added zest to his later years.

He is the oldest member of G.S. O.C.

We wish him happy days and many more anniversaries.

Grace F. Thomson

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BIRD CREEK MEADOWS TRIP

Leaving Portland Saturday morning at 7:45 a.m. it looked much like rain, but after driving about an hour up the Columbia River Highway the sun came through the clouds, and after crossing the Hood River Bridge, the weather turned warm. We drove through White Salmon, Washington 25 miles to Trout Lake on hardtop. Here the rock and dust road began and there was plenty of dust. We stopped to see the largest Ponderosa pine in Washington, 7 feet 2 inches in diameter. This tree is in an enclosure about 100 feet off the road.

After driving through dust and forest, we arrived at Gotchen Creek Guard Station among Quaking Aspen trees, a good place to inquire about road and fire conditions. Driving through forest and meadows, we arrived at Mirror Lake. A fine reflection of Mt. Adams is visible from this beautiful but small lake.

The road became steeper and rougherfor the two miles to Bird Creek Meadows Campground. Driving into the camp at 11:00 a.m., we were surprised to find it empty, the first time this occurred in over 23 years of our trips here. The G.S.O.C. camped here about 1936 the first time.

We started to make camp under the Alpine firs and Mountain Hemlocks when more members arrived and busied themselves making camp and lunch. Some really roughed it by having tents, while the more hardy put their sleeping bags under the trees or under the clear starlit sky. Oh, yes, here one of our charming lady members experienced her first overnight camping.

After lunch an exploring trip up in the meadows for botanical and geological study was lead by Dr. Howell and Leo Simon. The abundance of flowers for which this meadow is famous was missing, due to the hot weather of the preceding month. The flowers had bloomed a month too early, but the members were pleased with what were found. Over 40 varieties were listed and ten species of birds were seen between camp and Hellroaring Canyon at 6500 feet elevation. The view across this canyon, at Mt. Adams, was breath-taking with its waterfalls and glaciers.

The weather was warm and comfortable. No coats were needed. Although it was a little hazy, we had a fine view into central Washington across the Klickitat River Valley to the mountains near Goldendale. To the south we identified Tygh Ridge across the Columbia in Oregon, which is a large fault scarp. Southwest it looked like a mirage, as if Mt. Hood was floating in the clouds.

On returning to camp, everybody was hungry and the cooks got busy preparing meals for the hungry (wolves.) When the dishes were finally put away, we gathered around a large campfire, which was fed with wood gathered at a great distance.

Ruth Prentiss had a ukele which she played. Dr. Howell and Truman Murphy accompanied. We sang many old songs and some not so old. After playing for some time, Dr. Howell was asked by a youngster if he couldn't play classical music. This created quite a laugh.

There were 20 adults and 7 youngsters seated under the clear starlit sky. About 10:00 p. m. we were alerted that the 10-story satellite was visible in the southern sky and everybody left the fire to view this. Back to the fire for more songs and about 12:00 p. m. the satellite passed directly overhead. It was thrilling to see this latest U. S. achievement, as it was as bright as the brightest planet and traveled at great speed. At one time it seemed to collide with a star.

We all bedded down for the night after this stargazing. About an hour later a strong wind blew down from the mountain top and at times we felt that the branches above would be torn loose and fall on us. The sky was clear and starlit and the wind cold. About 5:00 a. m. the clouds came over and it misted. Then the sun came out only to disappear again. Next it rained and snowed. This lasted all morning.

After breakfast some wanted to hike, so we started out but the snow and rain sent us back to camp where we packed up and departed about noon. After driving down the mountain a few miles the rain and snow ended and we had more sunshine. After crossing Hood River bridge it became stormy and rain came down in torrents. This ended an interesting and pleasant trip with all kinds of weather.

(This area is covered by the -

1. Gifford Pinchot National Forest map and
2. Mt. Hood National Forest Map, obtainable from U. S. Forest Service in Lloyd Center
3. Mt. Adams and Steamboat Mountain Quadrangles at Gill's.)

P. S. A notebook was lost at camp. Please return same to Leo Simon.

---- Leo Simon, Trip Leader

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STRANGERS ON THE BEACH

North of Newport, Oregon there are a group of fine beaches separated by headlands and bordered on their landward side by recently cut bluffs. They are recent both in the geologic sense and in the sense of human history, for they are cut mostly in Pleistocene terrace deposits and are being actively eroded now. Little creeks coming down from the high knobs of igneous rock in the distance have entrenched themselves in the terraces and are helping in their way to destroy what was built by the sea so short a time before. The beaches themselves are largely covered with sand, but here and there gray sandstone ledges of the Astoria formation protrude like stony ribs across the smooth surface. Shingles of gravel, stretching up and down the beach from the mouths of the little creeks, complete the picture and lend additional variety to the pattern.

One may walk these beaches for the pure recreational joy of it, or collect agates and shells as fulfillment of hobby or research. Or one may have yet a deeper interest and collect fossils from the Astoria formation. In places these are abundant and well preserved. One may also take an interest in the stratigraphy of the Pleistocene terraces or study the petrography and character of the gravel shingle. At the mouths of the little creeks the shingle grades into small fans of coarse cobbles and boulders.

Strangers on the Beach -

On last Memorial Day my family and I were lolling in the sun near Beverly Beach, enjoying the cool breeze and the play of the waves. My mind and eye, being never completely at rest in such surroundings, played over the bluffs, the beach, and the gravels of a nearby creek fan, - not expecting to see anything in particular, just being curious. Suddenly I sat bolt upright! There was a stranger on the beach! One from a far away region; far indeed for one such as he. The general composition of the beach gravels is about 85 percent basalt. Most of the remaining 15 percent consists of sandstone, cherty material, and agates. Most of the basalt must have come down the creeks, for the boulder deposits are concentrated at their mouths. These boulders come chiefly from direct erosion of the high igneous rock knobs on which the creeks head, but some were undoubtedly reworked from the Pleistocene terrace deposits. Additional amounts came from the nearby basaltic headlands. Amongst this monotonous array, however, my sight had fallen on quite a different rock, - a nicely rounded cobble of granite about 6 inches in diameter. I sprang to my feet and walked over to it, lifted it up and inspected it closely. Beautiful biotite granite! What was it doing here? Various conjectures raced through my mind, but, while I was thinking, I hurriedly searched for more cobbles. I enlisted the aid of my son, and in twenty minutes we had collected fifteen or more of these strangers, ranging in size from 3 inches to a foot in diameter. They presented quite a variety, the main types being granite, diorite, gneiss, schist, greenstone, and quartzite. Greenstone was the most plentiful, and gneiss next.

Lloyd Ruff of our GSOC has found these strangers farther north near Delake under very interesting relationships, but I'll let him tell about his own discovery. Several years ago I remember seeing Agate Beach red with garnet sand, which my reasoning told me was alien, for the marine sediments of the hinterland contain little or none of this mineral. Now I thought back on this incident and wondered if the garnet sand were not another piece in this puzzle.

As I stood looking down on the little piles of strange rocks we had gathered, three possible explanations for their presence here came to my mind. The least likely of the three is that somewhere not far off our coast there exists submerged outcrops of ancient rocks, which, during Pleistocene sealevel lowering, were exposed to wave erosion. As the sea again advanced during interglacial periods, storm waves moved some of this debris landward to the beach areas where we now find it. This hypothesis could most easily account for the large quantity of garnet and other unusual minerals found in the sands of this coastal area.

Hypothesis number two is that this area was the discharge point for an ancestral Columbia River, the Coast Range section of which was considerably south of the present location. This hypothesis has been put forth by other geologists, but has never gained credence because there is no typical Columbia River gravel or sand between the Portland area and these beaches. I shouldn't say, "There is none." I should say, "None as yet has been found." This hypothesis gains some strength from the fact that the most pronounced low area in the Oregon Coast Range lies east of these beaches, specifically at the divide between the Yamhill and Salmon rivers. It is appreciably lower than that part adjacent to the present Columbia River course and is the area where you would have expected a large river to have crossed from the Willamette Valley to the sea. One other piece of evidence supports it in a default sort of way. Geologists have reason to believe that there was a pre-Columbia-River-basalt Columbia River which crossed the Cascade Range close to the present course. However, no typical Columbia River sediments appear in the vicinity of the present mouth until upper Miocene time (R. K. Dodds-unpublished thesis). Where did the Columbia River discharge in these earlier times? Perhaps the garnet sands and the strange boulders are reworked material from the ancient Columbia River deposits.

The third hypothesis, and the one that seems to most plausibly explain the presence of the strange boulders, at least, is that they are erratics dropped from Missoula Flood icebergs which grounded here. The bergs would have been swept far out to sea by the flood and sea currents would have brought them back to the beaches. So far as I know, no strange boulders have been found on the beaches north of Otis. Why then did the bergs return only to the Newport-Otis area? A quirk of the ocean currents? Or is it that no one has made a search of the beaches north of Otis? And where does the big concentration of garnet sand at Agate Beach fit into the picture?

These are all nice interesting hypotheses, but we need a lot more data before we can decide which is correct. How about some of you other GSOCers checking up on some of the missing

data. The low area at the Yamhill River-Salmon River divide may be a fertile field, especially those parts of the area that appear to be remnants of an old broad flood plain. The beaches between Otis and Astoria also need a good checking over. Come on! Let's get busy! Let's give a better welcome to those strangers on the beach.

---- Paul W. Howell

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CAMP HANCOCK AND "BEASTS OF THE BADLANDS" -

By Phil F. Brogan
The Oregonian

"There are thunderbeasts in those hills."

Scores of youngsters attending the Oregon Museum of Science and Industry geology camp in the colorful Clarno country of the mid-John Day River region have heard those words many times since 1950, year the camp was started.

Many of the youngsters, some now college graduates, joined in the hunt for the "beasts of the badlands" through the years and have assisted in digging ponderous skulls from rocky beds that were swamps eons before the volcanic Cascades appeared in the west.

The home of the thunderbeasts is high in the sun-scorched hills north of Pine Creek, an eastern tributary of the John Day. Forming a spectacular backdrop for this mausoleum is high Iron Mountain, where massive layers of Columbia lavas are piled into the sky. Meandering through a broad valley to the south is the historic John Day River, with Black Rock, capping other mammal beds, in the distance.

In a sheltered valley in the gray foothills of the land of the Oregon thunderbeasts is Camp Hancock. It is recognized as a natural science area unique in America. At this camp each summer, the Oregon Museum of Science and Industry operates a sort of outdoor summer school for boys and girls. The camp is known to some as "Hancock College."

The name of the camp and the "college" honors a retired Portland postal carrier who made the spectacular discovery in the Clarno region of mammals of the Eocene, first of this epoch ever found in Oregon.

The retired postman, whose find of fossil mammals in the Clarno formation virtually upset the paleontology of Oregon, is Lon Hancock, dean of Pacific Northwest fossil hunters who seasonally is honored by world-renowned scientists.

It was on a spring day in 1954, just four years after Camp Hancock had been established near Clarno by the OMSI, Portland, that a discovery was made which makes it necessary for geologists to rewrite their basic chapters dealing with a 60-million-year period of Oregon's pre-history. On that day six years ago, Hancock and Al McGuinness, then of Portland, were hiking over the warm Clarno hills, already world-famed for their fossils of petrified plants and nuts.

McGuinness, an "agate man," was searching the bottom of a dry creek for possible gem material. He found an object that appeared to be a mineralized bone. McGuinness tossed the fossil to Hancock. His first thought was that they had found an outcropping of the John Day formation, famed for its fossils.

Not even Lon Hancock, the veteran fossil hunter, could conceive of finding mammal bones in the Clarno clays. For more than half a century earth scientists had been saying that the Clarno was "boneless.. But Hancock continued his search and made the discoveries that "changed the face of primordial Oregon."

The discoveries were bones of the Brontothere, popularly known as the thunderbeast, and its kin. Dr. Arnold Shotwell, University of Oregon Paleontologist, identified the creature as an apparent relative of giant Brontops, one of the largest creatures ever to range over ancient America.

It was the pioner paleontologist O. C. Marsh of Yale who first found and identified these creatures in the tertiary formation of Colorado. He named the giant animals "Brontotheres"--the thunderbeasts. In early days, Indians of the mid-western badlands found huge bones in washes, following floods, and believed they were remains of "thunder horses" that jumped from cloud to cloud as lightning flashed.

Beasts of the Badlands -

This year, youngsters at Camp Hancock suggested a new name -- "Aurora beasts". One night in July, as the young people looked north from their camp toward the mammal beds they saw northern lights flashing over Iron Mountain.

In excavation work under the supervision of Hancock, new and important finds were made in the beds, which appear to have been deposited in or near Eocene swamp. Even crocodile remains have been found there.

Three different genera of Brontotheres, possibly all new to science, and more closely allied to Asiatic beasts than to those of the Rocky Mountains, have been found. Also three different generations of rhinos are represented, not to mention a tiny horse that galloped over trails blazed in earlier geological time by eohippus of poetic fame.

Not all work in this nature camp in the old hills of the Clarno country, about halfway between Antelope and Fossil, is confined to the search for mammal fossils in the beds that have provided a new and important chapter in Oregon geology. The area holds a rich story of trees, shrubs, plants and flowers of long millions of years ago. In this area, just back of Camp Hancock, are the world-famous Clarno nut beds that have yielded some 500 different types of plants of Eocene days -- an epoch when most of western Oregon was still under water.

Youngsters selected for attendance at Camp Hancock study living plants and animals of the area, as well as those of millions of years ago. Last year, a rare plant was found near a road. To protect the plant, the road was moved. Field trips take the young people to points as distant as Mitchell, where they have an opportunity to study the shores of Cretaceous seas that rolled over the area even before the thunderbeasts crashed through Clarno jungles.

Rock cutting and polishing is taught interested youngsters who have the privilege of making their own jewels from semi-precious stones of the region.

Even when night comes to the Clarno ranges, Camp Hancock youngsters continue their studies. An OMSI telescope seasonally is set up on the grounds. This summer, youngsters looked out over the lonely Clarno rims to watch some of Jupiter's nine moons circle that planet, and keep tab on the giant ringed planet, Saturn.

MOUNT MAZAMA

The climactic explosions that led to the collapse of the top of Mount Mazama and the formation of Crater Lake took place about 7,600 years ago, by which time all the glaciers on the volcano had retreated above the elevation of the present rim of Crater Lake, except in three canyons on the south side. The initial outbursts after a long period of calm were of Vulcanian type, the pumice being hurled high into the air to be drifted by winds and fall in showers over a vast area, chiefly to the east and northeast. The deposits of this pumice fall approximate 3-1/2 cubic miles in volume. Immediately afterwards, glowing avalanches swept down from the summit of Mount Mazama at hurricane speeds. They raced down the canyon of the Rogue River for a distance of 17 miles, and down all the other deep glacial canyons on the mountainsides, inundating vast areas of flat ground below. Most of the avalanche deposits are composed of dacite pumice, mineralogically and chemically similar to the dacite of the earlier pumice fall, but the final avalanches deposited dark, hornblende-rich basaltic scoria. All told, the avalanche deposits total between 6 and 8 cubic miles in volume. It was the rapid drainage of the reservoir beneath Mount Mazama brought about by these colossal eruptions, coupled with underground drainage of magma, that caused the mountaintop to founder and so produce Crater Lake. The discovery of artifacts beneath the deposits of the pumice fall shows that Man already inhabited this part of Oregon when these dramatic events took place.

Howel Williams

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OLD SETTLERS

As a result of a discovery made in Mexico recently -- that of a 30,000 year-old mastodon pelvic bone on which pictures of animals had been inscribed when the bone was fresh -- archaeologists may push the unwritten history of man in America back some 20,000 years.

Until about 35 years ago, man was believed to have arrived in America fairly recently -- about 3,000 to 4,000 years ago. Mongoloid people crossed from Siberia to Alaska on a land bridge, which existed at Bering Strait, in search of animals for food, it was assumed.

However, in 1925 man-made objects were found at Folsom, N.M., which placed human beings on this continent 10,000 years ago. Other finds, including sagebrush sandals uncovered in a cave near Fort Rock, Ore., which radioactivity tests showed were 9,300 years old, confirmed this evidence. There are indications that people lived in Tierra del Fuego, off the tip of South America, as long ago as 8,000 years.

It's a long, long way from Bering Strait to Tierra del Fuego. It's no short piece from the Strait to Puebla, Mexico, where Dr. Juan Armenta Comacho found the piece of mastodon bone. It would have taken many millenia for the descendants of small bands of Siberians to spread to all parts of the North American and South American continents.

New discoveries frequently prove that earlier archaeological deductions were in error. Perhaps the theory that the American Indian wandered accidentally into the western hemisphere in pursuit of game is incorrect. He may have come by other routes, or sprung forth here in the first place. America has animals, birds and fishes closely related to those of other parts of the world. Did all these come rushing across the land bridge during a lull in the ice age?

Anyway, in a period when the human race appears intent on rapid self annihilation, it is comforting to contemplate the steadfastness with which, over thousands of years, it proved its claim to all the earth.

- - - - The Oregonian

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Recent Dacites (Qd)

There has been more volcanic activity in the Three Sisters region during the past few thousand years than in any other part of the entire Cascade Range. This activity has produced basaltic cinder cones and flows on the one hand, and domes and flows of dacite and beds of dacite pumice on the other. The latest dacitic outbursts took place close to the South Sister. They formed an extensive sheet of almost barren obsidian at Rock Mesa, and a spectacular chain of obsidian domes and flows that extends for about 3 miles northward from Century Drive. Discharge of a few of these thick masses of blocky lava was preceded by explosions of dacite pumice. All of these obsidians are younger than the adjacent cinder cones, but whether or not they are also younger than the Recent basalts bordering McKenzie Pass is uncertain. In any event, the obsidians are younger than the dacite pumice blown from Mount Mazama, and perhaps they are no more than about 1,000 years old.

Two much older, but still Recent domes of pale-gray pumiceous dacite are present near the northeast base of the Broken Top volcano, namely Melvin and Three Creek buttes. These seem to lie on a northwest-trending fissure that continues in one direction to the vent of Trout Creek Butte volcano and in the other along the base of a pronounced break in slope of the Broken Top volcano.

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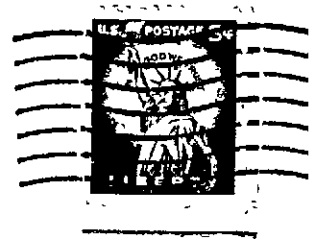

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1960-1961

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		Luncheon	- Mr. Leo Simon

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 a 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 Secretary.

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 Avenue and Yamhill.

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

Library Night: Once a month. Lewis and Clark College, Biology Bldg.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.25 per plate.

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

CALENDAR

Buffet luncheon every Thursday noon, second floor, Portland Chamber of Commerce, 824 S.W. 5th. $1.25.

GSOC Programs for October to be held at the Multnomah County Library.

Friday October 14 — Dr. Paul Howell
Subject: Sedimentation
Lecture to be illustrated by slides. This will be a continuation of our Basic Geology Series.

Friday October 28 — Mr. Leo Simon
Subject: Flowering Plants of the Pacific Northwest
Mr. Simon will illustrate his lecture with colored slides.

OCTOBER 23 - FIELD TRIP

Meet at the Crown Willamette Inn at 9:00 a.m. in Camas. We will ascend the Washougal River to Silver Star Mountain.

Tuesday October 18 — Library Night at Lewis and Clark College, Biology Building.

PERSONALS

Ralph Mason is one of the Workshop teachers at the Oregon Museum of Science and Industry. His group beginning October 8 will take up the fundamentals of classifying rocks and minerals.

Lee Simon travelled to Malheur Lake on the week-end of September 17 and 18th to aid in the dedication of a new Bird-blind on the lake for the observation of wild fowl.

Late word has been received of the passing of Mrs. Edwin T. Hodge, wife of Dr. Hodge, former president and father of G.S O.C.
Our sincere sympathy is extended to Dr. Hodge and family.

NEW MEMBERS

Mr. William M. Freer	2405 S.E. Taylor Street	City (14)
Mr. & Mrs. Clarence W. Hanson	2304 E. Burnside Street	City (14)
Mr. & Mrs. Kenneth Schramm	3407 S E. Vinyard	City (22)
Mrs. Gwen Helm	6225 S. E. Belmont Street	City BE 6-8324
Mrs. Rhoda Landels	3105 N. E. 56th Avenue	City (13) AT 8-1416

CHANGE OF ADDRESS:

Mrs. Almeda Smith	8807 S.W. Capitol Highway	CHerry 6-1532

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BOOKS ADDED TO GSOC LIBRARY AT LEWIS & CLARK

Tassili Frescoes	-	Lhote
World's Earliest Man	-	Natl. Geo - Sept. 1960
Geo. Times	-	March 1960
Geo. Times	-	April 1960

(continued)

Books Added to GSOC Library, Lewis & Clark - (cont.)

Geo. Times	-	May - June 1960
Geo. Times	-	July - August 1960
Journal of Paleontology	-	March 1960
" " "	-	May 1960
" " "	-	July 1960
" " "	-	Sept. 1960
Georgia Mineral Newsletter	-	Spring 1960
" " "	-	Summer 1960
Road Map of Klamath County		

TO THE FUTURE NATURAL SCIENTISTS IN THIS AREA - -

This notice is to all young men and women of high school and college age who have a keen interest in Geology and related natural sciences. The GSOC welcomes and extends an invitation to these interested young people to actively participate in the meetings and field trips sponsored by this Society. Special field trips tuned to student interests will be planned in addition to the regular monthly field trips.

We are fortunate in having many outstanding people of specialized talents within our society. It is from this nucleus we will draw those to lead and guide our natural scientists of tomorrow. It will also be an opportunity for young people to meet kindred souls in their age bracket and to have fun together exploring this earth of ours.

How do you join? It is easy. Come to any of the public meetings at 7:30 p. m. on the 2nd and 4th Fridays of each month at the Multnomah County Library and you can sign up with our secretary. For further particulars call Dr. John H. Hammond, OL4-5570, or Mr. Murray Miller, OL6-6724. What is the cost? Junior membership is only $2. 00 per year, and this includes 12 issues of our very fine publication, the Geological News Letter.

This is an opportunity. We ask the members of our society to relay this information to the interested young people in their community.

-- Dr. John Hammond

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CAMP ARAGO

Camp Arago, the family science camp sponsored by the Oregon Museum of Science and Industry, was founded in 1958 when an experimental session was held at the Oregon Institute of Marine Biology near Charleston, Oregon. The success of this session led to the establishment of two sessions during each of the following two summers and two more are planned for the summer of 1961. In addition a week's camp for high school students interested in marine biology and in geology is contemplated for 1961. The success of the camp is largely due to the unusual and exciting natural surroundings, consisting of diversified physical and historical geological features, excellent beaches of different types for the study of marine life and some of the most spectacular scenery of the Oregon coast. An attempt has been made to maintain a balanced relationship between educational, aesthetic and recreational experiences for different age groups, allowing complete freedom to participants to pursue whatever activity, if any, they find challenging.

While the camp is designed for family groups people are encouraged, if they have no children or if their children are grown up, to bring a child of a friend or from an orphanage and attend the camp. This was done by a couple from Corvallis, who adopted a little girl from an orphanage for a week. The girl was warmly accepted by the group and had a very happy time.

Usually there is a collecting trip each morning, some kind of short excursion in the afternoon after the recreation period and an evening program. Recreation takes the form of sports, fishing, hiking, beach combing or merely loafing in the sun. Swimming in the

Camp Arago - cont.

ocean has been rather cold the last two years but there is an excellent pool at North Bend which some of the people used last summer. The evening program may consist of square dancing, group games, movies, a talk on the local history, short discussion on the marine biology or geology or an evening around a fire on the beach. There is hardly a dull moment during the entire week, consequently the problem of disciplining children is practically non-existent.

Since interest in science very frequently begins with an interest in natural history this field of science receives the greatest attention. For example during the past summer different kinds of medusae (jellyfish), ctenophores (variously known as comb jellies, sea walnuts, sea gooseberries, etc.) and nudibranchs (sea slugs) were observed in their natural environments, collected and brought to the lab to be placed in aquaria supplied with running sea water. The primary interest in these animals for most persons is centered in their activity and their beauty of color and form; later attention may be given to structure, classification, reproduction, method of food getting and the like; at a higher level more advanced studies may be undertaken, but since the latter require a background of knowledge and considerable time they are far beyond the scope of this camp. It is believed some of the children may become so interested they will later follow the study of marine life as a career. Perhaps the chief function of Camp Arago is to provide an overwhelming experience of the infinite variety and beauty of nature.

The region around Camp Arago has some of the most fascinating geology of the entire Pacific Coast. Where else would you find such a combination as raised beaches, drowned valleys, magnificent sand dunes, coastal lakes, sea caves, sea arches, coal seams, angular unconformities, anticlines, synclines, faults and a wealth of marine fossils? For a study of both physical and historical geology there are few regions that equal the Coos Bay area. Trips to observe the above features constitute an important part of the camp experience.

If time permits it is possible to visit oyster farms, foreign lumber boats and any of the industries of the Coos Bay-North Bend area. Naturally it is not possible to do everything, so an attempt is made to determine the preferences of each group and to plan the programs accordingly.

Since both Camp Hancock and Camp Arago are successful consumations of rather new ideas it is hoped that other similar camps will spring up all over the country. In fact, the museum's educational director, Ray Barrett, has another family science camp in mind for the Cascade Mountains area. This is a needed extension of the family camp idea to provide experiences in mountain and forest regions. Probably more youth science camps should also be established in such places as the Wallowas, the Olympics, the newly established Glacier Peak Wilderness Area and elsewhere.

Both Camp Hancock and Camp Arago are non-profit activities of the Oregon Museum of Science and Industry. Both need moderate financial support, Camp Hancock for maintaining and improving facilities and Camp Arago for badly needed equipment such as books, hammers, nets, and microscopes. Both camps have been initiated largely through the efforts of members of the GSOC, Camp Hancock by Lon Hancock and Camp Arago by Jim Stauffer. The Society has helped the camps and in turn the camps have helped the Society. It is hoped that this symbiotic relationship will continue.

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THE LEWIS RIVER FIELD TRIP OF SEPTEMBER 18, 1960 - - - -

At nine o'clock on Sunday morning Dr. Paul Howell, the trip leader, collected thirty-six enthusiastic GSOCers at the rendezvous at Waddle's, Jantzen Beach, and told us to regroup at Cougar, Washington. He advised us to take the more easterly route through Battleground, Amboy and Chelatchie Prairie to avoid new road construction on the lower Lewis River - - (and though he didn't mention it) -- perhaps the temptation to linger over interesting new exposures in the fresh road cuts.

Aside from Mt. St. Helens, the most picturesque landmark en route to Cougar is the perfect cinder cone of Tum Tum Mountain, rising 2004 feet above sea level, and first seen from the lower end of Chelatchie Prairie.

Lewis River Field Trip - cont.

From Cougar the trip went in convoy to Pacific Power and Light's new hydro project at Swift Creek, and thence about two miles northwest over excellent logging roads to our destination and the first phase of the trip -- a lava cave and tree casts on the lower slopes of Mt. St. Helens.

Here the thoughtful Murray Millers were waiting to guide us a quarter of a mile down a lava flow to Lake Cave, one of two recently discovered during logging operations in the vicinity. Though we did not explore Lake Cave on this trip, it holds a bright promise for a future expedition. Of more immediate interest were the many excellent and spectacular tree casts close around.

Ranging in diameters of from eight inches to three and a half feet, these casts -- the molds of standing and fallen trees engulfed by flowing lava -- are from six to twelve feet deep, and indicate the thickness of the flow at that particular point. They are clean, with some moss and fern growing on the sides, and in places the pattern of the bark is so perfect that Mr. Miller quickly identified spruce, fir and hemlock. At the bottoms of these casts the diverging root patterns are easily discerned, indicating the comparatively recent date of the lava flow, estimated by Dr. Howell at between five hundred and a thousand years ago. The casts of the windfalls range up to forty feet in length, and some are open at both ends so they may be seen through.

It was fascinating to be able to reconstruct the form of old scenes, frozen by the flowing lava. In one place where a windfall was lying by a standing tree, another tree had fallen across it, breaking it at the point of impact; the record of these details are all clearly preserved. Needless to say, it would be indiscreet to wander around here on a dark night without a light.

The lava flows in this once tortured area, now in peaceful repose, are picturesque scenes with a charm all their own. The irregular formations, with many an exposed blister, are partially covered with ash and the light mulch of needles from the scrub timber growing on them. The feathery foliage of red and blue huckleberries and low-growing kinnikinnick are about all the underbrush there is, and the lichens, on which Dr. Stauffer gave us a short talk, are especially interesting. So fascinating was this place that it was with difficulty that some of the party could be induced to leave, even for lunch. This part of the trip alone would have made the day.

After lunch we proceeded half a mile up the road to the second phase of the trip; a cursory exploration of Ape Cave, the second of the newly discovered caves, and apparently named after the rumors of apes in the Spirit Lake area some thirty years ago. Only fifty feet from the road, access is down a ladder in a cave-in to a depth of fifteen feet, thence down a slight incline for about fifty feet to a cleft in the wall of the cave proper. Here a longer and more precarious ladder takes one to the floor of the cave itself, a lava tube running in both directions.

Equipped with gas lanterns and flashlights thirty explorers negotiated the ladders and followed Dr. Howell down to the lower sector of the cave. Surely, few caves are so conveniently arranged for the comfort of the general public as this one. The floor is comparatively even for easy walking, and as it serves as a drain from the point of entry down, it is covered for much of the way with damp sand. The headroom varies from perhaps thirty feet in places down to where one must crawl on his stomach to get through. It is naturally air-conditioned by a very noticeable, cool, damp draught. Indications of drainage flow-lines on the sidewalls show that a considerable flow of water has at times -- perhaps annually - gone down the tube. It would probably be better not to visit the cave at such times.

Space prevents an adequate description of many interesting details; erosion patterns in the sand; a hundred-foot long section in the form of an almost perfect Gothic arch, and good-sized, symmetrical, football-shaped boulder caught and held only by its tip ends in the narrowing cross-section directly overhead. Instinctively, one passes quickly under this, though it is firmly fixed in place.

About four thousand feet from the point of entry the cave makes an apparent dip, which has filled with sand. Here, since we would have had to crawl because of the impaired clearance, we turned back.

The sector of the cave above the point of entry runs for a thousand feet or so to a massive rockfall, beyond which we did not venture. Here there has been no drainage or other outside influence of any kind and the lava remains undisturbed in the writhing forms in which it cooled many years ago, rough, raw and fantastic.

Lewis River Field Trip - cont.

Out of the cave, we started for Cedar Flats on the Muddy River at the head of the Swift Dam reservoir. But some of us got lost, and some of us went to McBride Lake instead. At any rate, most of us came home the way we went, stopping for a short time at a borrow-pit just across Speelyai Creek, where Mr. Miller showed us how to find double-terminated quartzite crystals in some rock there. Although these don't do you any good, it is hard to stop looking for them once you begin.

This was a most interesting and instructive field trip on a very pleasant day, and the management -- Dr. Howell with an assist from Mr. Murray Miller -- should be congratulated on its success.

In conclusion, your reporter -- no geologist -- is constrained to mention that he is both impressed with and alarmed at the high administrative efficiency of this fast-moving organization. On Sunday he went on the trip; on Tuesday he submitted his application for membership, and on Wednesday he was assigned the writing of this report. In these circumstances your indulgence is practically mandatory.

NOTES - -

The area visited is clearly marked just north of the Swift Dam on the U. S. G. S. Mt. St. Helens fifteen minute quadrangle dated 1958, recently published.

Mr. Reece, who, with his three sons, operates a store two or three miles up the road from Yale, and who knows more about these caves than anyone else, is trying to have the area set aside as either a national monument or a state park. There is no telling how many other caves are waiting here to be discovered.

- - William M. Freer

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THE SECRETS OF THE SEDIMENTS

Of all the geological studies that one may pursue the study of detrital sediments is probably the most fascinating. A comprehensive study of these sediments requires the use of laboratory equipment and chemicals, but the solution of many sedimentary problems entails only the application of well-known geologic principles. Because of this the amateur as well as the professional can join in the search for information and can pursue a problem as chance and time permit. The study of sediments has many practical applications in industry, in engineering, and in the search for mineral wealth, but let us consider only the more general problems that interest every geologist.

From sediment studies one can deduce the type of rocks from which the sediments came, the agent of transportation, the environments of erosion and deposition, and, if enough exposures are present, even something about the topography and the geography of the times. Cross-bedding tells of wind or water flow, and the type of cross-bedding tells which of the two was the agent and in what direction was the flow. Imbrication of cobblestones tells of stream flow and its direction, and size of material is an indication of relative stream power. Gravel in a marine sequence tells of beaches with nearby headlands or of youthful streams debouching into the sea. Cobbles of quartzite and schist speak of metamorphic sourceland, as do such minerals as epidote, garnet, tourmaline, staurolite, kyanite, and glaucophane. If the sand grains show good rounding and percussion marks, they tell of an eolian chapter some time in their history, even though they now may be present in an alluvial deposit. It is not uncommon for quartz sand to go through several cycles of deposition and erosion, but, as a rule, gravel seldom goes through more than one. Quartzite and other quartzose gravels are an exception to this rule.

The study of sediments is a humbling study, for in it we find ourselves looking at vast eons of the geologic past. Each sedimentary deposit contains within it the story of its time. The great men of geology have unravelled many of these stories and from them have pieced together the geologic history of the Earth. No other field of geologic study has contributed so much.

Secrets of the Sediments - cont.

The above paragraphs have extolled the importance of and the information to be gained from studies of sediments, but all is not gain and fun. There are pitfalls for the unwary. Suppose for example that you are on the lower Rogue River and come upon a pebble conglomerate in the Riddle formation (Jurassic). After a pebble count of the rock types in the conglomerate you find that 90 percent of the pebbles are chert, mostly of black and gray shades, 3 percent are quartzites in shades of gray and green, and 7 percent are quartz and metamorphic rocks other than quartzite. Are you justified in deducing that the rocks of the mountains from which these gravels came are mostly chert beds? And what about the relation of the chert to the metamorphic rocks? The answer to the first question is NO! Most chert throughout the world is found in or eroded from limestones, and limestone is undoubtedly the source of the Riddle conglomerate chert pebbles. This is further born out by the black and gray colors which are very characteristic for limestone cherts. Where then is the limestone?

Limestone is a hard rock compared to sandstone and shale, and one might think, therefore, that it would show up in the pebbles of the conglomerate. In arid climates limestone does form a part of some stream gravels, but in humid climates, where the ground is saturated with water, limestone usually is dissolved in place or at best exists as gravel for only a short distance below its point of entry. The validity of this concept is born out by a study of gravel in the Tennessee River. The study was made by E. L. Spain and N. A. Rose in the 1930's, at which time they worked as geologists for the Tennessee Valley Authority. The results of their study are presented in Technical Publication No. 840 of the American Institute of Mining and Metallurgical Engineers. Their report reveals that the Tennessee River drains an area underlain largely by cherty limestone and dolomite. Some of its tributaries head in the pre-Cambrain igneous complex and the quartzites of North Carolina, and certain sections of the river pass through a belt of Pennsylvanian age sandstone. In spite of the great extent of limestone and dolomite traversed by the river only a few pieces of this rock exist in the river gravel, and those only among the coarse constituents (larger than 3 inches). No limestone or dolomite was found among the smaller constituents.

At the Tennessee-Alabama state line, 500 miles from the river's source, the composition of the smaller-than-3-inch fraction was found to be 51 percent quartzite, 37 percent chert, 8 percent sandstone, and 4 percent quartz; no limestone or dolomite. At Gilbertsville, Kentucky, near the mouth of the Tennessee River, the composition was 1.5 percent quartzite, 98 percent chert, and 0.5 percent quartz; no sandstone, limestone, or dolomite. Not only do we learn from this that the constituents of a gravel do not fully represent the rocks of a river's drainage area, but we learn which rock types are most durable.

Let us return now to the Rogue River area and examine the available geologic data. A geologic map of southwestern Oregon (Wells, 1955) shows us the general character and relationship of the various formations in the area. We find that the Riddle formation is the youngest of a group of five Jurassic formations, the folded strata of which form the western half of the Siskiyou Mountains in Oregon. The Riddle formation crops out at Riddle along the Umpqua River and in a coastal strip near the mouth of the Rogue River. At the latter area it was deposited in marine waters as is indicated by the presence of fossil Buchia in the fine conglomerates and grits. The conglomerate is at the base of the formation. We can be reasonably sure that the numerous chert pebbles in the conglomerate had to come from limestone in formations older than the Riddle. A check of the older rocks of the area shows that there are narrow limestone lenses in the Triassic Applegate group. We also find in the extreme south a mass of old metamorphic rocks, the Colebrook schist. The Applegate group consists of partially metamorphosed lavas, breccias, and tuffs and of argillite, quartzite, chert, limestone, and banded crystal line rocks composed of hornblende layers and siliceous layers. The Colebrook schist includes several varieties, named for the dominant mineral present: chlorite, epidote, sericite, or graphite.

The Jurassic and older rocks were folded into mountains during the Nevadan Revolution of late Triassic and early Jurassic time, and the streams developed as a consequence of the mountain building quickly began their irresistable erosion and transportation of these ancient rocks. The rocks, as we have noted above, show great variation of types, whereas, strangely, our Riddle formation gravel is almost mono-petrographic. Why is this? Hark back to the Tennessee River study and you have the answer. The cherts have much greater weathering durability and a high resistance to abrasion. Much of the destruction of the

Secrets of the Sediments - Cont.

shales, sandstones, crystalline rocks, limestones, et al must have taken place in the Jurassic streams. The process was probably completed on the Riddle-age beaches.

The soft rock elimination described above has its counterpart in the elimination of weak minerals. Only those minerals with great resistance to weathering and abrasion persist long in our sediments. That is why our sandstones are formed largely of quartz, and our shales and mudstones are formed largely of clays and micas.

The next time you are on a field trip, pay heed to the sediments. Look around you at what is happening in the streams and on the beaches. Note the composition of the transported detritus. Note which sizes are laid down in the bars and which in the quiet pools, and note their system and order of deposition. Then look at the nearest ancient beds. There you will see reflected the results of similar stream and beach erosion of ancient times. There you may unravel, as other geologists have done before you, the secrets of the sediments.

- - Paul W. Howell

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HERE AND THERE - -

MOHOLE -

H. H. Hess has this to say in regard to drilling through earth's mantle to reach the core:

This project has been referred to the American Miscellaneous Society. At present they are making estimates and gathering significant data. To sink a hole 100,000 feet deep on land is at present impossible, due to high temperatures that would be found. The plan then is to drill 30,000 feet below sea level. One spot considered for such a well is near Porto Rica, and another off the southern California coast. Soundings are being made in each of these areas.

The chief objectives are: to find earth's density; its mineralogy; its radio-activity and its age.

- - - - American Scientist

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Dr. Fritz Zivicky of Palomar Observatories has now set the age of the Universe as perhaps a million billion.

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THE GEOLOGIST'S LONG ARM -

How times have changed. Keep your eyes on the moon, for a new stake has been driven there. Government geologists of the Dept. of Interior have picked a spot on the moon for an Army Base. After taking thousands of photos, a spot was chosen because here was considered the best spot to dig in and so escape the excessive heat of about 200°.

Good luck, first space travellers to the moon.

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GRANITE -

Have you been to this "City"? It's now a ghost town, but there's gold in them thar hills. The Buffalo mine is pushing down another 250 feet to strike the ore body that has kept it operating these many years.

HERE AND THERE - cont.

White King Uranium mine at Lakeview is opening a pit 1,000 by 1500 feet to be carried down 370 feet as an open pit producer.

- - - The Mining World

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BLACK GOLD FROM DESERT SANDS -

From Dahra, Libya, oil may soon be flowing to a Mediterranean port. Eleven wells have been completed (one tested at 11,500 barrels) by the Ohio Oil Company. The Conorada Group have holdings of 62,000,000 acres in Libya.

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'ROCK' FOREST DISCOVERED -

Bend--Discovery in Cook County, in the range country west of upper Crooked River, of a petrified oak forest apparently buried in volcanic ash has been reported by rock hunters.

They said the wood is excellent gem material, dark in hue, but with considerable color, including red.

- - The Oregonian

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Science Research Dreaming and Experimenting - As an example, in recent years biologists have conducted protracted studies of all sorts of unrelated subjects: the dances of ants, the metabolism of hummingbirds, the habits of hydras, the hormones of cockroaches, the electroluminescence of fireflies, the sex life of bacteria, the intelligence of elephants, the leap of grasshoppers, the effect of drugs on a spider's web-weaving, the way wading birds keep cold from seeping up their long legs, the way cows make milk out of blood, and the list could be extended indefinitely.

- - David Bergamini, Assoc. Editor of Life

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LOOKING AHEAD -

Martin Schwarzschild of Princeton and Fred Hoyle of Cambridge, England, have shown that the sun will not start to die and that the earth will remain habitable for probably another 5,000,000,000 years.

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EVOLUTION -

"Man is the only product of biological evolution who knows he has evolved and is still evolving."

- - Scientific American

GEOLOGICAL NEWS LETTER

OFFICIAL PUBLICATION OF THE

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1960-1961

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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 a 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 Secretary.

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 Avenue and Yamhill.

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

Library Night: Once a month. Lewis and Clark College, Biology Bldg.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S.W. 5th Ave. and Taylor St. $1.25 per plate.

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

CALENDAR

Buffet luncheon every Thursday noon, second floor, Portland Chamber of Commerce, 824 S. W. 5th. $1.25

Friday November 11 — 8:00 p.m.
Geological Gab Gathering and Songfest - at the home of Dr. Arthur C. and Mrs. Jones, 3300 SW Heather Lane. Bring your favorite conversation specimen, tune up your voice, and be assured you'll have a very interesting evening.

Motorists - Broadway Drive or Vista Ave. to intersection; turn left on Greenway, follow white fence around curve; continue to Shell Service Station, Talbot & Patton Rd.; turn down Patton Rd. toward city; immediately turn right to Heather Lane; 1 Blk. to No. 3300.

Busriders - Council Crest car to Greenhills Station, walk back down Patton Rd. toward city just a rounding turn into Heather Lane, 1 Blk. to end of Lane.

Friday November 25 — Central Library.
Dr. Hammond is making this a night of your favorite slides. Bring your favorites, and be prepared to tell us about them.

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Sunday November 13 — Field Trip - Down the Columbia
Meet at Montgomery Ward parking lot, Sun. 9.00 a.m. Dr. Paul Howell leading.

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News of MEMBERS -

ALBERT R. KENNEY has been transferred from the Tillamook office of the Oregon State Employment Comm. to Portland. Sorry for the Tillamook Rockhounds, whose president he is, but we're glad to have him here. His family will join him shortly.

HARRIE L. JENNISON, one of our charter members, is chairman of a new committee, the Membership Promotion. His wife Ruth will be helping him. Also Ruth Prentiss, our Secretary, and Emily Moltzner. The slogan is "Each member secure a new member".

Recently installed by the Oregon section of the American Congress on Surveying and Mapping, were H. BRUCE SCHMINKY as president, and CLAIR E. PENSE as vice-president.

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DEATH NOTICES

The sympathy of the whole Society goes out to Dr. Edwin T. Hodge, for the passing of his wife Lydia Herrick on September 17th. Mrs. Hodge was known and loved by all who met her. She was 74 years of age when death freed her from several years of illness.

Those who wish to perpetuate her name may contribute to the Lydia Herrick Memorial Fund for the creation of a new art gallery to be dedicated in her name.

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GAGE HASELTON - Gage Haselton, 79, of 1107 SW 20th Ave., died Sunday at his home. He was born in Suncook, N.H., March 31, 1881, coming to Portland in 1904. From 1905 until his retirement in June, 1947, he was associated with the Southern Pacific Railroad Co., first as assistant engineer, then as division engineer.

Mr. Haselton was a member of Albert Pike Lodge 162, AF&AM, American Association of Mechanical Engineers, Society of American Military Engineers, Professional Engineers, Oregon, National Association of Retired and Veteran Railroad Employes, and the Geological Society of the Oregon Country. He also served in a consulting capacity in the construction of the Portland Zoo Railroad.

He is survived by his widow, Mabel; one daughter, Mrs. E.J. Rossiter, Portland; and two grandchildren.

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MRS. DAISY HENDERSON - Mrs. Daisy Hylton Henderson, 74, of 838 SE Peacock Lane, died Saturday. Born in Roanoke, Va., she married Dwight J. Henderson in 1924 and came to Portland, where she was affiliated with the Portland Council of Girl Scouts for some 20 years. She worked on Red Cross and Community Chest drives and was a member of the First Presbyterian Church, the Geological Society of the Oregon Country, the Oregon Museum of Science and Industry, and The Mazamas.

Survivors, in addition to her widower, include three sisters, Mrs. Eula Baldwin, Roanoke; Mrs. Mary Finley, Charlotte, N. C., and Mrs. Edna Argabright, Orlando, Fla.

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We regret Dr. Ford Lewis and his family are leaving Portland. He has accepted the call to the First Unitarian Church in Sacramento. His wife will be remembered as the glamorous secretary in the skit "Scrambled Eggheads" at the banquet, and he as co-leader of singing.

Our best wishes go with them.

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NEW MEMBERS

Mr. & Mrs. Jim Running 2 sons, Lief & Kip and daughter, Kris	1951 NE 142nd Ave., City (30)	AL 2-5202
Mr. & Mrs. Cecil Rosenberry son, Roger	1606 NE Thompson St., City (12)	AT 7-4170

NEW MEMBERS REPEATED TO GIVE TELEPHONE NOS.

Mr. William M. Freer	2405 SE Taylor St. City (14)	BE 2-9601
Mr. & Mrs. Clarence W. Hanson	2304 E. Burnside St. City (14)	BE 2-5911
Mr. & Mrs. Kenneth Schramm	3407 SE Vinyard Rd. City (22)	OL 4-4278

LONG - TIME MEMBER -

Mrs. Lillian F. Owen	Welches, Oregon	Hoodland 155

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FORT ROCK - A DIATREME

Thirty miles southeast of Lapine, Oregon and just a few miles north of State Highway 31, is the prominent stadium-shaped monolith known as Fort Rock. Most of you know it well. Group trips have been made to it by the Society, and many of you have made individual or family trips to see this geologic wonder. Mr. Phil Brogan, our eminent member from Bend, has written interestingly about it both in the Geological Newsletter and in the newspapers. This summer my family vacation took us there also. I had never seen this great monolith before, but I had read much about the enigma of its origin. We slept there overnight and as I looked up at it in the stillness of the next morning I could not help but think of the Sphinx in the Egyptian desert and how people used to stand before it and ask it questions. I thought to myself, "I'll just go along with the pretense and ask old Fort a question." So I took a good geological stance and called out, "What is your origin, oh mysterious rock of the Oregon Country?"

You may not believe it, but that rock talked back to me, and this is what it said:

"I am a diatreme. I was born of fire within the earth way back in Pliocene time, about 10,000,000 years ago. Great heat and pressures built up beneath the earth's crust here in eastern Oregon in those days; that was the source of my power. At last when the crust could withstand my pressure no longer, I blasted forth with a great roar. My activity was a sight to behold, I tell you. The explosion drilled a big round hole straight up through the crust. That's my throat, you know. It's there in front of you, buried under my feet of volcanic sandstone. You may not see it, but believe me it's there.

"Well, I tell you the dust and fire really flew around here for a few days after that initial break through. The first material went so high it nearly got lost in the stratosphere. Finally

Fort Rock-

things quieted down a little and I began to build a big bowl of cinders around my throat. Notice that the beds in my walls all slope back toward my throat. That's a characteristic of all we diatremes. Well, by the time things had quieted down to where the dust began to clog up my throat I had gotten pretty big, a lot higher and some wider that I am now. What you see here before you is but the skeletal remains. That confounded lake that was around here in the Pleistocene sure raised hobb with me, but for eons of time before that the rain and wind wore away at me and my brothers out there. Some of them are gone, poor fellows, and all the sediments that had filled in between us are gone too. The streams and the winds that were here in those days carried all the material away, gosh knows where. Nearly carried me away too, as you can see. Only my good old limonite and calcite cement saved me. Breached my side there where you're standing.

"That Pleistocene lake came near finishing me off. See where his waves cut benches in me, especially there on each side of the breach. Must have undercut half of what was left of my walls there on the outside. Finally retreated from here, though, and good ridance. I have a tough enough time trying to buck my old enemies without these fly-by-nite upstarts trying to get in on the act.

"Well, I hope that answers your question. I've still got a few relatives around here. Got a brother back up the road there a piece, name of Moffit Butte. Doesn't look very typical, but he's one of us all right. Then there's my uncle down near Silver Lake. Sets about a mile back northeast of the lake. He sure has taken a beating. Tough old coot though. If you get down there notice how that danged Pleistocene lake benched him. I have some more relatives down in Klamath County too, and a few scattered around other places out here. Used to be a real numerous clan, but age is taking its toll.

"Well, friend, my throat's getting tired with all this gabbing. That load of sandstone in there doesn't help either. Sun's getting warm and its time for my morning siesta. Got to do all I can to preserve what's left of me, you know."

Well, that's the story he told me, and it does seem like the truth all right. A few years back, I had seen a lot of his distant relatives down in the Hopi Buttes country in Arizona, and there was no doubting the family resemblance. Strangely enough the whole western clan seems to have been born about the same time, -- in the early to middle Pliocene.

Paul W. Howell

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NATIVE USE OF STONE

When Columbus "discovered" America, the mining of minerals and quarrying of stone was already a well established industry. South of the border crude smelting methods were used for extracting metals from ores, further north only native metals were used but ores were mined for specific uses such as paint. Few indeed were the mineral deposits not known to the aborigines and exploited by him.

The value of minerals to the natives may be estimated from the great amount of labor expended to retrieve them. With no more tools than horn pry-bars, fire and water, and stone hammers, shafts were sunk to a depth of 100 feet as in the Los Corrillos turquoise mines, and tunnels 300 feet long were driven as near St. Thomas, Nevada. Waste rock from a quarry near Cheyenne, Wyoming, has been estimated to aggregate hundreds of thousands of tons. Near Maryhill, Washington, there is a chert quarry extending over a quarter of a mile along the hillside, some pits are 20 or more feet deep, from which as much as 1000 cubic yards were excavated and carried over the lip of the pit in baskets. Flint from certain mines in the east can be traced over several states, and the pipe stone mines in Minnesota were known for centuries.

The natives were familiar with many different types of rock and used each to the best advantage. Even such a simple article as a cooking stone was obtained from specific sources. In the Portland-The Dalles area White River produced the most desirable, as the soft lava did not shatter when heated and dropped into baskets of water with food to be boiled. Broken cooking rocks are an infallible sign of an Indian encampment; along the Columbia they sometimes lay along the bank like gravel. One place to see them is at Henrici Light on the lower end of Sauvies Island; for a quarter of a mile the bank is covered, all that remains of the Indian Village Namuit.

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Native Use of Stone -

The most useful stone to the Indians was probably chert for chipping projectile points and implements, but the most valuable was jade, obtained from the Jade Mountains in Alaska or from gravel beds and moraines in British Columbia. This tough stone with the green color was used almost exclusively for adze blades--the Western Indians had no axes. Jade takes a beautiful polish and can be ground to a keen edge. The blades were cut from the parent rock by sawing with a thin sandstone slab and water, with incredible patience and labor. A blade's value depended on its length, one that was two or three inches long was worth up to three slaves or canoes. What, then, must have been the value of a beautiful blade 20 inches long, a little over two wide and three-eighths thick, found on the Snake River by Jay Perry of Kennewick! Jade blades are fairly common along the Columbia, being indispensible in a wood-working economy. They are most plentiful, however, along the Fraser and northward.

The most familiar, and in some ways the most spectacular, use of stone by early man was the common "arrow head". Unlike the Eastern Indians, who had little besides the common flint from which to fashion points and knives, those of the West had a wide variety of colorful materials from which to cho . A glance through any of the many collections of Columbia River material will quickly disclose that the natives appreciated agate not alone for its ability to be easily chipped into a sharp edge but for its beauty as well. The "Columbia River Gem Point" is famous among collectors the world over for its colorful material and exquisite workmanship.

All types of agatized material were used. In my own collection I have knives and projectile points of petrified wood, moss agate, jasper, rose quartz, polka-dot agate, cornelian, and opal, beside the more common wascoite, obsidian, basalt, etc. Petrified wood was a favorite material for knives for it could be split into long straight blades, and chips readily, but it cannot be easily fashioned into ornamental shapes. In the desert country of Oregon, nearly all chipped tools are of obsidian, an abundant material that takes a sharp edge. Along the Columbia about 5% of chipped material is obsidian; on the Willamette above Oregon City practically all arrow points are obsidian.

Since chipped implements were so important, and are so familiar, a word about how they were made may be appropriate. From a piece of the selected agate or other material flakes were struck with sharp blows of a hammer stone. Those of proper shape and size were further roughly fashioned with light hammer blows. The piece was then held in the hand, which was probably protected from the sharp chips with a piece of leather, and the point of an antler tool pressed against the edge, causing a flake to fly off. By working from both sides and all around, the point was shaped. All chips must start from the edge, never from any other place. A skilled artisan could cast a chip all the way across the piece. It is a revelation to visit a heavily occupied place like Fountain Bar on the Columbia just above Rock Creek, or the Priest Rapids area, or in fact most any bar on the Columbia and see the vast quantity of chips and spalls of the most beautiful agate, in places literally inches deep. A convenient place to see them is Maryhill Ferry landing on the Washington shore.

The various types of lava and basalt were used in many ways. Most of the mortars are of basalt, some of them took an incredible amount of work to fashion. Pestles were made of long basalt slabs or columns; they were laid on a bed of sand and slowly turned as the maker pecked away on the surface with a quartzite pebble. I have seen pestles two and a half feet long and one and a half inches in diameter, perfectly circular and straight. The softer forms of volcanic stone were used for fashioning perforated and banded net weights, and scoria was used as rough sand paper for dressing down wood or bone.

The more dense forms of basalt were favorite materials for making mauls, a bottle shaped instrument used to drive wedges when splitting plank or firewood. Mauls were not swung like hammers or mallets, but endwise, striking with the base. While a conveniently shaped river pebble would have served efficiently, a prodigious amount of work was expended in fashioning this instrument. The handles were frequently carved in fantastic and beautiful geometric and zoomorphic forms. Indeed, it sometimes appears that the maker had not the heart to use the form he had created, for some of the better ones show no sign of use. On the upper river, above the John Day, there are few stone carvings found other than mauls.

Another use of basalt was for digging tools. Where the stone scales off the cliffs in wide thin conchoidal slabs, generally with one sharp edge, conveniently shaped ones were selected and further roughly formed by percussion chipping, and sometimes the edge was ground. This was a tool as handy to the natives as a screwdriver or hatchet is to us, and is found on all the old village sites. Minor uses of basalt were weights to hold down the roofs of houses, for sal-
mon killing clubs, and for chipping into projectile points.

Granite is not found on the Columbia below Grand Coulee except as gravel or erratics but was used to a minor extent for forming mortars, stone clubs, and net weights. Granite had no features that were particularily desirable over more common stone except its pleasing color.

An interesting use of stone was as currency. In the Columbia River area the standard of exchange was the dentalium, a sea shell that looks like a piece of tapered macaroni, found off the Northwest Coast. But in California Long obsidian blades were used. Blades of ten inches or so were worth a few dollars, those of 30 inches or more were worth a fortune. In the Southwest turquoise was used as a medium of exchange, and among several tribes stone beads served as money. Copper plates, on the Northwest Coast, were a mark of both distinction and wealth. The distribution of arrowpoints indicates that they may have been used for minor bartering and for small change.

Painting, including houses, pictures, and the person, was an important feature of primitive life. Most of the paints were made from minerals, exceptions were dyes made of roots and bark for fibers. The most important mineral was ochre, found in a number of shades from yellow to bright red in the Oregon country. It was ground fine on a flat rock or in a sculptured paint mortar, then mixed with animal oils, water, and sometimes pitch. Paintings with this mixture along the cliffs of the Columbia are still vivid, although centuries old. White paint was made of koalin, and various shades of green and blue came from the John Day beds. Green and blue was also made from copper ores such as malachite and azurite, gypsum or heated selenite made white used in cleaning and whitening buckskin. Cinnebar made brilliant red paint. Coal or maganese dioxide made black pigments, but in the West charcoal made from grasses or reeds was generally used. Considerable ceremony must have been attendant to painting for paint mortars are among the most highly decorated artifacts found.

Some of the more glamorous minerals used, besides agate, were galena, graphite, coal, slate, soapstone, quartz, and pyrite. Galena was used for one purpose only, a loaf-shaped object weighing from 10 to 20 ounces, drilled through the center and thought to be ataltl weights. From graphite ornaments were made, but the lumps were used in their natural condition only except for drilling or notching for a cord; although easily worked the pieces were never shaped or carved.

Many carvings, pendants and beads have been found that are made of hard, glistening, black coal. Slate was used only occasionally, from it were ground knives and long, double edged war clubs with decorated handles.

All of the local soapstones were used, either for pipes or ornaments. Nearly all beads made by Western Indians are of steatite or greenstone. And beads are found by the thousands. Some collectors have enough to make a string 200 feet long; it has been estimated that, from but two sites on the Columbia near The Dalles, enough beads have been found to make a string nearly a mile long. These beads, like all stone mentioned in this article, are prehistoric. Most stone beads are small, from one eighth to one quarter inch in diameter and one sixteenth thick. But some are large, up to four inches long although they might be only one quarter inch in diameter. The method of drilling is not known, but probably both stone drills and a cane with sand were used. Course sandstone slabs served for cutting the blanks, and fine-grained sandstone served to form and polish the beads.

Quartz crystals, although rarely found, were used for ornaments; one end was notched for a suspension thong. Or they might be used unaltered as charms for the local shaman's medicine bag. They were also used with pyrite for striking fire.

One of the more exotic uses of stone was for a loaf shaped, grooved object two or three inches long, generally considered to be an atlatl weight. They are always of highly colored hard stone, and are beautifully formed and polished. Some of the stone used, such as catlinite, are not native to the Oregon Country.

Besides projectile points and knives, one of the oldest uses of stone by early man was for bola weights. These were found by a crew working near The Dalles under the direction of Dr. L. S. Cressman of the University of Oregon, in an occupational layer over 8,000 years old. From this early period the culture advanced from a subsistence level to one of the most highly developed in the nation, one which fashioned many artistic and useful creations from the abundant geological resources of the Oregon Country.

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Native Use of Stone

Reference

Ball, Sydney H., "Mining of Gems and Ornamental Stones by American Indians". Smithsonian Institution Anthropological Papers No. 13, 1941.

Emmons, George T., "Jade in British Columbia". Paper No. 35, Heye Foundation, New York. 1923.

- - - Emory Strong

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LAVA BOMBS YIELD RARE CRYSTALS, 'HOUNDS' SAY

By Phil F. Brogan

BEND -- When Spring comes and snow melts from Oregon's interior highlands, there will be a rush of rockhounds into the Fort Rock country, east of Newberry Crater.

Attention of mineral collectors has been attracted to the area by the discovery of crystals in lava bombs. It is a discovery unique in the Northwest, one that has attracted the attention of Oregon's Department of Geology and Mineral Industries.

Reports of crystals in bombs first came out of the Fort Rock area, where pines shrink to high desert sage, this past fall when road builders removed cinders from volcanic cones to surface roads for trucks used in the salvage of timber from the big Aspen Flat fire of last July.

The road builders excavated into the flanks of old volcanoes. In two localities, one just south of Pine Mountain, crystals were found inside chunks of lava that had been hurled out of fissures in a molten state and in the air had congealed into spindle-type volcanic bombs.

How did the crystals get inside the bombs? Certainly, rock hounds conceded, a porous volcanic bomb was no place for a nest of beautiful crystals.

There was also a second question: What minerals were represented in the crystals? The state Department of Geology and Mineral Industries, Portland, was called on for interpretative aid. A spectrographic analysis of the crystals was made by the department.

The analysis revealed that the crystals dominately were silicon, and therefore belonged to the quartz family. But many other types of minerals were also represented. They are iron, magnesium, zirconium, sodium, chromium, aluminum, calcium, manganese, vanadiu nickel, copper and even titanium.

What a jackpot--but, the department noted, the rate mineral were represented by a mere trace.

"But how did the quartz get inside the bomb unless it was originally on the side of a volcanic vent," Hollis M. Dole, director of the department of Geology and Mineral Industries, said.

Deschutes Geology Club members agreed with Dole. They said the molten lava apparently pushed its way up through a vent lined with quartz and broke some of the crystals from the vent sides. The lava wrapped around the quartz, then chilled into bombs when thrown into the air.

The Oregonian

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DO IT YOURSELF DIAMOND HUNT - By Edsel Ford, Murfreesboro, Ark.

You say you'd like to go diamond-hunting, but you don't have the fare to South Africa? Forget it. There are diamonds in southwest Arkansas. The Crater of Diamonds near Murfreesboro is the only spot in North America where genuine diamonds may be found "in the rough."

And anybody can get in on it. For a small admission fee you can be on your own from 8 a. m. to 5 p. m. (till midnight, during the summer months), prospecting in this field where over 100,000 diamonds have been found since the first was discovered in 1906. And there is always a chance that you may come upon another "Star of Arkansas" which is the largest gem recovered from the field to date. Found in 1956 by Mrs. A. L. Parker of Dallas, Texas, the gem weighed 15.33 carats in the rough, was cut into an elongated marquise-shaped jewel, weighing 8.24 carats, and valued at $75,000.

Even if you don't find a diamond, you will find a jewel of a vacation spot near Murfreesboro, in the heart of the scenic Ouachita Mountains.

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GEOLOGICAL SOCIETY OF THE OREGON COUNTRY

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Social	- Miss Clare Bartholomay	Library	- Mrs. Ardna Brown
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Museum	- Mr. Lon Hancock	GSOC Lib. Night	- Mr. Irving Ewen
		Luncheon	- Mr. Leo Simon

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 a 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 Secretary.

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 Avenue and Yamhill.

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

Library Night: Once a month. Lewis and Clark College, Biology Bldg.

Luncheons: Informal luncheons, with geological motif, each Thursday noon in Room B, Chamber of Commerce Building, S. W. 5th Ave. and Taylor St. $1.25 per plate.

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

CALENDAR

Buffet luncheon every Thursday noon, second floor, Portland Chamber of Commerce. 824 S.W. 5th. $1 25

Friday December 9 — Lecture, by Philip Grubaugh, "Wind Erosion", one of our basic geologic series.

Tuesday December 20 — Library night at Lewis and Clark. Dr. Allen of Portland State College College will discuss Current Geologic Literature.

Dr. Howell announces there are no Field Trips in December.

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NEWS OF MEMBERS

Honored with an Oscar from OMSI recently was J. C. Stevens, one of the most ardent early-day workers for it. New secretary-treasurer is Dr. John Eliot Allen. Among new board members is Lloyd Ruff.

NEW MEMBERS

Mr. and Mrs. Carl L. George 1924 SE 42nd Ave. BE 2-6610

CHANGE OF ADDRESS

Mrs. Elwin Lilly Box 145, Murphy, North Carolina

ORRIN STANLEY - 88 years young - MISSING?

When last announced was bound for Texas one month ago. Please notify G.S.O.C.

THE FRANKLIN BROWN'S - -

At our November 25th meeting we were given a pleasant surprise by having present the Franklin Brown family of Seattle.

Their new address: 411 - 2nd Ave. N., Edmonds, Washington PR 8-3610.

PRESIDENT BOB WILBUR

Mr. Wilbur is slowly recovering from a serious attack of virus pneumonia and is at the home of his daughter, Mrs. Robert Allison. Bob sends greetings and hopes to be out again soon. He is also retiring from his position.

PERSONALS -

A letter to our Secretary -

Beaverton, Oregon
October 22, 1960

Mrs. Ruth Prentiss
Secretary, GSOC

Dear Mrs. Prentiss:

Please change our address from 4350 S.W. 96th Avenue, Beaverton, Oregon
to
121 Kaha Street, Kailua, Hawaii.

We expect to return about mid-March.

Yours truly,

November 17, 1960

To the President and Members of the
Geological Society of the Oregon Country,

Greetings:

We, your nominating committee, respectfully present the following slate of officers for your approval -

President..... Dr. John H. Hammond

Vice-President ..... Frank J. Merryman

Secretary..... Miss Hilda W. Freed

Treasurer..... Miss Clare L. Bartholomay

Editor..... J. R. Rentsch

Director, 3 years, Leo F. Simon

Director, 2 years, Dr. James Stauffer *

Director, 1 year, Stephen W. Blore **

* Because of the resignation of Franklin Brown as President, we have to fill his place on the Board of Directors with the next last living President, according to our by-laws. This causes Dr. Stauffer to carry on through two more years.

** This is to fill the unexpired term of Dr. Hammond as director.

Nominating Committee: .William F. Clark.....

..Alonzo W. Hancock.....

..Leo F. Simon.....

..Mrs. Esther Hammond..

..H. Bruce Schminky.....
Chairman

Please note -

In accordance with the By-laws of the GSOC: "Other nominations may be made by members of the Society by filing with the Secretary on or before the 15th day of January of each year, a list of such nominations, which shall be signed by at least ten members of the Society. The names of the additional nominees shall be communicated by the Secretary to each member, either by writing or by publication of the Society, which communication shall be made not less than fifteen days prior to the annual meeting." Such additional nominees should have expressed a willingness to serve.

GEOLOGICAL GAB GATHERING AND SONGFEST

Ammonite and tribolite,
Hematite and azurite,
Zeolite and rhyolite,
Dinosaur and stegosaur,
And many, many, many more,
From ocean deep to mountain height,
Were a most impressive sight,
For amateur and erudite,

at "Hill Haven", the friendly home of Dr. Arthur C. and Doris Jones the evening of November 11, when more than fifty "Geesockers" gathered.

Arthur and Doris had transformed their basement into a museum, with hundred of their specimens arranged for easy viewing. A big fire of wood from trees on their homesite gave a warm glow for the guests as they were chatting, exchanging experiences and reminiscing. Mugs of hot, spiced apple juice and bowls of popcorn were made and passed around from time to time by Ralph Allison, one of the Jones helpers. James Woods kept the home fires burning and was helpful to everyone in car parking.

When the "Brag Rocks" program was announced, all assembled upstairs in the spacious living room, where a fire also blazed on the hearth. Specimens were shown by: Ruth Jennison, fossil leaves she found in the John Day; Dr. Paul Howell, double-handful sized amethyst in agate matrix, originally from Uruguay, via Poland to him, and part of a tusk from a Madras, Oregon elephant; Dr. Jones, a "washboard" surfaced mammoth tooth; Agnes Miller, an Eocene hexacoral she found on the beach at Roads End; Leo Simon, pink and blue tourmaline crystals in matrix of biotite from Africa, some Steens Mtns. basalts with labradorite crystals an inch in diameter, and several small myrtlewood trees he had grown from seeds; Anne Perley, a mushroom from the Great Lakes, with sand ingrained to give it petrified appearance; Mrs. R. L. Bryan, a specimen picked up on a farm at Wilsonville, unidentified, but Dr. Howell claims it's petrified wood, while Dr. John Allen thinks it's a dinosaur tooth; Emily Moltzner, a nautiloid, fossil ancestor of the nautilus, a full-page color picture in July '49 Nat. Geo. Mag. showing whole and bisected creature, and copies of the poem "The Chambered Nautilus" by Oliver Wendell Holmes, given away.

Frank Merryman, vice president, circulated a "Get Well" card for signatures to send our wishes to our president Bob Wilbur, who is convalescing from virus pneumonia at the home of his daughter and son-in-law, the Robt. E. Allisons, near Oswego.

Franklin and Ardna Brown and sons Dick and Bob telephoned a greeting from Edmonds, Wash. Franklin resigned as our president to take a fine position there. Their address is: 411 - 2nd Ave. N., phone PR 8-3610.

Now the songfest began, with Paul Howell as guitarist. From the slow tempo of old-time songs, to faster time after Jess Rentsch handed "Maestro Arturo" Jones a ruler for a baton, the singing grew better, louder and faster, -- into the songs of the cattle ranges, till someone dubbed our guitar player "Ragtime Cowboy Paul." During a lull, while everyone was recovering breath, Emily Moltzner asked for the song "Invitation to Oregon", the words and music of its three verses composed by our host and hostess. In lively 4/4/ time it states that, among other attractions, "The ancient rocks and hills of Oregon, Hold treasures rare for all to ponder on." Doris was accompanist at the piano. (It is hoped more verses will be forthcoming.) This was followed by Paul's "rootin'-tootin' " solo, "Has Anybody Seen My Gal?", while his wife smiled approvingly beside him. By now so many feet were tapping enthusiastically that it was apparent the joists in the basement might be endangered, so Doris told us coffee and cookies (thanks to Ruth Prentiss and Clare Bartholomay) were on the table in the dining room, -- to come and help ourselves.

Finally, at a late hour, all departed, obviously reluctant to leave such a cordial atmosphere. It was the consensus of the guests they would like to have a "Gab Gathering and Songfest" at the Joneses often, -- provided, of course, they are agreeable to the idea.

Emily Moltzner

NAME OF LAVACICLE CAVE GIVEN FIND IN DESCHUTES

By Phil F. Brogan - The Oregonian

Oregon's most spectacular lava cavern, tentatively named Pilot Butte Cave following its discovery in 1959, is to appear on Deschutes National Forest maps as Lavacicle Cave.

Foresters, members of the Deschutes Geology Club and persons who have been studying the strange cave for the past year believe the new name will better describe the long lava tube that has attracted the attention of geologists.

Dangling from the ceiling of the tunnel, large enough in places to provide space for a locomotive, are rocky "icicles" of lava, and reaching up from the cave floor are formations geologists call stalagmites.

Stalactites and stalagmites in the cave are unique because of their size.

Lava Grooved

Lava caverns are common in the western lava country, from Mt. Adams south through Central Oregon to New Mexico. In most areas, the caves are huge grooves in lava, without dangling stalactites or candle-like stalagmites.

Why, geologists have asked, are the strange "lavacicles" found in the Deschutes cavern?

Lava tunnels, earth scientists explain, were formed long ago when lava, spilling from craters and vents, flooded sloping terrain, filling valleys in some areas. The lava after a few days or weeks cooled on the top, the sides and the bottom. But the insulated interior remained molten.

In some valleys, molten lava broke through cooled crust and drained back into the higher country, creating the long tubes, and, in some instances, side caverns.

Tourists Visit Cave

The type cavern of the tunnel formation is Oregon's Lava River Cave, a state park adjacent to U. S. Highway 97 south of Bend. This cave, visited by thousands of tourists seasonally, does not have "lavacicles", except in miniature.

It is believed that when Lavacicle Cave was formed thousands of years ago it was completely sealed. The result was that the lava remained in a fluid condition for some time, permitting the dripping from ceilings that formed the "lavacicles" and the counterpart stalagmites that reach up from the cavern floor.

Also found in this cave are lava rosettes, on the tunnel bottom.

Other unusual features of this "lava laboratory" cave are terrace marks on the tunnel walls that illustrate the manner the fluid rock slowly drained from the cavern.

Lavacicle Cave, set aside by U. S. Forest Service as a place of scientific interest, was discovered by fire fighters in July, 1959, when a conflagration swept through more than 20,000 acres in the eastern Fort Rock country.

Entrance to the cave has been sealed, and placed under lock. Permission to enter can be obtained from Ranger Henry Tonseth, whose headquarters are in Bend.

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MOUND BUILDERS

By Max Hunn
(Special to the Christian Science Monitor)

Blakely, Ga.

Unusual centerpeice of Kolomoki State Park near here is a hugh Indian mound erected before Columbus discovered the New World. The park is located three miles north, off U. S. Route 27.

Fifty-six feet high and the size of a modern football field at its base, the mound was used as an Indian temple in the 12th and 13th centuries, according to archaeologists who have made preliminary explorations. However, the complete details of the mound's history are still veiled in mystery.

(continued)

Mound Builders - cont.

It was a construction job on no small scale. In the days when draglines and bulldozers were unknown, moving such a tremendous quantity of earth was a toilsome achievement. All the earth was moved by basket.

Remarkable Feat

How many years it took is unknown. In some ways, it's a construction feat comparable to those of the Mayas and Incas, although they had the added advantage of working with stone. It's a remarkable construction feat by primitive people.

It's an impressive sight towering over the otherwise level land, and as you look across the plain from the mound's top, you can easily visualize the thatched huts of the Indian villages stretching into the distance for a mile or more. Now covered with trees, the mound's top in Indian days was kept clear and clean and as the site of thatched-roof wood temples now long-vanished.

Experts believe that for more than 100 years the Kilomoki temple mound with its surrounding villages, burial mounds, and ceremonial plaza was a center of population and activity seldom equaled elsewhere in North America.

Population Center

From minor exploratory work, it has been deduced that the first Indian settlement was made sometime between A.D. 1100 and 1200, as the northern outpost of the Weeden Indian Tribe, whose mounds and villages stretched along the Florida coast from Pensacola to Tampa Bay.

Considering the size of the great mound, the extent of the village, whose limits have been determined by refuse deposits, and the number of smaller mounds, it's obvious the area served 2,000 to 3,000 people, an unusually large community by North American Indian standards.

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- HERE AND THERE -

COAL ON ICE - 75^0 N.

Spitzbergen off the northeast tip of Greenland has large deposits of fine grade coal. After shafting down through 40 feet of ice and a few feet of rock, you come upon a vein ten feet thick.

Norway is making much use of these deposits though shipping is possible only in months when ports are not ice locked.

* * * * *

OIL RESERVES

Geologist Wallace Pratt in his book "Oil in the Earth" 1942 makes the statement that the lower Mackenzie River basin is the richest known oil region in the world.

While speaking of this area it may be noted that somewhat to the northeast of this region chunks of copper are found as large as loaves of bread. Great deposits of copper are thought to exist there.

* * * * *

METAL AND MODERN LIVING

To live in our up-to-date manner means that among other things consumed by each we need 1300 pounds of iron, 23 pounds of copper, and 16 pounds of lead. Also we must have in stock 9 tons steel, 300 pounds of copper and 100 pounds of lead.

-- Harrison Brown, Amer. Acced. Arts & Sciences.

HERE AND THERE - (cont.)

NICKEL MT. - OREGON

Oregon is now first in nickel production in the United States. Reduction of ore at Nickel Mt. near the town of Riddle, near Roseburg, is now at 10,000 tons per year after six years of operation. Nickel is a highly strategic metal and formerly 90% of our needs were imported. Bonneville Power is supplied for reducing this ore by the Hanna Nickel Smelting Company.

- - Mining World

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ROCK FOUNDATION

The Portland Hilton Hotel, Broadway and Salmon Street, will soon rise to a height of 254 feet and top all other structures in the area. Eighty-five million pounds must be supported on a narrow base, so you may ask how safe can this spot be for such a building.

Herbert Schlicker of the Oregon Department of Geology says the foundation base is excellent. The excavation goes down 70 feet to sand and gravel layers of the Pleistocene age, 20,000 to 90,000 years ago.

* * * *

BIRD CREEK MEADOWS

A short time ago we had a field trip to this area led by Leo Simon. Supreme Court Justice William Douglas has just advertised his book, My Wilderness, in which he takes up the defense of just such areas. Speaking specifically of Bird Creek Meadows, he regrets that now a road leads there to carry "pot-bellied sigar smokers to profane the sacred precincts of a great mountain." (Geesockers, beware!)

The Oregonian

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SAND DUNES

Recalling our trip of inspection to our coastal dunes a few months ago, where Near East oil flows out of the Arabian Peninsula, they have 1/4 million square miles of barren sand, and the most fantastic dunes.

- - Science Magazine, November 15

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100 YEARS AGO

Geologists and Scientists, Beware! - -

"Let them dig into the bowels of the earth. Let them break asunder the massive rocks and unfold the history of Creation. Let them gather up the fossil fragments of lost Fauna. Let them put nature to the rack and torture her for her inmost secrets.

"But let them not think by searching to find out God. Let them be satisfied with what is revealed of Divine Nature nor break the bounds to gaze after the Invisible."

Robert Winthrop - Member of Congress