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DIATOMITE
by
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Diatomite, diatomaceous earth, and diatomaceous silica are common names given to deposits of minute tests of siliceous plants that accumulated in large quantities in marine waters and fresh water lakes. There is an increasing demand for diatomite for certain industrial uses to which it is admirably adapted. Of that used in the United States during 1942, about one-half was for filtration, one-quarter for insulation, and one-sixth for filler, and the rest for many other purposes. California produces by far the greatest tonnage; Oregon is in second place. Florida, Idaho, Nevada, New Mexico, New York, and Washington produce small tonnages. British Columbia has perhaps the largest deposits in Canada, at Quesnel, but they have not been worked to any degree comparable to the California deposits.

The following description of diatoms is given by Eardley-Wilmot[2]:

> "The diatom, which belongs to a group of flowerless aquatic plants called algae, secretes for itself an external case or box of clear silica consisting of two valves which slip over each other like the lid and bottom of a box. The form of the box may be any one of the 10,000 shapes and designs to which reference has been made. The two valves of the box are identical and are bound together around their edge by a separate ring or hoop called the girdle. Each valve consists of two, or in some species three, plates, or layers, separated from each other by hollow pockets. The numerous dots or lines which can be seen on the valves are believed by some to be pores through which the diatom 'breathes', but the general theory is that they are lumps covering internal hollows and that the breathing takes place through the girdle and through the raphe, which in many forms is the main central line.
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> "There appears to be several methods of reproduction, the commonest of which is brought about by the separation of the individual, longitudinally, into two along the median dividing line. The bottoms of a box are formed back to back along this line, push outwards, slip snugly into the upper and lower valves of the parent, thus forming two new boxes which separate, and each repeats the process, and so on. This method of formation is the origin of the name diatom, from two Greek words meaning, 'to cut through'. Other species grow in chains and are attached to each other by various kinds of horns or tentacles."

Light is necessary for the reproduction of diatoms; therefore they are not found growing in very deep water. The degree of salinity is important in marine forms.

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[2] Eardley-Wilmot, V. L., 1928, Diatomite, its occurrence, preparation, and uses. Canada Dept. Mines, Mines Branch, p. 2.

Becking and others[3] in their studies of diatom "epidemics" that occurred at Copalis Beach, Washington, noted that the masses of diatoms washed ashore occur (1) toward the end of the rainy season in April and May, (2) after a heavy rain, (3) when the rains are followed by gentle westerly winds, (4) and they reach a maximum when the rain is followed by clear weather and bright sunshine. The water off Copalis Beach is quite shallow so that the addition of considerable rain may have temporarily diluted the sea water facilitating the growth of diatoms. Their laboratory experiments showed that greatest diatom development actually occurs at salinities between 2 and 2.5 percent.

The present salinity of the sea water along the west coast is about 3.5 percent. It seems probable that marine diatomite was deposited in embayments near the mouths of streams where a dilution of the sea water might have facilitated the growth of diatoms.

As many of the freshwater forms are found associated with volcanic tuffs and flows, there is probably a direct relation between the abundant growth of the diatoms and the silica contributed by volcanism[4]. Disruption of drainage by volcanic flows might result in lakes in which the deposits form.

Diatoms are even more plentiful in Arctic and Antarctic seas than elsewhere. The deposits of diatomite range in age from Cretaceous to Recent, although the commercial deposits are all Tertiary or younger. The largest marine deposit in California is at Lompoc. It is Miocene in age. Diatomite deposits in northern California, Oregon, and Washington are nonmarine and largely of Miocene and Pliocene age, with a few Pleistocene and Recent deposits known but as yet unexploited.

The deposits are composed of hydrous or opaline forms of silica which, when pure, is usually white. They occur as chalklike masses, either stratified or massive, and colored white, light shades of gray, buff, or green. Some impurities such as clay, calcareous material, volcanic tuff, flint, and carbonaceous material may be present. The true specific gravity is 1.9 to 2.34 but the apparent specific gravity or apparent density of the dry block form is 0.4 to 0.6 (25 to 37.5 lbs. per cu. ft.) and the apparent density of the dry powder is 0.08 to 0.25 (5 to 16 lbs. per cu. ft.). Pure diatomite contains about 96 to 97 percent silica. The remaining part is water, but small amounts of iron and aluminum oxides are always present. Pure diatomite is much like opal in composition.

Diatomite has many properties that make it useful in industry. It is insoluble except in hydrofluoric acid and strong alkalies; it has low thermal conductivity, and it will absorb 1.5 to 3.5 times its weight of water. The absorptive power can be increased by calcination, as this drives off the combined water. The melting point varies from 1400° to 1750° C. according to purity and compactness. The index of refraction is usually between 1.44 and 1.46.

The size and shape of the diatoms themselves determine to a certain extent the use to which they are put. For filtering, a mixture of round honeycombed and thin rodlike acicular or "needlelike" diatoms are probably the best, but for polishing and mild abrasives the small spicules appear to be better. Many of the freshwater deposits are made up of disc-shaped and short rodlike diatoms which have greater compressive strength than the needlelike forms and when compact may be cut in blocks for building purposes.

When evaluating crude diatomite, the following properties should be noted: freedom from sand, volcanic ash, crystalline silica, organic matter, lime, clay, or other impurities; the microscopic structure (types of diatom forms and their condition, whether broken or whole, relative abundance of different forms, whether disc or acicular, and presence or absence of exceedingly fine particles); the friability; color; and the opaline silica content.

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[3] Becking, L. B., and others, 1927, Preliminary statement regarding the diatom "epidemics" at Copalis Beach, Washington, and an analysis of diatom oil: Econ. Geol., vol. 22, no. 4, pp. 356-368.

[4] Taliaferro, N. L., 1933, The relation of volcanism to diatomaceous and associated siliceous sediments. Univ. Cal. Pub. Bull. Dept. Geol. Sci., vol. 23, no.1, pp. 1-56.

The list of products that are filtered is far too long to enumerate. Sugar, oils, water, fruit juices, liquors, etc., are among the more common. Rapid strides have been made in research pertaining to filtration with diatomite. Many users have developed special processes requiring certain types of products which are made directly by the producers without release of the specifications for business reasons. The deposits near Terrebonne, Oregon, produce high-grade filter material.

Although the extent to which diatomite acts as a bleach is still in question, it can be treated chemically and then becomes a bleaching agent. Diatomite is used as an insulator for both heat and sound. It is light in weight, fireproof, and its many minute enclosed air cells form a very efficient thermal barrier. It is used in the form of a coarse or finely granular powder, natural sawed bricks, and as burnt bricks made with a mixture of clay or other bonds. In the case of sawed blocks, the more compact beds are utilized.

Finely pulverized diatomite is used as a filler by many producers of paints, varnishes, paper, battery boxes, rubber, portland cement, tooth paste and powders, phonograph records, plastics, and hundreds of other products.

Diatomite is an important constituent in many concretes, stuccoes, and plasters. The addition of 1½ to 3 percent increases the workability and the strength. High-grade material does not appear to be essential. In fact, tuffaceous diatomite such as occurs in parts of Oregon may be suitable. The diatomite helps to remove excess water.

Diatomite is used as a catalyst in the process of hydrogenation of oils necessary for the manufacture of soaps, edible fats, and grease. It is also used as an absorbent of wax, fats, and oils. Among other uses, it is an excellent polishing material, as the fragile tests give way under pressure, preventing harmful scratching. Much of the silver polish on the market is diatomite. It may be used as a mild abrasive for painted surfaces but continued polishing will wear through the paint eventually. It is a carrier for insecticides and a filler for explosives.

Most diatomite contains a certain amount of moisture, particularly diatomite that is dredged out of bogs. However, most of the western deposits are relatively low in moisture because they occur in regions of low rainfall.

Diatomite is quarried by power shovel or dragline, mined in underground stopes, or sawed into blocks. Hand quarrying is used when more careful handling and selection of material is desirable. The excavated diatomite is usually allowed to air dry but where climatic factors are not favorable or more complete and rapid drying is desired it is put through a drying shed or kiln. Deposits that are used mainly for insulation or for construction need not undergo the intricate processing that is necessary for that which is sized, pulverized, and packaged for filtration or fillers. Calcination which involves heating to about 900° C., or even higher temperatures, drives off the water of chemical combination and other volatiles. If iron is present, calcination produces a pink color.

The flow sheet of diatomite from deposits in western United States begins with excavation and haulage either to a drying field or place of storage. The material is run through grizzlies, crushed, heated to drive off water, recrushed, and then classified. Some is then packaged directly for use, whereas some is calcined and given chemical treatment, classified, and then packaged for more specialized use. Sizing of the diatomite is described by Skinner and others[5] as follows:

> "Size classification is important, and three methods are generally used: (1) wet- or dry-screening, (2) settling in water, and (3) air-separation. Dry-screening below 200-mesh is impractical, and wet-screening is uneconomical because excess water has to be removed. Hydraulic settling requires tests

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[5] Skinner, K. G., and others, 1944, Diatomites of the Pacific Northwest as filter-aids, U.S. Dept. Interior, Bur. Mines, Bull. 460, pp. 8-9.

for each diatomite. Although air-separation is not entirely satisfactory, it is the method generally used. Three types of flow sheets, one for each of different sections of the United States, are common, and the many patents issued covering diatomite processing are only modifications. The patents cover such things as blending, reduction of hammer mill speed to reduce diatom shattering during milling and final breaking by attrition during air transportation, and removal of chert and larger diatoms by means of air separators in series..... Filtration tests indicated that diatomite sized to minus 250- plus 325-mesh gave the highest flow rates and the highest clarities....."

Diatomite Occurrences in Oregon

The commercial deposits of diatomite in Oregon occur in strata of Miocene or Pliocene age, although a few younger deposits are known. Moore[6] has given the most detailed information on their occurrence and it is from his study that much of the following information is obtained. Skinner and others[7] have tested many of these deposits and given additional data.

A few of the more important diatomite deposits are listed below.

Baker County

Diatomite occurs near Durkee in beds about the age of the Mascall formation (middle Miocene). The Swayze Creek deposit in the SE¼ sec. 34, T. 11 S., R. 43 E., is massively bedded and 50 feet in total thickness. The Manning Creek deposit is in the SE¼ sec. 13, T. 11 S., R. 43 E., contains tuff, and is of doubtful quality. Diatomite which contains altered basaltic bombs is present along Clover Creek in T. 8 S., Rs. 42 and 43 E. Small samples obtained by the Oregon Department of Geology and Mineral Industries from the vicinity of Keating, in sec. 9, T. 8 S., R. 42 E., proved to be very pure.

Deschutes County

The best known deposit of diatomite in Oregon is located along the Deschutes River about 6 miles west of Terrebonne. This deposit is now being worked by the Dicalite Company which also has a quarry and plant near San Pedro, California. The Terrebonne diatomite occurs in beds of the Dalles formation of Pliocene age, which is composed of a series of tuffs, agglomerates, diatomite, and lava flows interbedded with sands. The diatomite ranges from 67 feet to a knife edge in thickness. It is in places capped by later flows.

The following description of the Terrebonne deposits is based on a report by Dr. A. C. Boyle[8], chief engineer of the Union Pacific Railroad. The deposit is covered by an overburden averaging somewhat less than 11 feet in thickness. It is tabular in form and was probably laid down in a spring-fed freshwater lake which may have been caused by lava-damming of a stream. The Deschutes River has cut through the deposit exposing it on both sides of the valley. In a few places the upper part of the deposit has been channeled before burial by younger sediments.

The deposit is banded with layers ranging from a few inches to several feet in thickness. The banding is probably due to slight variations in the composition of the diatomite, in particular the content of iron oxide.

Dr. Boyle describes the deposit as follows:[9]

> "The stratum of highest grade, known at the quarry as No. 6, is characterized by the absence of bedding planes and by good conchoidal fracture.

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[6] Moore, B. N., 1937, Nonmetallic mineral resources of eastern Oregon, U.S. Geol. Survey Bull. 875, pp. 1-180.

[7] Skinner, K. G., and others, op. cit.

[8] Stearns, H. T., 1931, Geology and water resources of the middle Deschutes River basin, Oregon, U.S. Geol. Survey Water-Supply Paper 637, p. 151.

[9] Idem., p. 154.

It is extremely soft, very white, and massive and is easily distinguished from every other member of the deposit by the peculiar pitch of sound produced when a sharp-pointed stick is thrust into it. This stratum is found in most of the pits and varies only slightly from 6 feet in thickness. It is made up of practically one species of diatoms and is almost free from injurious impurities.

"Vertical fissures, in places curved, break up the mass and are probably due to shrinkage. Water percolating through these fissures has deposited foreign substances, chiefly iron oxide, along their faces. The fissures aid considerably in the mining operations."

The volume is estimated to be 15,391,200 cubic yards, spread over more than 265 acres.

An analysis of the diatomite from the Terrebonne deposit shows 86 percent or more silica, between 5.15 and 7.60 percent moisture, and small amounts of aluminum and iron oxides.

Grant County

Considerable high-grade diatomite is exposed in the railroad cuts in sec. 28, T. 11 S., R. 35 E., just west of Austin. The diatomite is relatively pure, massively bedded material with thin partings of volcanic ash. According to Moore, this material might be used for most purposes for which diatomite is fitted, although it is not tough enough to be used for sawed natural brick.

Some diatomite occurs in the Mascall formation of middle Miocene age which overlies the Columbia River basalt in the John Day Valley. The diatomite is probably too impure to be utilized.

Harney County

The Otis Basin diatomite district covers about 65 square miles along Otis Creek in Northern Harney County. These deposits are located near Beulah, Juntura, and Drewsey. The deposits, like those of Malheur County, are a part of the Payette formation of upper Miocene age. The higher grade deposits are restricted to the central part of the basin. The diatomite of this district includes varieties of a fairly high degree of purity which might be used for concrete admixture, insulation, and filtration.

Jefferson County

Diatomite is reported from the NW¼ sec. 25, T. 11 S., R. 11 E., on the Warm Springs Indian Reservation. The deposit is about 45 feet thick and lies between lava flows which are exposed in a river gorge. The overlying basalt is reported to range from 3 to 15 feet in thickness.

Klamath County

Deposits of rather impure diatomite occur in and around Klamath Falls, near Chiloquin, along the western border of Poe Valley, in the broad valley of Sprague River, in Alkali Valley, in the Olene district which lies along the Lost River, and in several other places within Klamath County. The diatomite in the Klamath region usually contains very fine volcanic glass which disqualifies it for many purposes.

According to Moore:[10]

"The quality of Klamath diatomite, according to accepted standards, is in general poor. A great field, however, is open for the utilization of much of this material for clay-bonded insulating bricks and forms if a sufficiently large market should be found for the products."

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[10] Moore, B. N., op. cit., p. 51.

Recent deposits of diatomite of quite/good quality are present in Klamath Lake. These deposits which are as much as 10 feet thick could be utilized for most of the purposes for which diatomite is commonly used. It could be recovered by dredging.

Linn-Lane Counties

Diatomite has been recently discovered in the eastern part of Linn and Lane Counties between the McKenzie and Santiam Rivers.[11] These deposits are as yet unexplored but they appear to contain sufficient tonnages of good quality diatomite to be utilized commercially.

Malheur County

The Harper diatomite district reaches from the Malheur River northwestward to Westfall, a distance of about 12 miles. The diatomite occurs in an irregular basin cut out of the Payette formation by the Malheur River. The diatomite underlies most of an area of 50 square miles. It is a part of the Payette formation.

The deposit is described as follows by Moore:[12]

> "The diatomite of the Harper district occurs in massive condition in beds separated by partings of gray ash. The lack of lamination in this material is noteworthy, as well as the surprisingly large percentage of very pure material. Comparatively little of the diatomite carries an appreciable percentage of ash or clay..... The diatomite of this district is noteworthy for its high purity, its brilliant white color, its remarkable toughness, and its low apparent density. The better grades of it form more than half of the total in each measured section and have a general appearance in the hand specimen of brilliant white plaster or chalk. Toughness and freedom from lamination are combined with other desirable qualities to make the Harper earth of particular interest to the manufacturer or user of sawed natural blocks, bricks, and other forms."

Summary of quality of Oregon diatomite

Much of the Oregon diatomite is of excellent quality. It is of good color, with but few exceptions. There are several deposits which are of marginal value because of impurities, particularly volcanic ash. The texture of the deposits varies widely. In general, the quality of the deposits may be told by the presence or absence of gritty material, color (although this is not always determinative), and the apparent density. High apparent densities usually indicate a large amount of impurities. In general, a gritty feel of the sample, coupled with an apparent density of more than 35 pounds to the cubic foot, indicates a poor quality. The deposits in general have a conchoidal fracture because of the massive nature of the deposits. The Harper deposits are surprisingly strong which, like many of the other deposits, lends itself to the manufacture of sawed natural brick.

Most of the Oregon deposits are near to railroad branches which lead to main lines. The costs of transportation may be slightly higher than those in other parts of the country which have more favorable transportation. Then too, the largest users of diatomite are not in the Northwest, a region in which the location of the Oregon diatomite would be favored by location. However, an increase in northwest industrial development should, when coupled by an ever-widening use of diatomite, lead to greater development of Oregon deposits.

There is a shortage of diatomite in the Portland market. This may be a result of wartime labor shortages but it is probably due in large part to an increased demand for the material.

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[11] Smith, W. D., personal communication.

[12] Moore, B. N., op. cit., pp. 77 and 87.

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Cummins, A. B., and Mulryan, H., 1937, "Diatomite," pp. 243-260, Industrial Minerals and Rocks, A.I.M.E., New York.

Smith, W. D., 1932, Diatomaceous earth in Oregon: Econ. Geol., vol. 27, pp. 704-715.

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BUYERS OR USERS OF DIATOMITE IN PORTLAND AREA

A. McMillan & Co.
220 S. E. Ankeny

E. J. Bartells Co.
611 N. Tillamook

Calif. Spray Chemical Corp.
2109 N. Albina

Miller Products Co.
1932 S. W. Water Ave.

Miller & Zehrung Chemical Co.
2201 N. W. 20th

Fisher Thorsen & Co., Inc.
2100 N. W. 22nd

Van Waters & Rogers, Inc.
433 N. W. York St.

McCracken Ripley Co.
2221 N. Albina Ave.

La Grand Industrial Supply Co.
2603 S. W. Front

Western Industrial Supply Co.
208 S. E. Hawthorne

Blitz-Weinhard Co.
1133 W. Burnside

Portland Paint & Lacquer Products
7835 S. W. 37th Ave.

Duncan Paint Co.
4246 S. E. Belmont

W. P. Fuller Co.
2181 N. W. Nicolai

Miller Paint & Wallpaper Co.
317 S. E. Grand Ave.

General Paint Corp.
838 S. W. 2nd

J. E. Berkheimer Mfg. Co.
9111 N. Denver

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OREGON MINING NEWS

The B-H Company of Medford, Oregon, under the direction of Tom Gerety, is installing a dredge on Sucker Creek, Josephine County, which will be in operation in 1946.

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Charles Stearns is preparing to start dredging on the Applegate River at the Kubli ranch in Jackson County.

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Mr. L. V. Riddle of Medford is assembling a dragline dredge on Kane Creek south of Gold Hill for the Crescent Pacific Company. It is reported that enough yardage is available to keep the dredge operating for 1½ to 2 years.

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Mr. Bruce Murray, of Rogue River, and associates are testing dredging ground east of Highway 99 on Graves Creek.

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Mr. Charles Lyons of Grants Pass has moved his suction dredge from the Salmon River, Idaho, to Merlin, Oregon, where he plans to install it in the Rogue River at the mouth of Hog Creek.

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Mr. I. R. Perry of Grants Pass has erected a plant adjacent to the plant of the Rogue River Sand and Gravel Company to manufacture concrete building blocks and tile. The plant will supply local construction requirements.

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Mr. W. F. Kernin of Roseburg is reopening the old workings of the Levens Ledge Mine northwest of Canyonville, and is driving a crosscut to explore the vein below the present workings on the millsite level.

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Everett Gray and Don Griffith of Grants Pass are erecting a sand and gravel plant on the Rogue River north of Grants Pass.

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The Bristol Silica Co. is installing a crushing and screening plant at the company's granite quarry near Gold Hill to produce poultry grit. This will supplement the quartz-grinding plant which has been in operation at the town of Rogue River for several years.

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The Porter & Company bucket line dredge on Granite Creek in eastern Grant County will be put into operation as soon as weather conditions permit. A crew is now opening roads and re-establishing the camp which was closed when the WPB Order L-208 went into effect.

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WITHDRAWAL OF LANDS IN NEWBERRY CRATER, DESCHUTES COUNTY

(Public Law 267 - 79th Congress)
(Chapter 586 - 1st Session)
(H. R. 608)

AN ACT

To exclude certain lands in Deschutes County, Oregon, from the provisions of Revised Statutes 2319 to 2337, inclusive, relating to the promotion of the development of the mining resources of the United States.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, THAT WITHIN THE FOLLOWING-DESCRIBED REAL PROPERTY SITUATED IN DESCHUTES COUNTY, OREGON, NAMELY, SECTIONS 13 TO 16, INCLUSIVE, SECTIONS 21 TO 28, INCLUSIVE, SECTIONS 33 TO 36, INCLUSIVE, TOWNSHIP 21 SOUTH, RANGE 12 EAST, WILLAMETTE MERIDIAN; SECTIONS 16 TO 21, INCLUSIVE, SECTIONS 28 TO 33, INCLUSIVE, TOWNSHIP 21 SOUTH, RANGE 13 EAST, WILLAMETTE MERIDIAN; SECTIONS 1 TO 4, INCLUSIVE, SECTIONS 9 TO 12, INCLUSIVE, TOWNSHIP 22 SOUTH, RANGE 12 EAST, WILLAMETTE MERIDIAN; AND SECTIONS 4 TO 9, INCLUSIVE, TOWNSHIP 22 SOUTH, RANGE 13 EAST, WILLAMETTE MERIDIAN; DEPOSITS OF ALL MINERALS ARE EXCLUDED FROM THE OPERATION OF REVISED STATUTES 2319 TO 2337, INCLUSIVE (RELATING TO THE PROMOTION OF THE DEVELOPMENT OF THE MINING RESOURCES OF THE UNITED STATES): Provided THAT NOTHING IN THIS ACT SHALL DISTURB ANY VESTED RIGHTS OF ANY PERSON OR PERSONS IN OR TO SAID REAL PROPERTY OR ANY PART THEREOF.

Approved December 21, 1945.

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OREGON SOURCES OF BUILDING-BLOCK MATERIALS

Building blocks made of a light weight aggregate and portland cement are becoming popular for houses and small business buildings. The aggregates in most common use are mixtures of sand with either pumice, volcanic tuff, volcanic cinders, or calcined shale. Aside from their light weight, these blocks have certain advantages such as good insulating qualities and fire-proof characteristics. A number of people have been investigating the possibility of starting up small plants to make these blocks. The market situation is especially favorable at present because of shortage of lumber and the large unsatisfied demand for building materials.

In order to provide some basic facts connected with making these blocks, especially sources of supply of aggregate, the State Department of Geology and Mineral Industries has just issued a brief report entitled "Notes on Building-Block Materials of Eastern Oregon", by Normah S. Wagner, field geologist. This report, G.M.I. Short Paper No. 14, may be obtained at the Portland office of the Department at 702 Woodlark Building or from the field offices at Baker and Grants Pass. Price postpaid 10¢.

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MERCURY

The following items are taken from U.S. Bureau of Mines Mineral Trade Notes, issue of November 20, 1945, and give evidence of the influence which the Italian production will have on the United States quicksilver industry.

Italy: The production of mercury in Italy was greatly expanded during the war - from 42,732 flasks of 76 pounds each in 1936 to a maximum of 94,160 flasks in 1941. Production, which was completely suspended owing to demolition of power plants and some of the reduction plants in Tuscany by the Germans before retreating, and the loss of the Idrian mines, has been resumed, and current production is about 2,600 flasks a month from the Tuscany region. According to information obtained from the Allied Commission, stocks of mercury on September 30, 1945, were 26,500 flasks. Since Italy normally consumes only a small part of this output, the resumption of sales will provide foreign exchange and benefit Italy's economy. (Minerals Attaché C. A. Botsford, Rome.)

When the mercury mines in Tuscany are in condition to operate at capacity, they should again be one of the world's principal sources of this metal for many years. In 1938 these mines produced 58,800 flasks, or 88 percent of the total Italian output and 40 percent of the world's production. Based upon the 1940 output, the developed ore reserves are sufficient for about 8 years, and the tonnage of probable and possible reserves indicates that these mines will continue to be productive for many decades. The grade of the ore mined has averaged 1.29 percent mercury in recent years. The main mineral zone is defined by small mines and prospects starting at a point about 3 miles north of Abbadia S. Salvatore and extending to San Martino, 16 miles to the south. Exposures of mercury ore occur across a width of 5 miles. Outside of this zone, about 14 miles southeast of San Martino, is the Cerreto Piano mine, which for several years has produced over 5,000 flasks annually. The Idria mine has now been taken over by the Yugoslavs. Idria's annual output from 1938 to 1943 averaged 11,000 flasks, and the grade of the ore was 0.6 percent mercury. Reserves are said to be limited to less than a decade at a normal rate of production.

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The Abbadia San Salvatore on the east slope of Monte Amiata, owned by the S.A. Monte Amiata, in which the Italian Government has a controlling interest, has been and is the most productive mercury mine in Italy. Its annual output dropped sharply from 35,500 flasks in 1940 to 12,110 flasks in 1944. The 1945 output is estimated at 20,000 flasks. The war damage caused by the retreating Germans consisted of the destruction of the surface plant, including the furnace and the principal power plants, upon which the mines were dependent. A small hydroelectric plant, however, was not damaged, and with this the mine can operate at one-half capacity. Present capacity, however, is about 70 percent of normal. The main mercury deposit is developed by adits, shafts, and several levels to a depth of 165 meters below the surface. The horizontal cut-and-fill method is used to extract the ore. Waste is sorted from the ore in the stopes and used for back filling. Compressed-air rock drills and electric locomotives were temporarily replaced by pick and shovel, hand drills, and hand tramming and animal haulage because of the power shortage, but this situation is being eased. In 1939 the tonnage of ore extracted per man shift was 0.6 ton for underground labor and 0.47 for all labor. A total of 1,298 workmen were employed underground and 310 on the surface.

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Italy is in a difficult situation in reference to the foreign market for mercury. The bank rate of exchange for the dollar is 100 lire, and for the pound sterling 400 lire. The quoted open-market exchange is about 300 lire for the dollar and 1,200 lire for the pound. The Italian sale price for mercury is fixed at 25,000 lire a flask, or $250. However, sales by requisition to Germany were made at $180 a flask during the war. A shipment of 4,418 flasks was made to France in 1944 at 25,000 lire a flask. To overcome the exchange difficulty, producers are studying a barter system or the possibility of selling the dollars or pounds they receive to the Italian Government at a premium. There is a government tax of 2,000 lire for each flask produced, which is paid at the time of sale. Ways and means for the adjustment of the official and effective rate of exchange to permit the export of mercury on a more profitable basis are being discussed with the Instituto Commercio Estero in Rome and the principal producers in Italy.

A representative of the Italian producers was recently in Spain, and it was decided to re-establish the Cartel arrangements as before the war, giving Italy 45 percent and Spain 55 percent of the export trade and to reduce the price to $130 a flask. (Charles Will Wright and Mineral Attaché Clarence A. Botsford, Rome.)

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GEOLOGIC MAP ADVISORY COMMITTEE

The Governing Board of the Oregon Department of Geology and Mineral Industries has appointed the following geologists to serve as an advisory committee on the construction of a State geologic map: Dr. E. L. Packard, Head of Department of Geology, Oregon State College; Mr. A. M. Piper, District Geologist, Division of Ground Water, U.S. Geological Survey; Mr. L. L. Ruff, geologist, Portland District, U.S. Engineers; Dr. W. D. Smith, Head of Department of Geology and Geography, University of Oregon; Dr. F. G. Wells, geologist, U.S. Geological Survey.

Although a large part of the State has not been mapped in detail, it is believed by the Department that enough geological information is available to warrant construction of a preliminary geologic map of the State. There is a continual demand for such a map. Dr. W. D. Lowry of the Department staff will be in immediate charge of the map work.

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URANIUM

Governments do not know where they are going in control of uranium sources, but they are on their way. Some time ago the United States and Canada placed natural sources of uranium under strict government control. Russia, of course, does not need to give any notice that uranium ores are nationalized, as everything is nationalized. According to Mineral Trade Notes* Spain, Union of South Africa, and Venezuela have clamped down on prospecting for or production of uranium and other radioactive minerals. Some features of the regulations in a proclamation of the Union of South Africa are noteworthy, as showing a pattern of government control whish may be followed in other countries. One of the rules is as follows:

(1) No person shall, without the written authority of the Minister of Mines -

a. Search or prospect for or mine any uranium referred to in the Schedule to these regulations, or by any chemical or metallurgical process, extract or isolate any such uranium from any substance whatsoever;

b. Export any such uranium from the Union.

(2) An authority under sub-regulation (1) may be granted subject to such conditions as the Minister of Mines may deem fit to impose.

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* U.S. Bureau of Mines Mineral Trade Notes: Vol. 21, no. 5, p. 21.

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The ORE.-BIN
State of Oregon
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STATE OF OREGON
DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES

PORTLAND, OREGON

THE ORE.-BIN

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STATE DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES
Head Office: 702 Woodlark Bldg., Portland 5, Oregon

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PARTIAL LIST OF USERS OF INDUSTRIAL MINERALS IN THE LOWER COLUMBIA RIVER AREA*

Because of the many inquiries received concerning a market for some industrial minerals, the Department has prepared a list of users and possible buyers of these minerals in the lower Columbia River area. The list is not complete and additions will be made from time to time.

Asbestos

Asbestos Supply Co. of Ore.
221 S. W. Front Avenue

E. J. Bartells Co.
611 N. Tillamook Street

J. E. Berkheimer Mfg. Co.
9111 N. Denver Avenue

Duncan Paint Co.
4246 S. E. Belmont Street

Fisher Thorsen & Co., Inc.
2100 N. W. 22nd Avenue

Flexoid Paint Co.
4850 N. E. 97th Avenue

W. P. Fuller Co.
2181 N. W. Nicolai Street

General Paint Corp.
838 S. W. 2nd Avenue

Gilsonite Roof Products
5224 N. E. 42nd Avenue

Miller Paint & Wallpaper Co.
317 S. E. Grand Avenue

Pacific Roofing Co.
6350 N. W. Front Avenue

Pennsylvania Salt Mfg. Co. of Washington
6400 N. W. Front Avenue

Portland Paint & Lacquer Products
7835 S. W. 37th Avenue

Rodda Paint Co.
1103 S. E. Grand Avenue

Westco Waterpaints Inc.
1225 N. W. Everett Street

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*Unless otherwise stated addresses are in Portland.

Barite

Duncan Paint Co.
4246 S. E. Belmont Street

Fisher Thorsen & Co., Inc.
2100 N. W. 22nd Avenue

W. P. Fuller Co.
2181 N. W. Nicolai Street

General Paint Corp.
838 S. W. 2nd Avenue

Miller Paint & Wallpaper Co.
317 S. E. Grand Avenue

Miller & Zehrung Chemical Co.
2201 N. W. 20th Avenue

Pacific Laboratories, Inc.
10330 N. E. Marx Street

Portland Paint & Lacquer Products
7835 S. W. 37th Avenue

Rodda Paint Co.
1103 S. E. Grand Avenue

S. & S. Paint Mfg. Co.
121 S. E. Morrison Street

Van Waters & Rogers, Inc.
433 N. W. York Street

Bentonite

California Spray Chemical Corp.
2109 N. Albina Avenue

LaGrand Industrial Supply Co.
2603 S. W. Front Avenue

Miller Products Co.
1932 S. W. Water Avenue

Pacific Stoneware Co.
9217 N. Peninsular Avenue

Portland Gas & Coke Co.
Public Service Building

Snow Insecticide Co.
6043 S. W. Capitol Highway

Swift & Company
N. Portland

Van Waters & Rogers, Inc.
433 N. W. York Street

Western Industrial Supply Co.
208 S. E. Hawthorne Blvd.

Clay

E. J. Bartells Co.
611 N. Tillamook Street

Crown-Zellerbach Corp.
Public Service Building
(kaolin - filler)

Dant & Russell (kaolin)
Firtex Plant
St. Helens, Oregon

Durkee Famous Foods, Inc.
2736 N. W. Front Avenue
(Activated acid-treated bleaching clay)

General Paint Corp.
838 S. W. 2nd Avenue

LaGrand Industrial Supply Co.
2603 S. W. Front Avenue

McCracken Ripley Co.
2221 N. Albina Avenue

Miller Products Co.
1932 S. W. Water Avenue

Pacific Stoneware Co.
9217 N. Peninsular Avenue

Pennsylvania Salt Mfg. Co. of Washington
6400 N. W. Front Avenue

Van Waters & Rogers, Inc.
433 N. W. York Street

Westco Waterpaints, Inc.
1225 N. W. Everett Street

Western Industrial Supply Co.
208 S. E. Hawthorne Blvd.

Diatomite

E. J. Bartells Co.
611 N. Tillamook Street

J. E. Berkheimer Mfg. Co.
9111 N. Denver Avenue

Blitz-Weinhard Co.
1133 W. Burnside Street

California Spray Chemical Corp.
2109 N. Albina Avenue

Cleaver Mfg. Co.
2764 N. W. Thurman Street

Duncan Paint Co.
4246 S. E. Belmont Street

Durkee Famous Foods, Inc.
2736 N. W. Front Avenue

Fisher Thorsen & Co., Inc.
2100 N. W. 22nd Avenue

W. P. Fuller Co.
2181 N. W. Nicolai Street

General Paint Corp.
838 S. W. 2nd Avenue

Gilsonite Roof Products
5224 N. E. 42nd Avenue

Griffin Bros. Inc.
1806 S. E. Holgate

LaGrand Industrial Supply Co.
2603 S. W. Front Avenue

McCracken Ripley Co.
2221 N. Albina Avenue

A. McMillan & Co.
220 S. E. Ankeny

Miller Paint & Wallpaper Co.
317 S. E. Grand Avenue

Miller Products Co.
1932 S. W. Water Avenue

Miller & Zehrung Chemical Co.
2201 N. W. 20th Avenue

Pacific Building Materials Co.
400 N. Thompson Street

Pennsylvania Salt Mfg. Co. of Washington
6400 N. W. Front Avenue

Portland Paint & Lacquer Products
7835 S. W. 37th Avenue

Ross Island Sand & Gravel Co.
4129 S. E. McLoughlin Blvd.

Swift & Company
N. Portland

James A. Tait Co.
316 S. E. Madison Street

Van Waters & Rogers, Inc.
433 N. W. York Street

Western Industrial Supply Co.
208 S. E. Hawthorne Blvd.

Dolomite

Crown-Zellerbach Corp.
Public Service Building

Marine By-Products Co.
1039 N. W. 13th Avenue

Swift & Company
N. Portland

Thomas Ernest Cast Stone Co.
2705 N. E. Pacific Street

Feldspar

Miller & Zehrung Chemical Co.
2201 N. W. 20th Avenue

Pacific Stoneware Co.
9217 N. Peninsular Avenue

Packer-Scott
28 S. W. 1st Avenue

Western Industrial Supply Co.
208 S. E. Hawthorne Blvd.

Granite (crushed)

Solastic Products Co.
129 S. E. Alder Street

Triangle Milling Co.
665 N. Tillamook Street

Limestone and Lime

Columbia River Paper Mills
Oregonian Building

Crown-Zellerbach Corp.
Public Service Building

Duncan Paint Co.
4246 S. E. Belmont Street

Electro Metallurgical Co.
St. Johns, Oregon

W. P. Fuller Co.
2181 N. W. Nicolai Street

General Paint Corp.
838 S. W. 2nd Avenue

Hawley Pulp & Paper Co.
Oregon City, Oregon

Miller Paint & Wallpaper Co.
317 S. E. Grand Avenue

Pacific Carbide & Alloys
N. Columbia Blvd. & Hurst Avenue

Pacific Roofing Co.
6350 N. W. Front Avenue

Rodda Paint Co.
1103 S. E. Grand Avenue

S. & S. Paint Mfg. Co.
121 S. E. Morrison Street

Spaulding Pulp & Paper Co.
Newberg, Oregon

St. Helens Pulp & Paper Co.
St. Helens, Oregon

Westco Waterpaints, Inc.
1225 N. W. Everett Street

Magnesite

Western Industrial Supply Co.
208 S. E. Hawthorne Blvd.

Mica

A. McMillan & Co.
220 S. E. Ankeny Street

Asbestos Supply Co. of Oregon
221 S. W. Front Avenue

Dant & Russell
St. Helens, Oregon

Duncan Paint Co.
4246 S. E. Belmont Street

Fisher Thorsen & Co., Inc.
2100 N. W. 22nd Avenue

W. P. Fuller Co.
2181 N. W. Nicolai Street

General Paint Corp.
838 S. W. 2nd Avenue

Lloyd A. Fry Roofing Co.
3750 N. W. Yeon Avenue

Miller & Zehrung Chemical Co.
2201 N. W. 20th Avenue

Pacific Roofing Co.
6350 N. W. Front Avenue

Westco Waterpaints, Inc.
1225 N. W. Everett Street

Western Industrial Supply Co.
208 S. E. Hawthorne Blvd.

Pumice

Builders Concrete Products
3451 S. E. Madison Street

Empire Building Materials Co.
1205 S. E. Grand Avenue

Hart Manufacturing & Sales Co.
6639 N. E. Glisan Street

Mt. Hood Soap Co.
328 N. W. Glisan Street

Perma-Insul Co.
Sutter Road

Thomas Ernest Cast Stone Co.
2705 N. E. Pacific Street

Tigard Concrete Products, Inc.
Box 729, Tigard, Oregon

Van Waters & Rogers, Inc.
433 N. W. York Street

Western Industrial Supply Co.
208 S. E. Hawthorne Blvd.

Quartz

LaGrand Industrial Supply Co.
2603 S. W. Front Avenue

Oregon Electronic Mfg. Co.
Kraemer Building

Radio Specialty Mfg. Co.
403 N. W. 9th Avenue

Thomas Ernest Cast Stone Co.
2705 N. E. Pacific Street

Western Industrial Supply Co.
208 S. E. Hawthorne Blvd.

Silica Sand

W. P. Fuller Co.
2181 N. W. Nicolai Street

General Paint Corp.
838 S. W. 2nd Avenue

LaGrand Industrial Supply Co.
2603 S. W. Front Avenue

Miller Paint & Wallpaper Co.
317 S. E. Grand Avenue

Pacific Laboratories, Inc.
10330 N. E. Marx Street

Pacific Roofing Co.
1350 N. W. Front Avenue

Paulsen & Roles
1622 N. E. Union Avenue

Portland Paint & Lacquer Products
7835 S. W. 37th Avenue

Rodda Paint Co.
1103 S. E. Grand Avenue

S. & S. Paint Mfg. Co.
121 S. E. Morrison Street

Thomas Ernest Cast Stone Co.
2705 N. E. Pacific Street

Van Waters & Rogers, Inc.
433 N. W. York Street

Western Industrial Supply Co
208 S. E. Hawthorne Blvd.

Talc

California Spray Chemical Corp.
2109 N. Albina Avenue

Chipman Chemical Co., Inc.
6200 N. W. St. Helens Road

Columbia River Paper Mills
Oregonian Building

Crown-Zellerbach Corp.
Public Service Bldg.

Duncan Paint Co.
4246 S. E. Belmont Street

W. P. Fuller Co.
2181 N. W. Nicolai Street

Fisher Thorsen & Co., Inc.
2100 N. W. 22nd Avenue

General Paint Co.
838 S. W. 2nd Avenue

George E. Wightman Co.
3233 N. Williams Avenue

Griffin Bros., Inc.
1806 S. E. Holgate Blvd.

Miller Paint & Wallpaper Co.
317 S. E. Grand Avenue

Miller Products Co.
1932 S. W. Water Avenue

Miller & Zehrung Chemical Co.
2201 N. W. 20th Avenue

Pacific Laboratories, Inc.
10330 N. E. Marx Street

Pacific Solvents Co.
6948 S. W. Macadam Avenue

Portland Paint & Lacquer Products
7835 S. W. 37th Avenue

S. & S. Paint Mfg. Co.
121 S. E. Morrison Street

Stauffer Chemical Co.
P. O. Box 68

Swift & Company
N. Portland

Van Waters & Rogers, Inc.
433 N. W. York Street

Westco Waterpaints, Inc.
1225 N. W. Everett Street

Western Industrial Supply Co.
208 S. E. Hawthorne Blvd.

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OREGON ACADEMY OF SCIENCE MEETS IN PORTLAND

The fourth annual meeting of the Oregon Academy of Science was held on February 16, 1945, at the Portland Public Library, and was attended by about 160 scientists from Eugene, Corvallis, Portland, and other towns in western Oregon. Members of the section of Geology and Geography presented a program of 15 papers on petrography, economic geology, paleontology, and geography. The program began at 11:00 a.m. and lasted until late in the afternoon.

The morning session began with three papers presented by members of the Oregon Department of Geology and Mineral Industries. "Geology of a perlite deposit on Deschutes River," by Dr. John Eliot Allen, described an occurrence of glassy lava with a high water content which is being mined and furnaced to produce a light-weight insulating material. "Progress report on ferruginous bauxite in Oregon," by Mr. F. W. Libbey, Director of the Department, listed the advances made in the explorations of this aluminum ore by the Department and by Alcoa Mining Company during the last year. "Progress report on coal production in Oregon," by Mr. R. S. Mason, described the new, completely mechanized coal mining operation of the Coast Fuel Corporation at Coos Bay, now approaching a daily production of 150 to 200 tons. It is the largest operation since 1920, and the first mechanized coal mine in Oregon.

Mr. C. W. Read, of the U.S. Army Engineers, presented a paper on "Some aspects of geophysical prospecting," which outlined the present methods used, with particular reference to the seismic techniques used by the engineers to determine depth to bedrock at dam sites. Mr. John W. Robinson, of the U.S. Geological Survey Ground-Water Division, in a paper on "Pebble orientation in glacial till at Tacoma, Washington," described a new method of measuring the long axes of pebbles in an outcrop, in order to determine the direction of flow of the ice sheets which deposited them.

The Geology and Geography section then recessed to the Winter Garden Restaurant for lunch, where Dr. Ira S. Allison, of Oregon State College, spoke of his experiences with the veteran's college program at American University, Shrivenham, England, during the past six months, and described some of the geological features he had time to observe in Great Britain.

The afternoon session began with a paper by Dr. L. W. Staples, of the University of Oregon, on "Genetic significance of analcime spherical aggregates from Oregon," a discussion of the crystal occurrence of zeolites from several localities. Dr. Staples' study of this subject has led to several conclusions as to their order of deposition in lavas. Mr. W. J. Colegrove, of the University of Oregon, presented a paper on "A graphite-bearing rhyolite dike in Curry County, Oregon," a very unusual occurrence of carbon in an acidic rock. The origin of the graphite may, upon further investigation, prove to be magmatic, one of the first such occurrences ever to be noted. Four papers were presented during the afternoon in the subsection on paleontology. The first, "The Scio flora of western Oregon," by Dr. Ethel I. Sanborn, of Oregon State College, described 15 species of plants, 7 of which are new. These were collected at Franklin Butte. An upper Oligocene or lower Miocene age of the flora has been suggested by Wayne Felts who mapped the area from which the flora was collected. Mr. Lloyd L. Ruff, of the U.S. Army Engineers, described "An isolated marine fossil locality in Lane County," where poorly preserved shells, probably of marine origin, occur. This occurrence is in a terrestrial sequence of volcanic tuffs and breccias at least 18 miles away from any other reported marine rocks. Dr. E. L. Packard, of Oregon State College, reported on "A fossil sea lion from Cape Blanco," describing the arm bone of a sea lion of probable upper Pliocene age. Mr. R. E. Stewart, of the Oregon Department of Geology and Mineral Industries, gave a report on the "Status of the micropaleontology program of the Department," telling of the numerous localities from which the minute fossils, "foraminifera," have been collected during the past year, and the progress in their identification.

The subsection on Geography met at the same time in another room, and four papers were presented. Mr. John E. Smith of Oregon State College gave a paper on "Geography, a science." Dr. Warren D. Smith, of the University of Oregon, gave an outline of his forthcoming report on the "Geography of Eugene, Oregon," which is to be a complete survey of the various geographic features which have assisted in the growth and development of that city. Mr. W. G. Morris, of the Pacific Northwest Forest Experiment Station, spoke on "Summertime variation in atmospheric drying conditions according to geographic location in western Oregon and Washington." Mr. W. B. Merriam, of Washington State College, gave an interesting report on "Curry County; the geography of an isolated coast."

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THE PROSPECTOR'S COURSE AT THE COLLEGE OF MINES
University of Washington

To foster the art of prospecting by giving young men training especially designed for the purpose, the 1945 Session of the Legislature of Washington authorized the College of Mines of the University of Washington to offer a Prospector's Course. With the aid of a special fund of $18,000 the College is offering the course several times during the biennium 1945-47.

Prospecting in the Northwest

Washington and its neighboring states, together with Western Canada and Alaska, contain numerous rich mines and mining districts, but within this northwest quarter of the continent are large regions known to be mineralized that have not yet been closely examined. Their opening has been hindered by the difficulties of travel through them. The recent construction of highways and airfields, which was hastened by the war, has greatly improved the conditions for prospecting in parts of the area.

The prospector in the Old West travelled widely in his search for gold-quartz ore and gold-bearing gravel. At a later period he was on the lookout for ores of the common metals, especially copper, lead, and zinc. All these substances are still desired, but in addition a demand has arisen for many others that are less well known. Familiarity with a variety of these ores and minerals gives the prospector of today a greater chance of success than if his search were more limited.

Schedule and registration

The Prospector's Course, which was initiated at the University November 1, 1945, is repeated in each term except those in summer. The course will thus be scheduled as follows: March 4 to June 14 and again September 30 to December 20, 1946; January 6 to March 21 and again March 31 to June 13, 1947. The course is open without examination or credentials to men past high-school age. A certificate is awarded to those that satisfactorily complete the course.

Registration is performed and fees are paid in person in the week before the opening of each term. The special tuition fee for this course is $10. The breakage ticket for chemistry costs $3, part of which is returnable. Items of equipment cost $4 and books $20, but purchase of all the books is not a requirement. Field trips are made at small expense. Men that have completed the one-term course may enroll for an advanced course.

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MERCURY IN 1945

According to the U.S. Bureau of Mines monthly mercury report released February 18, 1946, mercury production in 1945 declined 19 percent from 1944, mercury consumption gained 49 percent over 1944, and exceeded the previous peak in 1943 by 17 percent, general imports were 261 percent higher than in 1944, and 49 percent above the previous record rate in 1943, and prices dipped from a monthly average of more than $161 in January to below $96 in September and recovered to $108 in December. The foregoing diverse movements are explained largely by the enormous war demand for mercury created by the new dry cell battery program, by the urgent need to obtain large supplies of metal quickly, and by the end of hostilities in Germany and the unexpectedly sudden collapse of Japanese resistance. Prices were high when the year began, but declined in anticipation of the arrival of ample supplies to cover unprecedented requirements for batteries. Following the end of the German phase of the war the price decline accelerated, the downtrend being sharpened by imports which in the month of July (19,504 flasks) exceeded in quantity average annual receipts before the war; price sank below $100 a flask in September. Stocks held at industrial plants, much of which was for use in filling battery contracts, reached a peak total of over 40,000 flasks at the end of October. The market strengthened when it became known that surplus mercury from contract cancellations would become part of the Government stock pile, and prices continued upward to the close of the year. Domestic production declined from 3,600 flasks in July, when the price was above $140, to 1,200 in October, following the drop in price to below $100.

Mine production

Domestic production of mercury dropped to about 30,600 flasks in 1945 or to 19 percent less than the reduced wartime rate of 1944; in the final quarter of the year the rate was below even that which prevailed in the prewar years 1938 and 1939. California continued to dominate the country's output by a substantial margin in 1945, but the proportion produced there dropped to 69 percent compared with 74 percent in 1944. The foregoing decrease is explained almost entirely by a rise of 75 percent in production in Nevada, owing to a sharp gain in the rate of operations at the Cordero mine, Humboldt County. Alaskan production reached a new peak in 1945, rising against the trend for most areas but all productive operations were closed in the late months of the year. The ten leading producers in the United States in 1945 were as follows: Alaska: Red Devil (New Idria-Alaska) mine. California: Abbott mine, Lake County; New Idria mine, San Benito County; Buena Vista (Mahoney) mine, San Luis Obispo County; New Almaden and Guadalupe mines, Santa Clara County; Mt. Jackson mine, Sonoma County, and Reed mine, Yolo County. Nevada: Cordero mine, Humboldt County. Oregon: Bonanza mine, Douglas County. The New Idria mine continued to lead by a substantial margin, with an output below that in 1944 and 1943, however, and several other leaders had smaller outputs in 1945 than in 1944. The Cordero mine, which rose from sixth to second place, on the other hand, expanded production sharply in 1945, the Buena Vista mine also showed a noteworthy gain, and the Red Devil mine produced more mercury in 1945 than ever before. In addition to the properties already listed each of the following produced more than 150 flasks in 1945: Alaska: Decoursey Mountain mine. California: Mt. Diablo mine, Contra Costa County; Sulphur Bank mine, Lake County; Knoxville mine, Napa County; and Red Rock mine, Santa Barbara County. Idaho: Hermes mine, Valley County. Nevada: Red Bird mine, Pershing County. Texas: Chisos-Waldron mine, Brewster County. Of the properties mentioned in the foregoing discussion the following reported production in December: Mt. Diablo, Abbott, Knoxville, New Idria, Red Rock, Guadalupe, Mt. Jackson, Reed, Hermes, Cordero, Bonanza, and Chisos-Waldron. These properties accounted for approximately 98 percent of the December total.

Salient statistics on mercury in the United States, in 1945, in flasks of 76 pounds

Period	Production	General imports	Exports	Consumption	Stocks at end of month 1/ Metals Reserve 2/	Consumers & dealers 3/	Producers 4/	Price per flask at New York
Jan.-March (avg.)	2,733	1,981	21	5,467	5/ 63,086	5/12,200	5/ 1,584	$ 161.47
April	3,000	10,963	30	7,500	63,086	15,800	2,148	156.84
May	3,300	7,242	70	8,900	63,089	15,600	2,760	153.69
June	3,000	3,677	22	8,500	63,640	16,100	1,377	147.73
July	3,600	19,504	23	6,600	63,640	33,600	3,179	140.72
August	3,300	4,417	19	5,300	63,640	32,300	3,266	123.20
September	2,050	582	62	3,100	63,638	31,900	4,167	95.84
October	1,200	148	626	3,100	63,638	6/37,800	2,468	101.39
November	1,350	18,261	54	2,500	63,638	6/23,000	2,761	106.87
December	1,600	770	69	2,000	63,638	6/17,000	3,243	108.00
Total	30,600	71,508	1,037	63,900				

1/ Based chiefly on location rather than ownership. 2/ In addition substantial stocks, information regarding which is still confidential, are held by other Government agencies. 3/ Largely excludes redistilled metal. 4/ Held by reporting companies. 5/ At end of period. 6/ Includes some metal, destined for the Government inventory, neither at consumers' plants nor in dealers' hands.

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State of Oregon
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DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES

PORTLAND, OREGON

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STATE DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES
Head Office: 702 Woodlark Bldg., Portland 5, Oregon

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FOSSILS AND THE COURSE OF HUMAN THOUGHT

By
Ralph W. Macy
Professor of Biology
Reed College

Publication in 1859 of the "Origin of Species" by Charles Darwin was a milestone which has hardly been equaled for its profound effect on subsequent human thought. The idea that animals were not suddenly created in the advanced state in which we find them but were slowly evolved from lower forms was a radical departure from traditional thinking. As a result, many of the beliefs about the universe which had been taken for granted were subjected to thoughtful scrutiny. Nearly all writings of modern times definitely show in their outlook the influence of the changed attitude resulting from the discovery and practical establishment of the doctrine of organic evolution. Further, it may be claimed legitimately that evolution is the central problem of the field of biology, since all organisms and therefore all parts of organisms point to a common origin.

Included among the lines of evidence which show that evolution has undoubtedly occurred are comparative anatomy, comparative embryology, comparative parasitology, domestication of plants and animals, physiology, classification, geographical distribution, and paleontology. Of these, none has been more important than the study of fossils.

In times gone by people have pondered the meaning of fossilized remains. Some thought that they represented merely the victims of some flood of historical times. It is true that well-preserved fossils often belie their actual place in antiquity. Others felt that fossils were placed by the Creator to mislead the weak in spirit, or that they were the work of the devil. When in 1726 there was unearthed the fossil of a giant salamander, Professor Scheuchzer of Zurich pronounced it "the damaged skeleton of a poor sinner drowned in the Deluge." A century later the great French zoologist, Cuvier, showed its true nature. Cuvier himself, however, did not fully appreciate the significance of fossils as related to evolution. He explained the succession in fossil beds as follows:

> "If there be one thing certain in Geology it is that the surface of our globe has been subject of a great and sudden catastrophe of which the date cannot go back beyond five or six thousand years; that this catastrophe has overwhelmed the countries previously inhabited by men and by those species of animals with which we are today familiar; that it caused the bed of the previous marine area to dry up and thus to form the land areas now inhabited; that it is since this catastrophe that such few beings as escaped have spread and propagated their kind on the newly uncovered lands; that these countries laid bare by the last catastrophe had been inhabited previously by terrestrial animals if not by man and that therefore an earlier catastrophe had engulfed them beneath its waves. Moreover, to judge by the different orders of animals of which remains have been revealed, there were several of these marine irruptions."

Cuvier's theory of Catastrophism, as it is now called, suggested that repopulation after each catastrophe came from remnants which wandered in from unexplored lands. In this way he avoided a decision on the matter of special creation after each disaster and also disposed of the matter of the appearance of new kinds of animals in each strata. Later writers maintained the necessity of special creation after each catastrophe; one author decided there must have been twenty-seven such events!

Even though the great antiquity of fossils is now recognized and their meaning has been well investigated, there is yet much perplexity concerning individual cases. Breaks in deposition, and rising and sinking with changing habitats for living organisms will cause breaks in the fossil record. Tilting, shrinking, bending, folding, breaking and faulting may occur in fossil bearing rocks; thus it is even possible to have older fossils above those of lesser age.

Then the process of fossilization is the happy fate of relatively few individuals, and that mostly in favorable localities. One reason why human fossils are so scant appears to be that primates thrive in more or less forested areas where sedimentary rocks are less likely to be formed, so that preservation is unlikely.

Of course, there have been those favored sites of coal beds, ancient resins known as amber, tar pools, and the frozen mud cliffs of Siberia. For obvious reasons preservation has been particularly good under conditions which prevailed in these places. An occasional fossil shows with great fidelity the parts of the original owner. An ancient duck-billed dinosaur, Trachodon, in the upper Cretaceous of some 100,000,000 years ago died in soft mud so that its body form, even to the character of the skin, is seen in satisfying detail.

If evolution is true, as we believe, then existing animals and plants are the present ends of long lines of slowly changing stocks, in most instances slowly diverging from central or common ancestry. If we consider only the species occurring in historical times we can see the evidence of their relative stability and therefore can readily imagine the vast extent of time required to produce the astonishing array of variety in plants and animals. Some million and a half species of animals and about a third of a million species of plants have been described and named, and this represents only a part of the number which exists. An examination of the Zoological Record will substantiate that in one group, the insects, thousands of undescribed species are found each year.

But we have more than the mere twigs of the evolutionary tree. Already before us are the relatively complete fossil histories of some animals -- for example that of the horse -- and it would seem safe to predict that in the centuries of discovery to follow, the record will be far more complete, showing graphically the course of evolution. Now we have enough clues to show us the probable origin of birds, of mammals, and of other forms.

When we examine skeletal material for details which will aid in understanding relationships between different kinds of organisms we recognize at once that in major stocks, even in distantly related kinds of animals, one can match parts bone for bone. Thus the bones in the wing of a bat can be matched with the same kind of bones in the hand of man. Again, these are found to have their counterparts in the front appendages of a whale. Parts which can be compared in such a manner are said to be homologous. It is evident that analagous structures such as wings of insects and birds, since they do not have the same fundamental origin and structure, obviously belong to animals which are unrelated. The value of the study of fossils is that we can piece together the intermediate steps in the relationships of parts and therefore understand the relationships of their possessors. This is well illustrated in the case of the horse and its ancestors.

The modern horse is a highly specialized animal; that is to say, various parts are highly modified to serve certain specific purposes. Thus the skull is specialized through elongation, the molars are arranged for efficient grinding, and the incisors are fitted for cropping grass. The whole construction of the head region, then, is particularly fitted for eating one type of food -- grass. Grassy plains have little cover for hiding from enemies, and it appears that in the wild horse the chief adaptation for escaping hungry carnivores was the ability to run rapidly, and this capability was achieved by limbs and joints molded to that end. An examination of the fossil horse stock shows the gradual change from an earlier more generalized (and therefore more primitive) condition to the present highly modified form.

The horse has only one digit in each foot; it is said literally to stand on its middle finger, the hoof being a modified nail. Leg bones are elongated and rotational movement is not possible. The latter has been sacrificed to attain efficient back-and-forth motion for running. Splint bones on either side of the functional toes suggest former possession of additional functional digits at some time in the past. But speculation is not necessary here because the fossil record verifies the presence of additional digits in early horse ancestors.

The fossilized remains of Eohippus, forerunner of the horse, which lived some 60,000,000 years ago in western North America and elsewhere show that it was the size of a cat, that it had generalized teeth, and that there were four functional toes on each front foot and three such digits on the hind foot. The molars were short-crowned and without many ridges, which would indicate that these animals fed upon succulent vegetation rather than upon grass. The greater number of toes and the broader foot compared to size could well allow for existence near the margins of forests or swamps.

Examination of the fossil record reveals at least ten stages in horse evolution beginning with Eohippus. Since breaks in the sediments occur it appears likely that we will never have the complete record, but enough has been discovered to give us the unmistakable trend. By steps both feet lost toes, the hind foot always showing a greater reduction in this regard. Side toes successively became "dew claws" and then splints, the latter completely enclosed by skin. Without the fossilized remains we would be completely ignorant of all but the last step.

We have seen the trends in the horse line in which the changes were directional -- the increasing complexity of the grinding surfaces of the molars and premolars, the increase in body size and length of legs, and the reduction in the number of digits. What could have brought about this directional change?

The most reasonable hypothesis states that these changes were parallel to those of the changing environment. Former lush forests and swamps gave way to firm grassland plains in which coarse grasses became the dominant basic food source. Given these changes, it was a matter of remodel or be eliminated. It is thought possible that from time to time variants appeared and these served as the basic material for natural selection. Variations not based upon mere changes in the somatic tissues would have to be ruled out since only mutations arising from modification of germinal tissue could be passed on through successive generations, a point demonstrated by modern genetics. Those mutants better able to eat coarse grass and those whose legs fitted them for greater speed were candidates for survival in a highly competitive world.

Now we may turn to the world of animals without backbones for another examination of the fossil record to see if here, too, there are similar trends from the more generalized plan of construction to the specialized condition. Indeed we are not disappointed, for in cases where the material is sufficient the same principle holds. The trilobites can serve as examples.

These aquatic animals which would have appeared much like large pill "bugs" were dominant forms of life at the beginning of the Cambrian, more than one-half billion years ago. At first they were generalized, then radiated into various types with differing habits. The more specialized groups developed long projections which very well may have been their undoing as the environment changed. One can well imagine that these parts increasingly hindered locomotion. In any event the more specialized forms disappeared first, followed by the entire trilobite line by the Permian period. Before we judge the trilobites too harshly for their failure to survive, we may note that as a group they were successful organisms for a period of more than 200,000,000 years, an interval two hundred times that of the existence of man as far as may now be determined. We know a great deal about trilobites: their diversity of species, some of their habits, success and failure as judged by survival, and yet no one has ever seen a living individual. Here the entire story comes to us from fossilized remains.

Turning to the record left by insects we again find a group which has persisted for a very long period -- in fact some three or four hundred million years. They were already common in Carboniferous times. Shales of Kansas have yielded dragonflies with a wing spread equaling that of large birds, not to forget cockroaches nearly six inches long. One wonders about the mosquitoes of that time, if there were any! Baltic amber, ancient fossilized resin, has yielded ants perfectly preserved to the last little hair. Since various castes were preserved it may be inferred that some species of those ubiquitous insects had already gone social. Some species were primitive; others have remained unchanged to this day, a compliment to the stability of the gene. Not only ants but the fossils of many other groups of insects were preserved and many remain to be found.

Returning to our central theme of evolution, one of the most convincing types of evidence is that of the comparative study of wing veins of insects. Here we have a vast array of recent material in addition to the paleontological findings. On the basis of such comparative work Comstock and Needham of Cornell University, at the turn of the century brought forth a discovery which another great entomologist has termed the greatest single advance in the field of entomology. They arrived at a hypothetical primitive type of venation to which all wing veins can be related. However modified a given species may be, one can deduce how each vein in its wings is derived from a comparable vein of the primitive plan. This work has made possible a common and simple nomenclature of veins. Of special interest is the fact that fossils were used to substantiate the findings. In general the ancient insects had more primitive venation than those living today.

Thus far our discussion has dealt with animals other than man. Some people who are willing to accept at face value the fossil record of animals are much less willing to look squarely into the countenances of our own remote relatives of the past. Of course we <u>are</u> set apart, and we differ from other animals chiefly by virtue of brain development which has made it possible for us to literally change the face of the earth. Whether or not we want to call ourselves animals is just a matter of definition. A biologist, who learns comparative anatomy, comparative physiology, and other aspects of the field, has the animal relationship of man forced upon him by the sheer weight of evidence. Without question, the body is animal-like. How we got that way has been partly revealed by fossil remains.

Earliest discoveries of Neanderthal remains came nearly a century ago and at that time there was general disagreement as to the meaning of the finds. Some thought they represented the victims of disease. One German scientist believed that a Neanderthal skull was that of a Russian soldier killed in the Napoleonic wars! It would be of interest to review the history of the discoveries of early human remains, but only a few of the findings can be mentioned. For recent details discussed in an authoritative but entertaining manner the reader would do well to consult William Howells' <u>Mankind So Far</u>.

Neanderthal man lived somewhere between 50,000 and 100,000 years ago, was widely distributed over Europe and had a definite culture which fortunately included special burial. He differed sufficiently from ourselves to be considered a separate species. The brow ridges were beetling, the skull was carried far forward, and the posture was stooped in the extreme. There are numerous remains from many parts of Europe so that now we have a rather good picture of this formidable appearing type of person.

Pekin man, the first traces of whom were unearthed near Pekin, China, in 1927, lived during mid-Pleistocene times, and was so different from modern man that he is considered to belong to a special genus, <u>Sinanthropus</u>, but the remains are very definitely human and not at all ape-like. The brain capacity was much less than ours, the brow ridges were massive, the long bones were heavy since the marrow cavities were much smaller in proportion, and the teeth were distinctive. Parts of about forty individuals had been discovered by the beginning of World War II.

Java Ape Man, discovered by Dubois many years ago, probably dates back to the early Pleistocene of some half million years ago, and is more human than ape but is still more primitive than Pekin Man. Parts of several individuals have been recovered in recent years so that Dubois' early interpretations have been substantiated except for minor details.

These together with a good many other finds have given us the basis for believing that man like other animals has been subject to the evolutionary process. Actually this need cause no one any particular worry since it should appear just as suitable to have been created in this manner as by a sudden synthesis.

Having now made a brief survey of bits of the field of paleontology, or biological geology, we can see the great contributions which have been made to our knowledge of the past, and more important, how animals are related and what their trends of development have been. This information has formed some of the more convincing kinds of evidences for evolution. In turn it may be stated that no idea ever presented in modern times has had more influence on our way of thinking than has the doctrine of organic evolution. Therefore, a knowledge of fossils has actually been a strong factor in charting the course of human thought.

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ANNUAL ASSESSMENT WORK

Suspension of annual assessment work on mining claims is covered by the law as follows:

PUBLIC LAW 47 - 78th CONGRESS
Chapter 91 - 1st Session
(H. R. 2370)

AN ACT

Providing for the suspension of annual assessment work on mining claims held by location in the United States, including the Territory of Alaska.

BE IT ENACTED BY THE SENATE AND HOUSE OF REPRESENTATIVES OF THE UNITED STATES OF AMERICA IN CONGRESS ASSEMBLED, That the provision of section 2324 of the Revised Statutes of the United States, which requires on each mining claim located, and until a patent has been issued therefor, not less than $100 worth of labor to be performed or improvements aggregating such amount to be made each year, be, and the same is hereby, suspended as to all mining claims in the United States, including the Territory of Alaska, until the hour of 12 o'clock meridian on the 1st day of July after the cessation of hostilities in the present war as determined by proclamation of the President or concurrent resolution of the Congress: PROVIDED, That every claimant of any such mining claim, in order to obtain the benefits of this Act, shall file, or cause to be filed, in the office where the location notice or certificate is recorded, on or before 12 o'clock meridian of July 1 for each year that this Act remains in effect, a notice of his desire to hold said mining claim under this Act.

Approved May 3, 1943.

As there has been no proclamation by the President or concurrent resolution of Congress that "cessation of hostilities" has taken place, then suspension of annual work is in effect at least until July 1, 1946.

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VALUE OF GOLD

Why do people, when they have the opportunity, eagerly acquire gold? It is that age-old search for the safest investment for savings; the wish to exchange a government promise-to-pay for a precious metal that has always been a safe hedge against depreciated currencies; the universal feeling that no matter what governments may attempt in the way of discouraging circulation of gold for money, or what may be done with the gold standard, they cannot destroy the intrinsic value of gold. Since time immemorial it has stood the test. The feeling of trust in the value of gold is ingrained in human consciousness.

According to an article in the Commercial and Financial Chronicle, New York, issue of February 21, 1946, some prices paid for gold in foreign lands are as follows: Brazil is selling a limited amount of gold to the public at the official rate of 25.25 cruzeiros per gramme (about $47 per ounce). In Bombay the legal price has been equivalent to $60 - $75 per ounce. Occasionally the India Reserve Bank has attempted to restrict sales, and at such times the open market quotation has gone as high as $80 an ounce. The French louis d'or has a face value of 20 gold francs (about $6.50 at par). It commands a price of $12 to $14 on the open market, and sometimes a much higher price for coins.

As the article points out, it is an inescapable fact that the world price for gold is now double the official price. Although, for the most part, the gold producer may not take advantage of this unsatisfied demand for gold, it is important to note that there are exceptions such as those in Latin America (note the legal price in Brazil). The legal ceiling price is maintained through government fiat and control of foreign exchange, but like all other such artificial controls, there comes a time when natural laws become overpowering. Unless there is a correction in the inflationary trend, open devaluation will be unavoidable in this country as elsewhere.

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ASSOCIATION OF AMERICAN STATE GEOLOGISTS

The annual meeting of the Association of State Geologists was held February 21 - 23 at Urbana, Illinois, at the invitation of the Illinois Geological Survey, Dr. M.M.Leighton, Director. Technical sessions were held in the large building, occupied jointly by the State Geological Survey and Natural History Survey, on the campus of the University of Illinois. Several papers were read descriptive of the comprehensive work of the Illinois survey both in the field and laboratories. These papers showed clearly the great importance to the State of the survey which Dr. Leighton has built up. At one of the meetings, Dr. W.E.Wrather, director of the U.S. Geological Survey, discussed the plans and activities of the Federal Survey, and Mr. E.W.Pehrson, Chief of the Economics and Statistics Division of the U.S. Bureau of Mines, spoke of plans of the Bureau.

Meredith E. Johnson, State Geologist of New Jersey, and Edward L. Troxell, State Geologist of Connecticut, were elected president and secretary-treasurer respectively.

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CURRENT MINING NEWS

The Golden Dredging Company, Prairie City, Oregon, has been organized to work the Elliot placers on Pine Creek in the Upper Burnt River area, Baker County. The company is a partnership composed of Geo. England, Harry Morse, Thomas Harrie, Frank Kendall, and Jenkins Pryce, all of Prairie City. The ground to be worked occupies the old channel of Pine Creek. A washing plant will be fed by a $1\frac{1}{2}$-yard Northwest dragline.

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C. W. Gardner, Baker, has leased the mill tailings at the Ibex mine on McCullys Creek, Baker County, and has set up a small cyanide leaching plant.

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Messrs. Holt and Bower, Boise, Idaho, are installing equipment on the Meeker and Wyant placer claims on upper Pine Creek, Baker County, Oregon. It is expected that the property will be in production this spring.

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AN ALUMINUM PRIMER

by

F. W. Libbey

1. Is aluminum an important metal?

Aluminum metal belongs to this modern age. Because it holds tenaciously to other elements with which it is associated in nature, it does not occur in nature as a metal, and therefore was not known to the ancients. In fact an economical method of production of aluminum metal is a relatively recent discovery. It was in 1886 that Charles Martin Hall discovered that he could reduce aluminum oxide to aluminum metal in a cryolite bath. From that discovery dates the United States aluminum industry which has grown in this century by leaps and bounds along with development of electric power, until now it is one of our basic industries. Without aluminum we could not successfully prosecute a war, or take part in modern peacetime industrial progress.

2. Is aluminum a rare element in rocks?

No, it is the most widely distributed of all the metals, but it is for the most part combined with silica to form silicates which have not been treated economically to produce aluminum in competition with bauxite, the impure oxide of aluminum. Bauxite occurs in many parts of the world, but is limited in quantity compared to aluminum silicate rocks.

3. What are the principal uses of aluminum?

Because of its light weight, conductivity, color, noncorrosiveness with acids, and strength of its alloys, aluminum has a great variety of industrial uses; its household use is universal. It is essential from a national defense standpoint because of its need in aircraft construction, in tank engines, and in naval vessels. The U.S. Bureau of Mines Minerals Yearbook for the year 1944 is authority for the statement that 96,369 planes of all types were delivered to the armed forces in 1944, and that 50 percent of the weight of these planes (average weight per plane 10,600 pounds) was aluminum or aluminum alloys. An aircraft carrier requires 1000 tons of aluminum; a battleship, 700 tons; a heavy cruiser, 300 tons; and so on down the line. The best known peacetime uses are in transportation equipment, including automobiles and trucks; electrical transmission cables and electrical appliances; household utensils, in steel making, in many machines other than automotive, in the chemical industry; and for miscellaneous uses such as foil, paint, and the like.

4. Why does aluminum appear to have great future importance?

The aluminum industry is youthful. It has had a remarkable growth during the present century, but because of the metal's peculiar properties it seems certain that the industry will continue to grow. We are entering an age of expanding air transportation.

To compete in this age, ground transportation will need to use increasing quantities of light metals in order to achieve maximum economy of operation. Aluminum will be used to an increasing extent in the construction industry.

5. Why does aluminum appear to have special importance to Oregon and the Northwest?

Before the war two privately owned aluminum reduction plants were built on the Columbia River at Vancouver, Washington, and Longview, Washington, respectively. During the war three additional reduction plants were built with Government funds at Troutdale, Oregon, Spokane, Washington, and Tacoma, Washington, respectively. In addition an aluminum sheet rolling mill was built by the Government at Spokane. When the war demand stopped there was a drastic reduction in operations at Government-owned plants. Finally these plants were closed down and later declared surplus property. It has been recently reported that the Spokane plants have been leased by the Government to the Kaiser interests, and that the Troutdale plant has been leased to the Reynolds Metals Company. Because of the production at the privately owned plants at Vancouver and Longview, and because of the probable future production of the Government-owned leased plants, the Northwest's share in the domestic aluminum industry is of major proportions. As a corollary, the aluminum reduction plants are a market for a large proportion of Bonneville Power, and this fact alone makes the industry important to the Northwest. Oregon has a particular stake in the industry because Oregon ore may be the principal future source of alumina for these plants.

6. What are the materials required for making aluminum metal?

Alumina, which is pure aluminum oxide; cryolite which is sodium aluminum fluoride with a strong solvent power for alumina; and carbon electrodes. Alumina, the primary raw material is obtained by the treatment of bauxite which is the only ore of aluminum at the present time. Cryolite occurs in nature in commercial quantity in only one place in the world, at Ivigtut, Greenland. There is no difficulty however in making synthetic cryolite. Carbon electrodes are made from a pure coke together with a binding agent. Petroleum coke makes a desirable electrode because of its low ash content.

7. What are the steps in producing aluminum metal?

a. Mining bauxite ore.

b. Treating bauxite to produce pure alumina (aluminum oxide).

c. Electrolysis of alumina to produce aluminum metal.

8. Is the production of aluminum difficult compared to other common metals?

Yes, the metallurgy of aluminum is much more complicated mainly because aluminum has such a strong affinity for oxygen.

9. What is bauxite?

Bauxite was named for a material found near Les Baux, southern France, in 1821 by the French chemist Berthier. This material was composed essentially of aluminum oxide, iron oxide, and water. For many years bauxite was considered to be a mineral. It was finally recognized that this substance, consisting of impure aluminum oxide combined with water, found in several parts of the world varied in petrographic characteristics, and that the name bauxite had come to be applied to a mixture of oxides rather than one particular aluminum oxide. These natural aluminum oxides, containing combined water are known as bauxite minerals, and the best known are gibbsite, boehmite, and diaspore. One or more of these oxides together with impurities makes up commercial bauxite.

10. Has bauxite any uses other than production of aluminum?

Yes, it is used in fairly large quantities for making chemicals, abrasives, high-grade refractories, and in oil refining. In the prewar year 1939, over 50 percent of domestic production of bauxite was used by industries other than the aluminum industry. This proportion of course does not give a true picture of the relative amount of bauxite going into aluminum production, as the large amount of imported bauxite is used for the most part in making aluminum metal.

11. What process is now used to treat bauxite ore in order to obtain alumina?

The ore is dried, ground, and treated with hot caustic soda solution under pressure. The aluminum goes into solution as sodium aluminate, and the impurities remain undissolved and may be filtered off. This residue is known as "red mud". The filtrate is cooled and agitated, and on the addition of a "seed" charge of aluminum hydrate, the aluminum is precipitated as aluminum hydrate in crystalline form. The hydrate is filtered and calcined to form pure aluminum oxide, or alumina. This method of treatment is known as the Bayer process.

Although the Bayer process is the only one used commercially, a procedure known as the Pedersen process was used formerly in Norway. The ore, relatively high in iron, was smelted in an electric furnace with lime and coke. The resulting products were pig iron and calcium aluminate slag which was ground and leached with sodium carbonate solution. The aluminum was thus combined with sodium to form sodium aluminate. Then on treatment with carbon dioxide gas, the aluminum was precipitated as aluminum hydrate which was filtered and calcined to alumina as in the Bayer process.

12. Have clays been treated commercially to produce alumina?

Not in the United States. During the war when enemy submarine activity in the Caribbean endangered our bauxite supply, the Government authorized construction of pilot plants to make large scale tests on high-alumina clays with the object of working out an economic process or processes to produce alumina from such material. These plants were located at Harleyville, N. C., Laramie, Wyoming, and Salem, Oregon. Although these plants, if allowed to work out processes thoroughly, will contribute very valuable information, it seems unlikely that clays will be able to compete successfully with bauxite in production of alumina.

13. Why is Oregon especially interested in production of alumina?

Extensive deposits of high-iron bauxite have been found in northwestern Oregon, and are being developed by Alcoa Mining Company. This ore is much lower in alumina than the bauxite being used in Bayer plants, but the Oregon ore is relatively high in iron, production of which will offset the lower alumina value. The Pedersen process, or some modification of it, would seem to be applicable to this ore. Alcoa is carrying on metallurgical testing work, and if an economical process can be worked out, a plant will be built to produce both alumina and pig iron from Oregon ore.

14. How was Oregon ore formed?

After Columbia River basalt had flowed over the country many millions of years ago, climatic conditions were right for intense weathering of this rock. The basalt is made up for the most part of aluminum and iron silicates, with small amounts of combined lime, magnesia, and titania. The weathering process, called laterization, resulted in breaking down of the silicates, and leaching of silica, lime, and magnesia, leaving behind and concentrating aluminum oxide, iron oxide, and titanium oxide. The aluminum oxide is present mainly as the mineral gibbsite - a bauxite mineral. The ore was thus formed by weathering, and in order to have it preserved, weathering had to proceed much faster than erosion. In many places erosion was effective, and the ore was removed.

15. What is the distribution of the Oregon ore?

Deposits have been found in Washington, Columbia, Multnomah, Clackamas, Polk, and Marion counties. So far as is now known, the most important deposits are in Washington, Columbia, and Marion counties.

16. Is there a variation in the character of the deposits?

Although in general the deposits are similar, those in Marion County are somewhat different from those in the other counties. Probably the Marion County area suffered somewhat greater erosion than the other areas so that a portion of the upper section of deposits has been removed. This resulted in a surface concentration of high-grade bauxite boulders left behind as float over the Salem Hills and to a less extent in the Eola Hills. Also the ore section in Marion County is thinner than in Washington and Columbia counties.

17. Is the high-grade bauxite in Marion County of importance commercially?

Insufficient work has been done on these deposits to determine their extent. Their wide distribution warrants exploration. Although the quantity of this material is probably small compared to the lower grade, high-iron bauxite in the several counties, the high-grade float may have industrial uses other than for producing aluminum.

18. What is the extent of reserves of Oregon ore?

Alcoa Mining Company has been sampling the deposits in Washington and Columbia counties for over a year. No tonnage figures have been made public, but reserves are in the order of many millions of tons. In the preliminary work of the State Department of Geology and Mineral Industries, auger-hole drilling[1] indicated over 5,000,000 long tons of ore in two deposits in Washington County only.

19. Do the Oregon deposits have good physical characteristics from a mining standpoint?

Yes, the deposits lie flat and generally have a moderate overburden of silt. The ore is for the most part soft, and little in the way of explosives will be required. The deposits could be mined cheaply by surface mining methods. Highly important is location of deposits so close to the aluminum plants on the Columbia River.

20. When will a decision be reached concerning commercial production of Oregon ore?

It seems likely that exploration and testing work now being done will allow a decision sometime in 1946.

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CURRENT MINING NOTES

Langdon Rand and associates, Baker, are working a drift placer on Connor Creek, Baker County.

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J. R. Davies, Boise, Idaho, is in charge of development work now underway at the Red Cloud quicksilver mine, northern Jackson County. Mr. Davies will do several thousand dollars worth of underground work according to an announcement by F. E. Hobson, consulting engineer.

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[1] Libbey, F.W., Lowry, W.D., and Mason, R.S., Ferruginous bauxite deposits in northwestern Oregon: Oregon Dept. Geol. and Min. Ind. Bull. 29, 1945.

Mason, R.S., Auger-hole prospecting: The Ore.-Bin, vol. 6 no. 12, 1944, Oregon Dept. Geol. and Min. Ind.

The Baker-Union Concrete Products Co., C. L. Lawton, manager, has built a plant at North Powder, Baker County, for making building blocks and concrete fence posts. Production has reached 700 blocks per day, according to a statement in the Baker Record Courier of March 14.

* * * * * *

L. A. Damon, Marial, Curry County, has driven 200 feet on his Golden Fraction claim tunnel on the west fork of Mule Creek. The tunnel is developing a vein 7 feet in width and having a high-grade streak 6 to 12 inches in width which contains iron and manganese oxides. Over 550 tons of ore on the dump is reported to assay $12 to $15 to the ton excluding the high grade. Damon and associates are also working the Brown Eagle claim in the same district. An open cut is being driven to crosscut a vein near the surface. Assays as high as $298 to the ton in gold and silver have been reported.

* * * * * *

W. F. Crowell, Medford, Oregon, has taken over the Golden Economy claim, formerly owned by Chas. M. Lewis, located near the head of Tiny H Creek, Curry County. A 26-inch vein containing copper, lead, and manganese has been encountered. Gold and silver values from $28 to $48 to the ton have been reported. A contract to sink a shaft on the Golden Economy claim has been let to Willis Ireland.

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USEFUL LITHIUM COMPOUNDS

Among the many wartime discoveries to enter the postwar world are lithium greases and waxes. Two recent articles[1,2] in Foote Prints, issued by the Foote Mineral Company, emphasize the importance of these new materials.

A lithium grease is a grease prepared from a lubricating oil of the vegetable or mineral type with a sufficient amount of lithium soap to thicken the oil. These greases are adaptable to many lubrication problems which other greases fail to solve. Lithium greases are easier to make and the manufacturing cost is no greater than that of other greases.

A lithium wax is a mixture of lithium stearate and a paraffin wax. Because of their superior properties these waxes find great use in improving such products as cosmetics, pencils, waterproof coatings, electrical insulation, sound recording disks, adhesives, paper coatings, etc.

It is believed that lower cost and superior properties will make lithium organics indispensable to the industrial progress of the future.

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1. Luckenbach, W.F., Jr. and Meyer, H.C., Jr., "The Effect of Fatty Acid Molecular Weight on Lithium Greases," Foote Prints, Vol. 17, No. 2, pp. 3-8, 1945.

2. "Lithium Organics," Foote Prints, Vol. 17, No. 2, pp. 22-23.

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CLEARING HOUSE

CH-86: For sale - unpatented placer claim in E½ NW¼ NE¼ sec. 5, T. 34 S., R. 7 W., 13 miles from Wolf Creek at the mouth of Rock Creek in Josephine County. The claim has first water right, 2 ditches, pipe line, and giant. There is a 4-room house and garage on good road. Four test holes reported to return 31 cents per yard. Price $1500 cash. After May 10 for 30 days address W. T. Tennison, Wolf Creek, Oregon.

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NEW FIELD GEOLOGIST

Elton A. Youngberg, Department field engineer stationed at Grants Pass, has resigned to take a position with Howe Sound Mining Company at the Holden Mine, Lake Chelan, Washington. Youngberg has been succeeded by Hollis M. Dole, until recently Navy lieutenant with over three years' service in the South Pacific. Dole majored in geology at Oregon State College and was doing graduate work in geology at University of California at Los Angeles when he entered the Navy.

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OREGON GEOGRAPHIC NAMES

The March 1946 issue of Oregon Historical Quarterly contains a list of Oregon place names compiled since the last installment in 1944. In this list Lewis A. McArthur, author of the invaluable volume on Oregon geographic names, has assembled basic information of 175 names of places not previously catalogued in all parts of the State, starting with Abberdeen in Linn County and ending with Yampo School in Yamhill County. Dr. McArthur seeks additional information on some of these names, and readers of the Quarterly are requested to send him anything specific in the way of explanation or clarification.

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NEW ENGINEERING EXPERIMENT STATION BULLETIN

The Engineering Experiment Station, Oregon State System of Higher Education, Oregon State College, has just issued a bulletin, No. 20, entitled The Fishes of the Willamette River System in Relation to Pollution. The authors are R. E. Dimick, Professor of Fish and Game Management, and Fred Merryfield, Associate Professor of Civil Engineering. This bulletin gives results of a survey of the Willamette River system in relation to the menace to fish life due to pollution by industrial and domestic wastes. The bulletin is sent free of charge to residents of Oregon.

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PUBLICATIONS

GEOLOGIC MAP SERIES	Price postpaid
1. Geologic map of the Wallowa Lake quad., 1938: W.D.Smith & Others (also in Bull. 12)	$ 0.45
2. Geologic map of the Medford quadrangle, 1939: F.G.Wells & Others	0.40
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31-36

MODERN TOOLS OF CERAMIC RESEARCH

by

Esther W. Miller*

Within the past thirty years increasing use has been made of the modern instruments of research in providing some of the missing links in the study of the raw materials and products of the silicate industries. This has meant the constant cooperation of engineers and physicists in developing new equipment, and also the cooperation of research personnel in such fields as soil science, ceramics, mineralogy, and chemistry, in making evident the need for such equipment and in developing techniques for the solution of ceramic problems. The net result has been new and better products and methods of manufacture, more accurate control of materials and processes, a greater insight into the silicate minerals and all that occurs in their evolution from the mine to the market, and the laying of the groundwork for future ceramic discoveries and improvements.

Ceramic materials possess a remarkable and variable combination of properties. Silicon, next to oxygen, is the most abundant element in the earth's crust and in nature is always found in the combined state. Clay, which is one of the most important constituents in soils, is composed of one or more of a group of complex silicates called the clay minerals. It is also the basic ceramic raw material. Clays are secondary products and are found in varying stages of alteration. They possess colloidal properties and are of extremely fine particle size. In nature they are found to be impure to a greater or lesser degree and have a variable chemical composition. The crystal structure of the clay minerals is complicated. When clays are wetted, they develop plasticity, which allows them to hold their shape when they have been deformed. They may be fired to controlled high temperatures and will then undergo changes in crystal structure, physical properties, and chemical composition without alteration of the formerly plastic shape. The usefulness and the large number of different types of ceramic products are dependent on these properties, but because of them it is little wonder that some of the advances in the basic studies of ceramic technology were required to wait for the twentieth century and its progress in instruments of research.

The polarizing microscope, the spectrograph, x-ray diffraction apparatus, and differential thermal analysis apparatus have shed much light on the subject of ceramics. Their importance in such diverse enterprises as the glass, porcelain enamel, dinnerware, insulator, portland cement, and clay mining industries may best be seen by a short discussion of some of the specific problems in which they have played a primary role.

The description of apparatus must be confined to general principles and the bibliography at the end of the paper contains references which may be consulted for further information.

The Polarizing Microscope

The polarizing microscope is "an optical instrument consisting of objectives and an eyepiece that magnifies minute objects for visual observation or photographic record by direct illumination and in which the object is on a rotating stage between crossed Nicols."[1]

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There are two Nicol prisms in a polarizing microscope. The first is called the polarizer and it is located below the stage of the microscope. The polarizer resolves the light passing through it so that it vibrates in one direction only, producing what is known as plane polarized light. The second Nicol prism is called the analyzer and it is located in the body tube of the microscope above the objective. When the optic plane of the analyzer is perpendicular to the optic plane of the polarizer, all the light is rejected and the Nicols are said to be crossed. The analyzer may be removed from the body tube when it is not in use. The rotating stage is graduated in degrees and acts as a mount for the glass slide containing the specimen to be observed. It allows the specimen to be rotated for the determination of extinction angles, interference figures, and other optical data. There are many types of objectives which vary in magnifying power and in the ability to correct for aberration. The objective consists of a group of lenses which form a real image of the specimen. This real image is later magnified by the eyepiece. The ocular often corrects for aberration in the objective. The Huygenian eyepiece is commonly used in many microscopes and consists of two plano-convex lenses, the upper lens having a focal length about twice that of the lower or field lens. These lenses are mounted and may be removed from the body tube when desired.

Probably the most important use of the polarizing microscope is for the identification of minerals and other crystalline materials. With special techniques it may be used to determine the strain in glass, the constituents of portland cements, and much other information which is of value in both basic research and plant control. Some of these methods will be discussed in the following cases.

Case 1. The great variation in the composition of clay in a single deposit has been known by clay producers for a long time. V. T. Allen[2] made a study of clay samples which were obtained from many different sections of the United States and with the microscope showed that the clay minerals (of which there are a large number) and other hydrous aluminum oxides are capable of migrating through a deposit of clay after that deposit has been altered from the original rock. Cracks in the deposit and the circulation of water with good drainage are held partly responsible for this. Microscope slides showed such things as veins of white montmorillonite cutting gray or buff montmorillonite, the filling of bubbles in bentonite (originally found in the parent volcanic glass) with montmorillonite, the filling of a fracture zone in kaolinite with nontronite, and the presence of kaolinite veins in an altered porphyritic rock. The application of such a study may be of great value in providing more uniform clays to industry, and eventually in eliminating many of the plant troubles caused by variation in clay deposits.

Case 2. Awareness of the variation in the composition of similar clays of a certain region was brought about by a study of Georgia kaolin.[3] The microscope was used to examine a number of clays from the mines along the Georgia Fall Line. This information as well as that obtained by x-ray and thermal methods indicated that variation in the degree of development of kaolinite was the most important factor in causing the difference in properties of the kaolins of this region.

Case 3. The microscope has been helpful in studies pertaining to phase diagrams. These diagrams are very important to the ceramic technologist, for they tell much about the chemical and physical reactions which occur in mixtures of materials at high temperatures. Briefly, a phase diagram is "a graph showing the relation of one or more properties of one or more substances."[4] There are several types of phase diagrams, but the forms most used in ceramics are obtained by identifying the phases (gas, liquid, or solid) which are encountered when percentage composition and temperature are varied. For example, in studying the system magnesium oxide-boric oxide[5] all the phases which were obtained with different combinations of magnesium oxide and boric oxide were examined with a petrographic microscope, and thus were identified. Such information is of importance in the development of boron glasses and glazes and in some cases anomalies in plant practice may be explained.

Case 4. The most important defects in glass are stones, which are unmelted inclusions in the glass; cords, or striae; and bubbles. A study was made of most of the types of glasshouse stones found under operating conditions in a glass plant.[6] At least fourteen different types of stones were found and identified with the petrographic microscope. Contamination by refractories and metal parts of the tank, incomplete solution of some of the material in the batch, incorrect composition of the glass, improper viscosity of the glass, incorrect furnace design, and surface volatilization were found to be some of the causes of glass stones. When so many factors influence the final glass product, constant control of methods and materials is essential in those industries which demand a non-defective glass. Hence, application of petrographic information may mean dollars and cents to the plant owner or stockholders.

Case 5. Cords or striae often produce excessive stresses which may greatly weaken the final product. For this reason the Glass Container Association of America developed a method for determining the strain in glass by means of the polarizing microscope.[7] In practice, the examination of one container every twenty-four hours was recommended. This procedure is believed by the Association to be capable of checking cord defects before too much loss of ware has taken place.

Case 6. In the past great losses have been sustained by the porcelain enamel industry because of defects occurring during the preparation, the application, and the firing of the enamel coating on steel. Tearing of the enamel, which usually occurs in the firing process, is caused when the enamel cracks in drying and pulls away along irregular tears. The preparation of thin sections of enamel specimens were studied, and striking differences were observed between enamels which tear and those which do not tear.[8] The causes and some remedies for the tearing of enamel were determined. This is another example of the application of fundamental research to industrial practice.

The Spectrograph

Although the spectroscope has been used for the identification of elements since 1860, it is only within the past twenty years that it has become one of the foremost analytical instruments. A spectroscope is "an instrument for analyzing light by separating it into its component rays."[9] When a spectroscope is equipped with a recording device (usually photographic) to obtain a permanent record of the image of the spectral lines, it is known as a spectrograph.

When a substance is appropriately heated, its vapors give off light which is characteristic of the metallic elements present in the material. It is this light which is separated into its components by a prism or a grating. When this light is photographed, the resulting picture consists of a series of lines, known as a bright line emission spectrum, which make it possible to identify the substance. Although other types of spectra are commonly used, the discussion will be confined to the bright line emission spectrum because it is of the greatest importance in analytical work.

The principal parts of a spectrograph are (1) an excitation source for vaporizing the material to be analyzed, (2) a slit, which acts as a narrow aperature and new source of light, (3) the lenses, which render the light rays parallel, (4) the dispersing system (prism or grating), which separates the light into its component rays, and (5) the recording system, which provides a permanent record of the spectrum.

The spectrograph has the advantage of making possible very rapid qualitative analyses of a great many elements and of the accurate quantitative analysis of minute traces of elements in a material. Only a small amount of sample is required and the sensitivity in most cases is very great. The spectrograph has brought about a saving in time and has made possible the determination of minute amounts of rare elements which ordinarily would be overlooked by other methods. The descriptions which follow demonstrate the adaptability of the spectrograph to a wide range of problems.

Case 1. A study was made some time ago of the effect of glass on alcoholic products stored in bottles at room temperature for three years.[10] The sensitivity of the spectrograph was responsible for the detection of small amounts of silicon, aluminum, and magnesium in the alcohol product which had been so stored in certain types of the glass containers. No contamination of the alcohol occurred when the alcohol was stored in Pyrex brand bottles. This work very ably demonstrated the possibilities for the superior storing of alcohol products over a long period of time.

Case 2. There has been much controversy over the degree of the effect of alkalis in portland cements. Belief that the presence of the alkalis in excessive quantities was detrimental brought about rigid specifications concerning the allowable amounts of alkalis in portland cements. This means that all portland cement which is used must be analyzed for the alkalis. Very recently a spectrographic procedure for the determination of sodium, potassium, and lithium in portland cements was developed by Armin Helz.[11] He states, "The procedure is rapid, requiring about 4 hours for the determination of sodium and potassium in six samples as compared with 30 hours for the chemical procedure." Where a large number of analyses are to be made, the spectrograph is a source of great saving in time.

Case 3. Increasing interest in trace elements in materials has been shown in recent years. In some cases very minute quantities of an element may have a tremendous effect on the properties of a substance. For this reason the spectrographic method was applied to clay analysis. A procedure was developed for the determination of trace elements in clays.[12] Such an analysis would not have been tackled by the ordinary chemical methods. The development of such procedures indicate the possibility of more stringent control and more uniform products in the future.

X-ray Diffraction Apparatus

The story of x-ray analysis is a short but brilliant history, for x-rays were first discovered by Wilhelm Roentgen in 1895. Although observations and discoveries were made as early as 1705, Roentgen was the first to announce the existence of x-radiation. X-ray analysis by means of powder diffraction methods has established many facts concerning the structure and the identification of ceramic materials. The future application of x-ray analysis is apparently unlimited and its value in research and plant control is inestimable.

X-ray analysis concerns "the determination of the internal structure of a material by means of the diffraction pattern formed when an x-ray beam passes through it." [13] At first only single crystals could be studied, but Debye and Scherer in Europe and Hull in America independently discovered a method by which a powder could be identified by x-ray analysis. Through this discovery the application of x-ray analysis to ceramic problems was inevitable, for ceramic materials are seldom, if ever, found in sufficiently large crystals to adapt them to a single crystal method.

The principal parts of the apparatus used in x-ray analysis are (1) the x-ray tube with transformers and electrical equipment to produce x-rays, (2) a camera with a collimator, (3) a mounting for the sample within the camera, and (4) a film for recording the x-ray diffraction pattern. The film is placed around the inside circumference of a cylindrical camera. The powdered sample is placed in a straw or capillary tube and this container is mounted vertically in the center of the camera. The collimator is made up of two lead pinholes which receive the beam of x-rays. When the x-rays enter the camera through the collimator, they impinge on the sample and are diffracted by the crystal powder. The diffracted beam is recorded on the photographic film and this picture reveals the structural arrangement of the atoms in the crystals of the material.

Case 1. X-ray diffraction methods as well as the petrographic microscope have been widely used in the work on phase diagrams. X-ray diffraction data were determined for compounds in the system CaO-MgO-SiO_2.[14] This fundamental information may be correlated in other research projects concerning the calcium and magnesium silicates. The x-ray diffraction apparatus and the microscope have been mainly responsible for the vast amount of phasé diagram work that has been done in recent years. Such work has aided the ceramic engineer in the preparation of better products.

Case 2. X-ray diffraction methods may be used in many ways in manufacturing control. F. G. Firth of the North American Phillips Co. has discussed a number of these applications,[15] among them the use of x-ray analysis in determining particle size, in determining the constitution of fire glaze products in refractories, in predicting crystalline changes which occur during the firing of ceramic products, and in controlling the transformations which occur in the firing of steatite insulators.

Differential Thermal Analysis Apparatus

Differential thermal analysis is another method for determining the character of materials where the microscope, chemical methods, and x-ray analysis may not always be used. When certain minerals are heated, chemical and physical changes occur which are exhibited by exothermic (liberation of heat) and endothermic (absorption of heat) reactions. A standard material (usually alumina) and the material being tested are heated simultaneously and the difference in their temperatures is measured with a differential thermocouple. The rise of temperature in the heating chamber is also measured. This information is plotted to form a curve which is characteristic of the mineral being investigated. These curves have been very useful in identifying the clay minerals and other hydrous aluminum oxides.

Case 1. R. E. Grim has suggested the differential thermal analysis apparatus as a control and prospecting method.[16] It has been possible to predict the properties and potential uses of clay deposits, and a correlation of the thermal analysis data with ceramic properties was shown to be very practical. The material from several refractory and face brick plants was studied and variations in the clay deposits which are responsible for variation in the final product were detected. Although the method is a rapid one, much preliminary work would be necessary to apply the findings to control work. In a large plant such preliminary work undoubtedly would be worth-while.

The use of modern instruments in solving ceramic problems has been the foundation for many new ideas in a large and expanded industry. These instruments have not become a substitute for the older methods of analysis, but they have augmented the value of these more common methods by increasing the range and scope of research and control. The importance of the modern tools of research is undisputed. Without a doubt the future of ceramic technology will continue to be more dependent on its allied fields of physics and engineering. The result can only be a continued progress with an increased tempo in knowing more about these complex silicates which surround us in everyday life and in the production of new and better articles at a lower cost than ever before.

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O & C LANDS

On May 22 Senator Cordon sent the Department the following telegram:

> SUB-COMMITTEE ON SENATE PUBLIC LANDS COMMITTEE ON SATURDAY FAVORABLY REPORTED TO THE FULL COMMITTEE S. 723. THIS BILL CONTAINS PROVISIONS FOR RESTORING O AND C LANDS TO MINING ENTRY. HOPE TO OBTAIN ACTION BY FULL COMMITTEE IN NEAR FUTURE AND SHALL KEEP YOU ADVISED.

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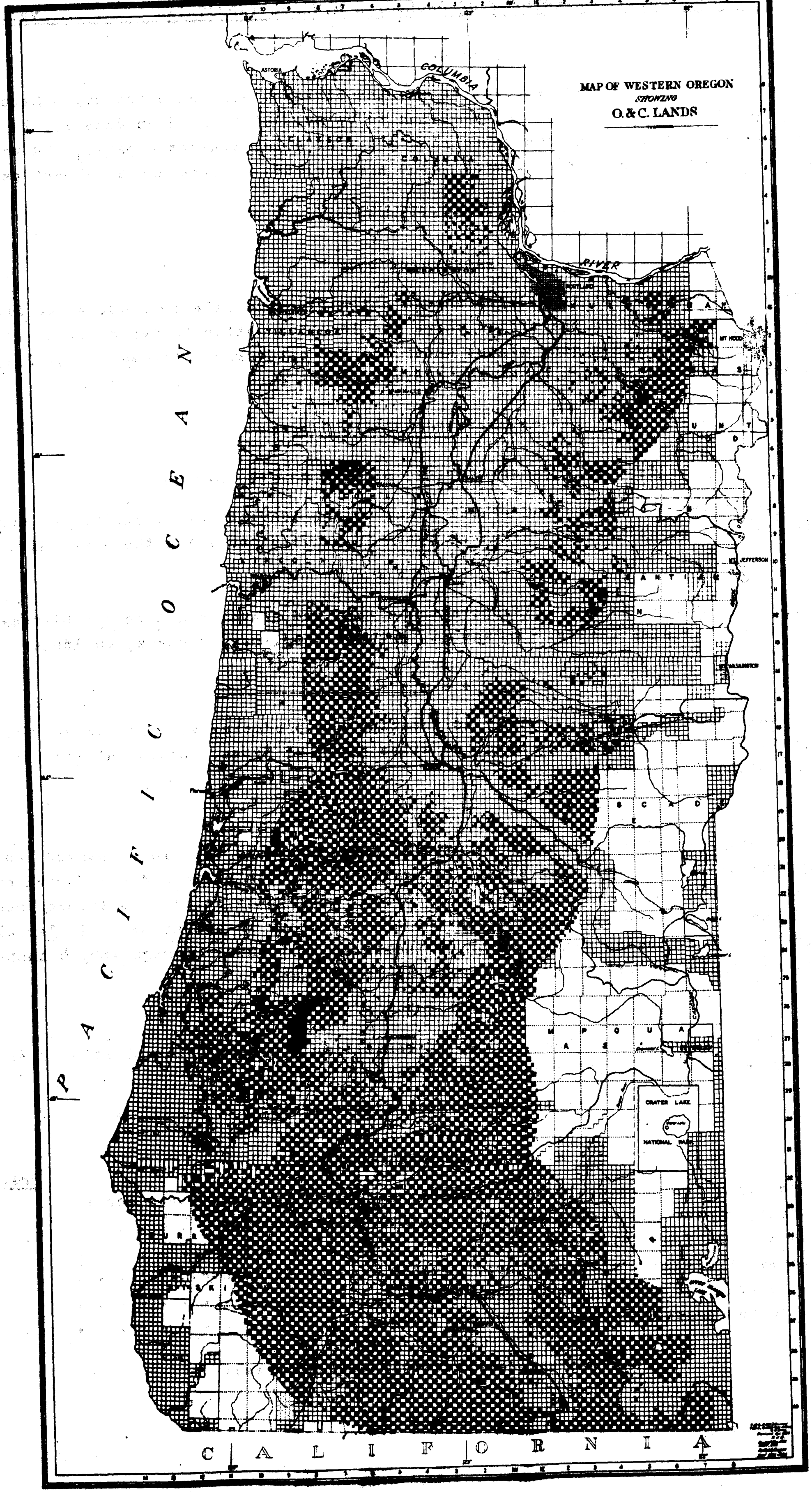

MAP OF WESTERN OREGON
SHOWING
O. & C. LANDS
ASTORIA
COLUMBIA
RIVER
MT HOOD
MT JEFFERSON
CRATER LAKE
NATIONAL PARK
PACIFIC OCEAN
CALIFORNIA

MINING CONVENTION

The Jackson County Mining Association and the Siskiyou Mineral Association have announced plans for the Western States Mining Convention to be held at Medford on June 13, 14, and 15. Speakers will discuss problems concerned with price of gold, venture capital, and western industrial development. For entertainment there are included a rodeo and a "49-er" parade.

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ASSESSMENT WORK

Owners of unpatented mining claims should not neglect to file or cause to be filed before 12 o'clock noon of July 1 in the office where the location notice is recorded, a notice of their desire to hold their mining claims under the act of Congress signed May 3, 1943, which suspends annual assessment work on mining claims for the duration of the war.

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ACTIVITIES IN NON-METALS, MALHEUR COUNTY, OREGON

L. H. Snodgrass has a sand and gravel plant, using conventional dragline and screening equipment, located about one mile north of Nyssa in gravels bordering the Snake River.

* * * * * *

Mr. Chester Lackey, Ontario, is operating a sand and gravel plant on the highway just north of the Ontario city limits. Equipment includes draglines, screens, bulldozer, trucks, trencher, etc.

* * * * * *

Strasbaugh Sand and Gravel Company is treating and producing sand and gravel from a large deposit near the Snake River about 1½ miles north of Nyssa. Equipment includes sand pump, power plant, and screens.

* * * * * *

The Hardesty Division of Armco Drainage and Metal Products Co., Inc., Denver, Colorado, is making concrete pipe, including sewer, irrigation, and both plain and reinforced culverts up to 27 inches in diameter at a new plant at Nyssa. Aggregate is being obtained from Strasbaugh Sand and Gravel Company. At Ontario the Armco Company is operating a similar plant and making pipe of the following sizes: sewer, 4 inches to 24 inches; irrigation, 4 inches to 18 inches; and plain and reinforced culverts up to 54 inches.

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Oregon Clay Products Co., Inc., Vale, is installing a modern brick plant on U.S. Highway 28 near the Union Pacific Railroad at Vale.

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RELEASE BRAKES ON MINING INDUSTRY

Much has been written about the excessive depletion of domestic mineral reserves during the war period. Generally the intent of such statements is to give the impression that all of the important metallic mineral deposits in this country have been found, that the large war production used up the greater part of our reserves, and that the life of domestic commercial mineral supplies is limited to a relatively small number of years. Granted that war production seriously depleted metallic mineral reserves, and that known domestic reserves are in a weakened condition for another emergency, the principal causes for this condition are due to Government regulations. Development, the life blood of a mining enterprise, was neglected in favor of production during the war because of manpower shortages. Whether or not certain regulations and their administration were essential in war time is not the point, but rather that when development is neglected, ore is not found to replace that which has been mined. Again if the profit incentive is lacking, new mining enterprises are not undertaken and the finding of new deposits languishes. If development work on known deposits is neglected and if new exploration projects are not undertaken, serious depletion of ore reserves is inevitable. The greatest obstacle to new mining enterprises is oppressive taxation, and a resolution recently adopted by the Mining and Metallurgical Society of America, as given below, clearly points out the unhealthy condition of the mining industry and the remedies that are sorely needed. We cannot change the effects of repressive war regulations, but new life can be given to the mining industry, so essential to progress and protection in this metallic age, by providing incentive, now lacking, to mining enterprise. A far-sighted tax policy would not be an immediate cure-all in this period of high costs, but it would be a long step in the right direction. The resolution follows as given in Engineering and Mining Journal, May 1946 issue.

Ed.

FEDERAL TAXATION OF MINERAL ENTERPRISE
A Resolution of the Mining and Metallurgical Society of America

The members of this Society believe that a dynamic and prosperous mining industry is essential to a sound national economy in the future, is necessary to the national defense and security and is therefore vital to the public interest.

We also believe that a vigorous and flourishing general economy is equally essential to a dynamic and prosperous mining industry.

It is our belief that the existence of a sound and prosperous general economy and mining industry, capable of producing the maximum revenues which the future needs of our government and the servicing and amortization of the national debt require, is dependent upon adequate incentives.

The known ore reserves in the United States have been seriously depleted by the demands of the war effort and prompt action to replace these reserves by new discovery and development is essential in the national interest.

Adequate incentive cannot exist unless the tax system is so constructed as to encourage investment of risk capital in new enterprises, the development of new properties, uses, and processes, and the creation of maximum production and employment.

The Mining and Metallurgical Society of America hereby urges the adoption by Congress at an early date of the following changes in the Federal tax system as necessary to create such incentive and to remove existing clogs upon the expansion and development of mining and other business enterprises:

1. Full and adequate allowance should be made for the tax-free recovery of capital out of profits, including liberal allowances for depreciation and obsolescence reasonably administered. Provision should be made that depreciation rates established and consistently applied by the taxpayer should be accepted except to the extent that the Commissioner establishes that such rates are excessive.

2. Adequate provision should be made for offsetting the losses of bad years against the profits of good years over a reasonably long period. With this end in view, section 122 of the Internal Revenue Code should be revised so as to eliminate certain technical adjustments and limitations it now contains which operate to penalize taxpayers having loss years as compared with those whose profits are distributed more evenly over the given period.

3. The Internal Revenue Code should be amended so as to permit the treatment as current expense, and the deduction of amounts expended in scientific research and experimentation, in the development of new processes and products, and in the exploration and development of new orebodies and ore reserves.

4. In order to stimulate adequate investment of equity capital in hazardous mining enterprises and provide a reasonable opportunity of tax-free recovery of such shareholder capital, provision should be made for the distribution of depletion reserves to stockholders tax-free.

5. The double taxation of corporate profits should be eliminated by provisions which will allow shareholders receiving taxable dividends a reasonable credit on account of corporate taxes paid.

6. The tax upon intercorporate dividends should be repealed, as well as the penalty tax imposed upon corporations filing consolidated returns.

7. The imposition of corporate taxes upon or with respect to undistributed profits of business corporations should be avoided.

8. The tax system should be made more intelligible to the ordinary business man. Its structure should be simplified by the elimination of unnecessary taxes and in all other practical ways. We commend the recent repeal of the excess profits tax and the capital stock and declared-value excess profits taxes from the points of view of removing clogs upon incentive and of simplification of the tax system.

9. An earnest effort should be made to enact as promptly as possible a reasonable, equitable, and well-balanced plan of taxation which can be continued in force for a number of years without the necessity of continually recurring substantive changes. The goal should be a sound and stable tax system.

10. Every effort should be made to improve the quality of administration of the tax laws and thereby to win the confidence of taxpayers that the tax laws will be fairly and equitably administered. The present administrative tendency to disregard legislative intent under the guise of administrative interpretation should be discouraged. Long-established administrative interpretations and

procedures should not be modified or reversed unless such action is compelled by a change in the statute or by authoritative judicial decision. The frequent adoption of inconsistent positions on the same issue in different cases is inimical to public confidence in the fairness of the administration of the revenue laws, and this unfortunate practice should be restricted to an unavoidable minimum.

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U.S. GEOLOGICAL SURVEY DEVELOPS INSTRUMENT

The U.S. Geological Survey has announced the development and successful testing of a magnetometer instrument that can be used in airplanes for rapid and accurate geophysical surveys of potential iron and petroleum producing areas. Development was through the joint efforts of the Navy Department and the Survey. The instrument is an adaptation of magnetic air borne detector instruments that were developed by the Naval Ordnance Laboratory and the Air Borne Instrument Laboratory of the National Defense Research Council early in the war for spotting deeply submerged enemy submarines operating in the open seas. During the past two years the Survey has employed the instrument in cooperation with the Office of Naval Petroleum Reserves in making test surveys of more than 40,000 square miles of territory from the northern coast of Alaska to the Gulf of Mexico at altitudes from 150 to 14,000 feet. Accurate reference to ground positions is secured in these surveys by electronic and photographic means. It is stated by the Survey that, so far, particular attention has been devoted to surveying potential areas of petroleum and iron ore occurrences but that a wide variety of geologic conditions of scientific importance has been mapped with this instrument. The particular advantage is stated to be the ability to map difficult terrane over either land or water at a speed 100 times as fast as would be possible on the ground and with greater accuracy and detail. Seemingly the instrument is not affected by iron and steel installations or power lines.

The Survey also announces that it has recommended an automatic radio alarm system capable of giving instantaneous warnings over thousands of miles in the Pacific Ocean against approaching tidal waves. This warning system would be made up of observation stations around the shores of the Pacific and on certain mid-Pacific islands. While serving primarily as weather stations, these installations could be so equipped that they would automatically record the arrival of large-amplitude seismic waves near their points of origin, setting off radio alarms that would alert the entire system. By this means adequate warnings could be broadcast to areas subject to possible seismic wave damage.

Studies of the recent disastrous tidal wave by geologists disclose that it was generated by a sudden and sharp adjustment of the earth's crust along a major fault line in the Aleutian trough south of Unimak Island. From this point concentric semicircular shock waves were directed outward into the Pacific Ocean. These waves traveled fanwise through the water at a speed of approximately 470 miles per hour until they spent themselves through distance or were intercepted by shorelines. The shock waves were reported to be scarcely perceptible at the ocean's surface. They sped through the water at 80-mile crest intervals creating surface wave swells not more than 4 or 5 feet in height. The force of the initial shock impetus was sufficiently great, however, that after being transmitted through the water for some 2300 miles within the space of 5 hours' time, the wave forms tripped on the shallow sea floor near the Hawaiian Island coasts and toppled over to create a series of racing super-breakers which by their momentum were able to reach as high as 55 feet above normal high-tide levels in certain exposed areas on the northern coasts. As pointed out by the investigating scientists, the force of the seismic waves was concentrated at certain points along the island shores because of the deflecting or funneling effect of near-shore submarine ridges and wide-mouthed bays. Other areas were spared because of the existence of either steeply sloping ocean bottom near shore or of offshore barrier reefs protecting the land inside.

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BLOATED VOLCANIC ASH AND TUFF*

NEW LIGHTWEIGHT MATERIAL

or

Is Oklahoma Volcanic Ash Just So Much Dirt?

by

A. L. Burwell
Chemical Engineer, Oklahoma Geological Survey

Is it possible to make something from nothing? The answer will be negative, of course. However, how close to nothing can we start and still make something from it? Apparently, very close. There is an old saying, "cheaper than dirt", meaning that the material in question has a value "next to nothing".

The natural mineral material regarding which this article is written meets these specifications exactly. To the average person seeing the material in place it is just so much dirt. Its value in place is next to nothing. That qualifies the material, volcanic ash, as at least "as cheap as dirt". Starting with a material as low in the economic order as volcanic ash, can something of real substantial value be created? We think it can.

Volcanic ash is the fine dust-like particles thrown from volcanic craters during eruption, and is not the residue of combustible material which is the usual conception of an ash. It may consist of fine particles of solid rock or of finely dispersed particles of molten magma solidified while in contact with the air. Generally it may be considered simply as lava in dust form in contrast to massive-bedded lava, scoria, and pumice. Chemically these substances are more or less alike but are very different physically. On being blown high into the atmosphere during eruption, volcanic ash is often carried great distances by the air currents and finally deposited, sometimes in extensive beds. It may have settled on water and been transported, or after original deposition it may have been again transported by wind or water.

A chemical analysis of a typical and average Oklahoma volcanic ash shows:

	Percent		Percent
SiO_2	72.42	MgO	0.17
R_2O_3	13.47	K_2O	4.84
Al_2O_3	11.55	Na_2O	2.93
Fe_2O_3	1.92	LOI	5.37
CaO	0.64	Loss at 105°C	0.81

Deposits of volcanic ash have been reported from twenty-three counties well distributed throughout the state, with many of the deposits located close to transportation, power, and fuel. The August 1945 issue of The Hopper carried an article on volcanic ash, its occurrences, and analyses of several deposits. In addition, the statement was made that experiments in the laboratory of the Oklahoma Geological Survey show that volcanic ash can be "bloated" under proper temperature control to yield a product somewhat similar to sponge glass. Since that time, as circumstances have permitted, more work has been done on "bloating" so that now it is definitely known that volcanic ash from all the major Oklahoma deposits can be expanded or "bloated" to yield products with a cellular structure, and that tuff, a mineral material of similar origin and composition, reacts in a similar manner.

The basic conditions under which volcanic ash and tuff can be bloated satisfactorily may be summarized as:

1st. A relatively large amount of glass phase must be formed.
2nd. Gas must be liberated within the mass while it is in a thermoplastic condition.
3rd. The glass phase must be sufficiently viscose to maintain the foamy structure.

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*From The Hopper, May 1946 issue, published in the office of the Oklahoma Geological Survey, Norman, Oklahoma.

These basic conditions are approximately the same as given for bloated clay products by Austin, Nunnes, and Sullivan in A.I.M.M.E. Trans. 148, Industrial Minerals Division.

Experiments have been made to determine the temperature and temperature range at which bloating takes place and the influence of length of time. A report on this work is in process of preparation and will be published as soon as completed.

The question might well be asked as to why the Survey is giving attention to the bloating of volcanic ash. The answer is that occurrences of inorganic material with a true cellular structure are rare. In a true cellular material the cells are separate and not connected one to another. In this respect it differs from a porous material wherein the cells are connected. The difference is the same as that between a mass of soap bubbles (foam) and a sponge or a bed of sand. Because of this difference, cellular material does not allow the passage of liquids or gases whereas the porous material does. Therein lies a further answer as to why the Survey is giving attention to bloating of volcanic ash. In other words, it has industrial possibilities: possibilities as insulating material to prevent transmission of heat, cold, and sound; as light-weight aggregate for concrete construction; and possibilities in numerous other ways.

Bloated volcanic ash looks very much like foam glass. Its apparent density, that is, its weight per unit space, is very low. Products weighing 50 to 35 pounds per cubic foot and even less are possible. Being a mass of glass bubbles it will float on water without absorption. It can be bloated to form, or it can be cut with a saw to shape. It will not transmit heat or sound, and therefore should make ideal insulating material for refrigeration, for furnace construction, for homes and offices, and for many industrial applications. It appears to have sufficient structural strength to withstand reasonable loads, stress and strain.

The present uses for volcanic ash account for only a small tonnage. The consumption as an abrasive is small. The tonnage for concrete admix is erratic and has never been large. But now it appears that volcanic ash may become one of the more important natural mineral materials of Oklahoma. Oklahoma possesses tremendous reserves of volcanic ash and tuff, the processing of which to bloated cellular material will require quantities of fuel. Here again may we re-state the particular advantage of that combination of natural raw material and low-cost fuel with which Oklahoma is favored. Together volcanic ash and fuel may go far. That is the considered opinion of many who have seen the product and visualized the possibilities. If it pans out the Oklahoma Geological Survey will again have had a hand in "making something from near nothing".

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SALEM ALUMINA PLANT

According to a statement in the Oregon Journal the Reconstruction Finance Corporation has authorized the operators of the Salem alumina-from-clay plant to continue operations for another six months. Senator Guy Cordon made the announcement in Washington D.C. on June 13. The news-release stated that the plant has been and is making aluminum sulphate fertilizer. This probably is a typographical error as the plant in the past has made ammonium sulphate. Mention in the news-release of making aluminum phosphate for supplying U.N.R.R.A. must be a similar error.

The plant at Salem was constructed for the purpose of testing out and developing a process for the commercial production of alumina from Northwest clays, and reportedly about 5 million dollars was spent in construction and tuning up operations at the plant. Seemingly the principal purpose for constructing the plant has been by-passed.

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PUBLIC DOMAIN

Public domain consists of land belonging to the United States. This land was either ceded to the Federal Government by the original thirteen states or acquired by treaties, purchase, or rights of exploration in the earlier days of the republic. The public land states, or states containing public domain, are listed below:

- Alabama
- Arizona
- Arkansas
- California
- Colorado
- Florida
- Idaho
- Kansas
- Louisiana
- Michigan
- Minnesota
- Mississippi
- Missouri
- Montana
- Nebraska
- Nevada
- New Mexico
- North Dakota
- Oklahoma
- Oregon
- South Dakota
- Utah
- Washington
- Wisconsin
- Wyoming

Some of these public land states contain only very small areas of public lands. For example, the state of Missouri has now only 432 acres, while the state of Nevada has 45,169,951 acres. As given in a paper entitled, "Vacant Public Lands", issued by the General Land Office, Washington, D.C., Oregon's public lands have a total acreage of 13,273,737. This amount is made up of 12,368,244 acres within grazing districts and 905,493 acres outside of grazing districts. These acreages do not include areas acquired through purchase by the Government for resettlement, submarginal land administration, military, or other purposes. Information concerning vacant public lands may be obtained from the appropriate district Land Office. In Oregon these offices are located at Roseburg, The Dalles, and Lakeview; in Washington there is a district Land Office at Spokane; in Idaho district Land Offices are located at Coeur d'Alene and Blackfoot; in California at Sacramento and Los Angeles; in Nevada at Carson City.

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METAL MINE CONVENTION

The 1946 Metal Mining Convention and Exposition of the Western Division of the American Mining Congress will be held in Denver, September 9-12. J. B. Haffner, General Manager, Bunker Hill and Sullivan Mining and Concentrating Company, Kellogg, Idaho, has been named National Program Committee Chairman, according to an announcement by Julian D. Conover, Secretary of the American Mining Congress, Washington, D.C. Oregon committee members are as follows: S. H. Williston (Chairman), Vice-President, Horse Heaven Mines, Inc., San Francisco, California; Clayton Jones, President, Sumpter Valley Dredging Company, Portland; F. W. Libbey, Director, State Department of Geology and Mineral Industries, Portland; Irving Rand, Secretary, Oregon Mining Association, Portland; S. R. Smith, President, Bonanza Mines, Inc., San Francisco, California.

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MISCELLANEOUS PUBLICATIONS

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Index to geologic mapping in Oregon, 1944	Free
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FUSED QUARTZ

by

Raymond B. Ladoo*

Fused quartz is a glass made by the fusion of very pure silica. There is some confusion in terminology but in the trade today "Fused Quartz" generally refers to the perfectly transparent colorless product made from rock crystal while "Fused Silica" is a white, translucent product made from silica sand. Vitrified silica is the term preferred by purists for all quartz glass, but it lacks the definiteness of the trade terms. Since the raw materials, methods of production, and properties of the finished products are different for the two types, the trade terms are to be preferred.

As fused quartz is amorphous, its physical properties differ greatly from those of quartz crystal. Lacking crystallographic directions and having no piezo-electric properties, fused quartz, of course, has no value for the making of radio oscillator plates; but it does have other most valuable and unique properties. Perhaps the best known and most useful properties are its extremely low coefficient of expansion and its ability to transmit very short-wave ultraviolet radiant energy.

Crystal quartz not only has an average coefficient of expansion greater than that of fused quartz but the coefficient varies with crystallograph direction. Also when crystal quartz is heated and cooled it passes through the several states of alpha and beta quartz, tridymite, and cristobalite with varying densities and coefficients of expansion. Thus when crystal quartz is heated to say 900° C. and rapidly cooled, strains develop which shatter it.

Fused quartz has the lowest coefficient of expansion of any mineral or metal (at least among those accessible to industry), far lower than iron, copper or tungsten, porcelain or glass. A fused quartz rod may be heated to redness and plunged into ice water without damage. While in recent years special glasses with low expansion coefficients have been developed, none yet equals fused quartz in this respect. Furthermore these glasses are not as resistant to chemical action as fused quartz; they have much lower softening and melting points; and they have inferior electrical properties. Fused quartz is one of the almost unique materials that is a good electrical insulator at elevated temperatures, as well as at very high frequencies.

Its ability to transmit a wide range of radiant energy from below 1850 Angstroms in the ultraviolet to over 70,000 Angstroms in the infrared make it of great value for optical purposes. There is no glass which covers this wide range, nor which has as great efficiency of transmission in a much narrower range. Fluorite transmits shorter ultraviolet waves than quartz, but is physically not suitable for making irradiation tubes, cells, lamps, etc.

This combination of physical and chemical properties makes fused quartz absolutely essential for certain highly critical technological uses, for which there literally are no substitutes. Due in part to the difficulties of manufacture and in part to the high

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* Consulting Mining Engineer, Newton, Massachusetts.

prices which must be charged for quartz ware, production, and use have been limited. Up to World War II our domestic needs for clear fused quartz were supplied by only three domestic producers, none of whom made a full line of products, plus imports chiefly from one English company. There was not a single producer of clear fused quartz of really optical quality. One producer made small lens and prism blanks but they contained many bubbles, had relatively low transmission value, were optically non-homogeneous, and were too greatly strained optically to meet critical standards.

During the war there arose an urgent need for better fused quartz in quantity for several applications. One of these was for the making of new, highly efficient vaccines and serums by an ultraviolet irradiation process developed by the Michael Reese Research Foundation of Chicago under a grant from the Medical Research Committee of the Office of Scientific Research and Development and sponsored by the National Institute of Public Health. These vaccines and serums are up to 100 times as potent as those previously available. The key to the new process was irradiation by extremely short (1849 Angstrom) ultraviolet wave lengths. It had been generally assumed that these extremely potent bactericidal wave lengths could not be used practically, since published data showed 1850 A. as the "cut-off" point for commercial fused quartz, below which there is zero transmission. But Dr. Franz Oppenheimer of the Michael Reese Foundation had seen and used some fused quartz made by an expert quartz technician and inventor named Berthold F. Nieder. This fused quartz would transmit 1849 A. wave lengths in usable volume.

Eventually the Office of Production Research and Development made a contract for the development of Nieder's process and for the construction of equipment by which this high quality quartz might be made in quantity. The author was charged with the direction of this project.

Fused quartz production methods in no way resemble those used in making or forming glass. Quartz has a very high melting point - about 1750° C. as against 400° to 800° C. for various glasses. Furthermore molten silica never becomes really liquid, but remains a highly viscous mass at highly elevated temperatures. Near the softening point of around 1450° C. silica begins to volatilize and this continues at an increasing rate as temperature is increased. So fused quartz cannot be melted and cast, blown or pressed as is done with glass. Special production methods must be used.

The earliest fused quartz was made by laboriously fusing together small fragments of quartz in an oxygen-illuminating gas blowpipe flame. Even today much of the finest fabricated quartz used for ultraviolet lamps is still made by hand methods. Pre-calcined and water-quenched quartz is crushed and screened to particles ranging between 40- and 100-mesh. Quartz workers, seated at benches with oxygen-illuminating gas or oxyhydrogen burners in front of them, heat a quartz starting "bait" in the flame to the softening point, roll it in quartz powder, reheat until completely fused, roll again in powder, re-fuse and so on until the quartz nucleus has grown to sufficient volume for the object to be made. If a hollow tube is needed the starter "bait" is a short length of previously made tubing fused into hollow tube holders at each end, long enough for the worker to hold comfortably by each end. One end of the tube is plugged with a cork. To the other end is attached a mouth blowpipe tube. As the heated section grows in volume the worker gently blows and pulls, gradually elongating and increasing the diameter of the tube, but maintaining uniform wall thickness. Such tubing forms the starting point for making all types of hollow ware. Obviously the size of the piece which can be worked in this way is limited by the ability of the worker to support it in his hands, and by the volume of heat which can be concentrated on the object.

Mechanical methods of fused quartz production were introduced by General Electric Company about 25 years ago. By their process fused quartz slugs or blanks made in graphite crucibles form the starting point for making tubing, rods, lens, blanks, etc.

The raw material for all high-grade clear fused quartz is Brazilian rock crystal. This crystal quartz must be of the highest quality from the standpoint of impurities. It must be water clear and entirely free from all specks, feathers, and inclusions, but optical or electrical twinning is not detrimental. Hence the selected discards from the quartz oscillator plate program made perfectly acceptable melting grade quartz.

Quartz sand, no matter how pure, cannot be used for making clear fused quartz because the films of air adsorbed on the surface of the grains and occluded gas cannot be removed in fusing, and a milky, non-transparent quartz, full of bubbles results.

In the General Electric process the quartz lumps as received are first inspected, lump by lump, removing all visible contaminated pieces, then washed in water, then soaked in hydrofluoric acid, again washed and inspected, then dried. The quartz lumps and chips are then packed as tightly as possible in thin-walled, straight-sided graphite crucibles of the size and shape needed. Thus lens and prism blanks are made in shallow crucibles, and slugs for making rod and tubing are made in tall narrow crucibles, 1½ to 2 inches in diameter by 8 to 10 inches or more tall. The charged crucibles, one at a time, are placed in carbon-resistance, vacuum furnaces, and the charge melted. Vacuum is relied upon to pull off most of the air and occluded gases. When the charge is fully melted and it is judged that no more gases can be withdrawn, the vacuum is cut off and nitrogen under high pressure is introduced. This compacts the molten slug and squeezes the remaining gas bubbles down to microscopic size. At the end of the cycle the current is shut off. The furnace is allowed to cool, and the crucible is removed. After further cooling the crucible is broken away and the finished blank or slug removed.

Rod is made by local heating of solid slugs and pulling in a vertical pulling machine. For making tubing the solid slug must first be pierced to make a hollow slug. The slug is placed in a crucible in another type of carbon-resistance furnace, heated to 1800 or 1900°C. and pierced longitudinally by forcing a slender carbon spike down through its center. The hollow slug is then pulled into tubing in the pulling machine.

Although it is possible to make tubing up to 1¼-inch diameter or a little more by this method, good tubing of uniform diameter and wall thickness not much over three-fourths inch in diameter can be made in this way. This is due to the impossibility of maintaining uniform high temperatures localized in the critical pulling zone and to the effect of impurities in the tubing. Carbon from the graphite crucibles reduces the SiO_2 to metallic silicon and also forms silicon carbide. These form hard zones which melt at higher temperatures and form lumpy, uneven tubing.

Tubing of larger diameter is made by blowing up smaller tubing by hand or semi-machine methods. In this way tubing up to 4- or 4½-inch diameter with walls up to 4 mm thick can be made with difficulty. The work is very slow, tedious, and expensive. Small diameter tubing is also used to make all types of hollow ware such as flasks, beakers, casseroles, and the like.

In the new Nieder process clear fused quartz slugs, the starting point for making tubing and rod, are made by building up from quartz powder, grain by grain, as in the hand process described, but it is done mechanically. The crude quartz crystal is washed, acid-treated, and inspected, as in the other processes. Then the lump quartz is heated to redness in a closed muffle, then rapidly withdrawn and quenched in water. This process changes the quartz into opaque, white, fragile lumps which are very readily crushed to a granular powder. The powder is screened into fractions between 50- and 100-mesh, oversize is reground, and fine dust is discarded.

The quartz slugs are formed in a "slug machine", which resembles a lathe but in which both heads revolve at the same very slow speed. A starting "bait" of fused quartz rod, about five-eighths inch in diameter, is secured between the head and tail chucks. A sliding carriage, like the tool-rest carriage of a lathe, carries a burner-box assembly. Above and below the starter bait are oxygen-illuminating gas burners set so that the hottest flame zone impinges on the rod. Above the upper burner is fixed a container for the screened quartz powder which flows down from the container through a quartz tube and an accurate measuring orifice into a nozzle which is part of the upper burner. In operation the quartz powder drops through the heating zone of the upper burner on to the revolving bait where part of it sticks long enough to be completely fused in by the lower burner. The whole burner-box assembly moves slowly and mechanically along the bait to the end of the run where the motion is automatically reversed and a run is made in the opposite direction. This process is continued until the volume of the slug is so great that the burners can no longer supply enough heat to keep the surface of the slug completely fused and the slug becomes lumpy. In practice, at this stage of development, good slugs about 8 inches long by 1 inch in diameter, weighing about a half a pound each, can be made in $3\frac{1}{2}$ to 4 hours. Larger, but shorter, slugs of the same weight can also be made. By speeding up the machine these slugs can be made in much shorter time - say down to $1\frac{1}{2}$ hours - but at the expense of quality, that is, they contain many more bubbles.

The finished slugs are made into rod and tubing by the methods previously described.

By this means water-clear, virtually bubble-free quartz slugs can be made, of much higher quality than have ever been made before. The process sounds simple, but at each stage of manufacture, from the handling of the crude quartz to the treatment of the finished slugs, there are many technologic difficulties which have required many months of experimenting to solve. The making of larger slugs seems to depend largely upon solving refractories problems. More burners or larger burners can be used but the quantity and intensity of the heat generated is such that it is difficult to find materials for making the burners and burner box which will stand up.

Considerable work has been done on methods for producing large blanks and rectangular slabs. Small trials have been successful but the problem in general has not yet been solved, largely because of difficulties with refractories.

The Nieder process slugs show unusually high transmission of very short-wave ultraviolet and there has been much interest in this material for all types of ultraviolet irradiation and optical use. Irradiation lamps and cells made from this quartz for bactericidal work are now in actual use. Some lenses, prisms, and windows for optical use, as in spectrometers, have been made but important commercial production has not yet resulted. Although this quartz is unusually homogeneous and free from strain optically, yet larger blanks must be annealed for critical uses. More work has to be done on annealing procedure to determine the best type of equipment and operating conditions.

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SO YOU WANT A HOMESTEAD?*

by

Clarence W. Ogle, Register
District Land Office, Lakeview, Oregon

I have lived in Oregon 37 years, have been register of the District Land Office at Lakeview, Oregon, twelve years. I have seen very few homesteaders make a success of their undertaking. The biggest portion of the good land, agricultural in character, outside of reclamation districts has been taken up - years past, even before my time.

The Act of June 28, 1934, known as the Taylor grazing act, eliminated the stock-raising homestead, which was for 640 acres of grazing land. These same lands outside of grazing districts may be leased under Section 15 for grazing purposes.

There will be land opened up in almost every state, under its reclamation act for soldier's preference right; but we don't know when, and the only drawback is, there will be so few homesteads for the thousands of boys who want them. The law is so strict as to farming experience and money, that very few boys will have a chance. When a portion of land is opened up, there will be so many filings on the same piece of land, that each one will have to draw. The person who has the most farming experience as an irrigated farmer, or money, and equipment, equivalent to money will be the winner.

I am not trying to discourage you, I am only telling you my experience. I have not used my homestead right, although I was raised on a farm and have always liked the farm life. I bought a 320-acre ranch 26 years ago and still live on and operate the same.

My advice to you is, if you are not eligible for a reclamation homestead and you can buy a farm in the right location for its purpose, do so. You will be better off.

* From Agriculture Bulletin, March 1946, published by Oregon State Department of Agriculture.

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BAKER COUNTY DEVELOPMENT

Extensive development of Bourne mines on the Columbia lode, one of the principal mineral veins of the Baker region, was forecast with announcement of the merger of Ellis Mining company, lease holder on the properties, with Consolidated Mining and Smelting company of Canada.

The contract covers the North Pole, E. & E., Tabor Fraction and Columbia mines, Senator Rex Ellis, treasurer of the Ellis company, reported. He, with C. C. Curl of Pendleton, president, and Bruce Hurdle, assistant manager of Consolidated, was here this week to complete the transaction.

The new company, Solar Development Company, Inc., a subsidiary of Consolidated, will initially examine, survey and study geology of the mines at Bourne, located north of the former mining boom town of Sumpter. The announced objective is to reopen the mines as one operation, said Ellis, with a tunnel planned to drain the workings 1000 feet below previous levels.

Bourne mines produced heavily in gold prior to 1915. Cracker Creek Gold Mining company was formed in 1938, consolidating the five separate ownerships on the lode, and ownership of the property remains with this company. Ellis entered the field shortly thereafter, taking a lease and erecting a mill about the time war priorities quieted gold mine operations.

Most recently gold production was prior to the war when a half-dozen small leasers mined high-grade ore which was shipped via Sumpter and Baker direct to the smelter at Tacoma.

Oregon Journal, July 13, 1946.

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O.S.C. MINING PROFESSOR LEAVES

Dr. A. W. Schlechten, head of the Mining Engineering department of Oregon State College, has resigned to accept the position of Chairman of the Department of Metallurgy at the Missouri School of Mines, Rolla, Missouri. The Department of Mining Engineering was re-established at Oregon State College just before the war, and Dr. Schlechten came from the University of Minnesota to take charge. Because of war conditions organization of the department was postponed and Schlechten was granted a leave of absence in order to do metallurgical work for the U.S. Bureau of Mines at Albany, Oregon. The new position at the Missouri School of Mines is a great compliment to Dr. Schlechten's training and ability.

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PROMINENT SCIENTIST ON INDUSTRY STUDY*

Possibilities of establishing an artificial abrasives manufacturing industry in the Portland area are to be studied this summer by R. B. Ladoo of Newton, Massachusetts, specialist in non-metallic minerals, who has been engaged as consultant by the Industries department of the Portland chamber of commerce, Industries manager Chester K. Sterrett reports.

Ladoo previously has worked in Portland on special projects for the Aluminum Company of America in preparing market surveys for use of lime and limestone, and has been a consultant to the Pacific Power and Light company.

Production of silicon carbide and fused alumina to be made up into grinding wheels and similar products is the goal of this study which is in line with the department's policy of encouraging, where practical, establishment of factories here for goods at present shipped in from other sections.

Ladoo is the author of a number of standard technical books on non-metallic minerals.

*From Commerce, June 29, 1946, published by the Portland Chamber of Commerce.

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RECONNAISSANCE GEOLOGY OF THE LOWER ROGUE RIVER
CURRY COUNTY, OREGON

by

Ewart M. Baldwin*

Larry Lucas, well-known guide and resort owner of Agness at the so-called head of navigation on the Rogue River, found a remarkably fine ammonite near Agness. This trip was made mainly to search for fossils at this locality. At the same time notes on the reconnaissance geology of the lower Rogue River were taken.

Dr. Warren D. Smith, head of the department of geography and geology at the University of Oregon, who had previously visited the area to search for fossils and who wished to make a more thorough search, was accompanied by the writer. The trip from Gold Beach was made by power boat which leaves about 8:30 a.m. and arrives at Agness about 11:00 a.m. At this time of the year the water is unusually low and the boat had difficulty in crossing many of the riffles.

The geology of part of this area was mapped by J. S. Diller of the U.S. Geological Survey and published as the Port Orford Geologic Atlas in 1902. Since that time little additional mapping has been done in adjacent areas although the units as defined by Diller may be traced southward throughout the Gold Beach area. G. M. Butler and G. J. Mitchell, 1916, published a reconnaissance geologic map of Curry County.

Serpentine crops out in the vicinity of Gold Beach. Mesozoic conglomerate, sandstone, and shale, presumably of upper Jurassic or lower Cretaceous age, crop out between Gold Beach and the mouth of Lobster Creek. These beds are steeply folded, broken by many faults, and well indurated.

The unconformable contact between the Mesozoic sediments and underlying Colebrooke schist lies a short distance west of the mouth of Lobster Creek. This schist formation is the predominant rock type between this point and Agness. It is a contorted phyllitic schist with numerous thin lenticular quartz veins. Slates and graphitic schists occur in places. Diller assigned this mass a pre-Devonian age because of the resemblance to schists in northern California that lie beneath Devonian strata.

On the eastern edge of the schistose highland, steeply dipping Mesozoic strata lie in faulted contact against an intervening lens of serpentine. The sediments are very much like those in the vicinity of Gold Beach and a limited fauna consisting of species of ammonites and pelecypods was found. The Mesozoic sediments are exposed along the Illinois River and abundant shellbeds consisting largely of species of Aucella were found about a mile upstream from Oak Flats. The numerous lenses of conglomerate in the steeply folded Mesozoic sediments stand out as peaks such as Sign Butte and Pebble Hill.

The contact of the Mesozoic sediments with Eocene sediments trends northward and southward from Agness and both the Rogue and Illinois rivers parallel this contact for several miles. The Eocene sediments are predominantly well-bedded sandstone and sandy shale but conglomerate beds which resemble the Mesozoic sediments are common near the base. The sediments are steeply dipping but less indurated than the Mesozoic sediments. Coal is known to occur along Shasta Costa Creek near the base of the section. Fossils are relatively scarce but some oyster beds have been found; one of these beds lies a short distance below the summit along the road above Illahe.

The summits of the hills lie about 3000 feet above sea level and are generally accordant. Diller called this erosion surface the "Klamath peneplain." The region is in a youthful stage of dissection, and most of the valleys are steep-walled and narrow except where the erosion has occurred along belts of less resistant sediments. There has been some oscillation in sea level as shown by the well-developed gravel-covered terrace that stands about 200 feet above

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*Associate Geologist, Oregon Department of Geology and Mineral Industries.

river level and 300 feet above sea level at Agness. Later erosion has modified this terrace and it is generally obliterated throughout the lower gorge.

The lower Rogue River valley has been cut beneath sea level as have the other coastal rivers along the Oregon Coast but this relatively narrow valley has long since been filled by the rivers' load and the tide has little effect upon river level upstream from the mouth.

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ST. JOHNS BRIDGE

Steelways, published by the American Iron and Steel Institute, New York, in its July issue, contains an interesting article by David B. Steinman on famous steel bridges with emphasis on their beauty of architecture. Prominent among those described is Portland's St. Johns Bridge. The author of the article writes of St. Johns Bridge and steel bridges in general as follows:

> "The setting for the St. Johns Bridge at Portland, Ore., challenged the designer to produce a span of matching beauty against the colorful panorama of city, river and valley below, and peaks beyond. The selection of the suspension type, with its naturally graceful cable curve and harmonic composition, was the first step. Then in the lofty steel towers, the bracing naturally yielded a pointed arch high above the roadway, the lines of the arch harmonizing with the curving lines of the cables. The portal openings in the towers frame colorful views of green trees, blue sky and white clouds. The finial spires, carrying the aviation beacon lights, blend with the evergreen spires of the tree-tops in the background.
>
> "In this example of architecture in steel, beauty was secured without concealment, camouflage or ornamentation. Not a pound of metal was wasted. The structural steel itself was planned for beauty of line, proportion, surface relief, light and shadow. And to all this was added color, the steel being painted a pleasing shade of verde green.
>
> "The bridge designer of this era has to be both engineer and artist combined. To a thorough understanding of structural design and function he must add a strong feeling, both innate and trained, for beauty of form, line and proportion. Architects, before they can help the engineer, must learn to understand and appreciate this new material - steel - and not regard it merely as a skeleton to be clothed in some foreign raiment.
>
> "In bridge after bridge, design engineers have now demonstrated that beauty can be secured without sacrificing utility or economy. They are directing their efforts toward producing the most beautiful designs in the steel itself, by developing forms that express the spirit of this metal - its strength, power and grace.
>
> "I think that no one, unless he is completely without feeling, can remain unmoved at the sight of a beautiful bridge. The arching span of steel, at once so delicate and strong, summons an ancient dream in the heart of man - the dream of flight. It is as if the bridge itself lifted wings and soared from shore to shore."

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CLEARING HOUSE

CH-87: Two service men wish to install and operate small mill, either concentrating or amalgamation, on mine with some milling ore developed. Will not develop mine beforehand or build roads, but will enter into agreement on a percentage basis with owner of property to mill the ore which the owner mines or furnishes. If interested write Lowell W. Tyler, 137 South Montgomery, Bremerton, Washington.

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CURRENT MINING NOTES

Golden Dredging Company, a partnership among George England, Harry Morse, Thomas Harris, Frank Kendall, and Jenkins Pryse, has moved its plant from Pine Creek in Baker County to the Middle Fork of the John Day River near Caribou Creek. Equipment consists of conventional 1½-yard dragline and washing plant.

* * * * * *

Associated Dredging Company has moved equipment from lower Burnt River, Baker County, to Vincent Creek northeast of Austin in eastern Grant County. Equipment includes a 3/4-yard Lima shovel and floating washing plant. This company is a partnership composed of W.A. Hilliard, Ira Pound, J.D. Oscar, Elwood Welch, and Harry Welch. The ground on lower Burnt River is still being retained by the company and is currently doing further testing work by drilling.

* * * * * *

The Double H mine, formerly the Lucky Boy, located about 2 miles north of the town of Rogue River in Jackson County, is being explored by a group headed by G.S. Holmes and R. J. Howard. John Johnson, Grants Pass, is superintendent.

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WILLAMETTE VALLEY LIMESTONE

Farms of the Willamette Valley continually require a large quantity of limestone to neutralize acidity and to provide calcium for crops. The amount of limestone which a farmer can use depends mainly on cost and one of the principal factors in this cost is transportation. Most of the limestone used in the Willamette Valley is now brought in by railroad from deposits in eastern and southern Oregon, because these deposits are much higher grade than known Willamette Valley deposits. If high-grade limestone could be found in the Willamette Valley, transportation cost would be lowered and farmers could use more of the needed limestone.

These facts together with descriptions of Willamette Valley deposits are discussed in a short report just issued by the State Department of Geology and Mineral Industries entitled "Reconnaissance Geology of Limestone Deposits in the Willamette Valley, Oregon." It is No. 15 of the series of G.M.I. Short Papers. The author is John Eliot Allen, geologist of the Department staff.

The report is available at the office of the Department at 702 Woodlark Building, Portland, and the field offices at Baker and Grants Pass. Price postpaid 15¢.

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PUBLICATIONS

	Price postpaid
GEOLOGIC MAP SERIES	
1. Geologic map of the Wallowa Lake quad.,1938:W.D.Smith & Others(also in Bull.12)	$ 0.45
2. Geologic map of the Medford quadrangle,1939:F.G.Wells & Others	0.40
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BIRCH CREEK CINDER OCCURRENCE
Baker County, Oregon
by
Norman S. Wagner*

Introduction

A tremendous amount of volcanic cinders (millions of yards) occurs on the headwaters of Birch Creek in Baker County. They appear to constitute the bulk of a prominent oval-shaped butte which is nearly a mile in length and somewhat in excess of half a mile in width at its base. This butte occurs on the flank of a "table top" lava and rises an estimated 200 to 300 feet above the lava surface. A county road-metal pit is situated on the southwestern flank of the butte.

Owner

Both public domain and patented ranch land cover the butte. The patented land embraces by far the most of the occurrence and this land is owned by Mr. J. B. West and associates. Mr. West's address is Route 1, Huntington, Oregon.

Location

The occurrence is situated in Tps. 13 and 14 S., R. 43 E. Rough mapping from section and quarter corners as identified by Mr. West indicates that the butte is nearly one mile long at its base along its longest or north-south dimension. It begins essentially on the line which divides the southern half of sec. 5, T. 14 S., into north and south halves, and it extends northward to the same line in sec. 32, T. 13 S. The width is about half a mile or slightly more. The western flank begins somewhat east of the western north-south section line. The eastern flank lies somewhat east of the north-south quarter line. The crest of the butte occupies the eastern half of the northwest quarter of sec. 5.

Huntington is the nearest shipping point, a total of 13 miles from the county pit as follows: 11 miles by graveled county road up Durbin Creek to the F. J. Haw ranch on Birch Creek, plus 2 miles of access road through the Haw and West properties.

Development

The only development work on this occurrence has been that done in connection with the recently opened county pit. This pit was located from evidence obtained in a bulldozer cut which showed an abundance of readily available road-metal material. Subsequent operations have resulted in a pit 200 feet long with a 25-foot face.

Geology

This "butte", as it is locally called, appears to be a volcanic cone. As already mentioned it is situated on the flank of a lava flow which caps the hills to form a mesa. The lava is basic as are the cinders. The top of the cone is flat with a sizeable depression in its center. Only the lack of a small segment prevents the trace of its periphery at the very crest from making a symmetrical oval. As is, it is horseshoe shaped.

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*Field Geologist, State Department of Geology and Mineral Industries.

While lava as well as fragmental material may compose the cone, a traverse around the cone and to the crest showed fragmental material to occur exclusively on the surface excepting for a small area in the dissected portion of the crest where lava is exposed.

The fragmental material as exposed in the county pit is black and is estimated to contain 95 percent minus 3/4-inch mesh, bank run. The common size appears to be about 1/8 to 3/8-inch. Large chunks do exist but they are not common. This material is composed of both scoriaceous lava and solid fragments. Elsewhere on the cone and particularly at the crest, the color is brick red but an admixture of off color pieces grading to gray or black suggests that the red color may be limited to the exposed surface material.

As is the case in the pit the fragments elsewhere on the cone are both solid and scoriaceous in character but larger pieces (up to 3 and 4 inches in diameter) are to be seen in some places.

Economics

A test of a small sample from the county pit indicates that the material weighs 73 pounds to the cubic foot. This is intermediate in weight compared to cinders (about 45 pounds to the cubic foot) and clean gravel (about 100 pounds to the cubic foot). This weight is greater than is altogether desirable for use as a light-weight aggregate. However, the scoriaceous fraction alone would weigh considerably less, and in consideration of the enormous size of the occurrence it is possible that careful investigation would show areas in which scoriaceous fragments existed in relatively greater abundance.

The nature of the occurrence as judged by the county pit would permit mining operations using a shovel or dragline and screen only. Because of the low initial cost of such mining due to the lack of any appreciable overburden and to the lack of necessity of crushing, it might be practicable to install some means of segregating the scoriaceous and non-scoriaceous fractions should a lighter weight aggregate be desired.

From the standpoint of quantity only, the potential tonnage of reserves is very large. The location of the occurrence with respect to rail distribution is fairly good, but a large market for building-block aggregate is lacking. Unless very favorable freight rates may be had, the immediate market area would appear to be limited to the numerous small cities in the farming area from Weiser, Idaho, to Ontario, Oregon.

Reference

Notes on building-block materials of Eastern Oregon. G.M.I. Short Paper No. 14, State Department of Geology and Mineral Industries, 1946.

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THE MINING INDUSTRIES

by

W. C. Broadgate*

The majority of mining men seem to be of the opinion that true conservation of our domestic mineral resources hinges upon continued production at adequate prices which will encourage an accelerated rate of development and give proper inducement to private enterprise to make new discoveries. This today is an expensive procedure. Utilization of technological improvements also will lower costs and permit the economic extraction and processing of our considerable bodies of known marginal and low-grade ores.

Proponents of the scarcity theories have on their side the plausible and undoubted truism that when a pound of ore is extracted, that pound of ore can never be replaced in the ground. Such an oversimplification is easy to sell to the public. This statement

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*Technical consultant for the subcommittee on mining and minerals industry of the U.S.Senate Special Committee to study problems of American small business. Address given at 34th Annual Meeting Chamber of Commerce of the United States, Natural Resources Department, Atlantic City, New Jersey. May 2. 1946.

generally is bolstered by Government figures showing "commercial ore reserves" (without definition) divided by some high rate of consumption, giving an alarmist view of the possible exhaustion of our reserves.

I want to point out that published mineral statistics are not always reliable for establishing the facts of a "have" or "have-not" position. Economic cut-off points continue to move toward lower value ores for various reasons, some of which I have already enumerated, thus increasing our "statistical" reserves. Probably only a relatively small portion of potential mineralized areas has been prospected because of the obvious limitations of the physical methods in use up to recently. It may be expected that the development of geophysical prospecting will reveal important ore bodies now covered by various kinds of overburden, and "blind" lodes which do not outcrop. Some ores, like those of mercury, are seldom blocked out ahead in any quantity and each year potential exhaustion is apparent - yet an adequate price will bring out sufficient quantities and apparently leave the reserves in no worse shape than before. Also, tax laws do not encourage blocking out or reporting large ore reserves.

Tariffs and subsidies

Then we must consider the serious results of depending solely on imports, or as one school of "conservation" puts it, "keeping our ores in the ground for the need of future generations." Removal of all tariff protection is an integral part of such a plan. This program obviously would discourage private exploration and development. Due to the fact that higher grade ores might be mined out selectively so industry could compete as long as possible with cheaper, imported foreign ores and metals, it might actually reduce our known "commercial" reserves. It also might encourage importers to gouge the American consumer with high prices, once our mines were shut down and no longer in competition with foreign production.

The potential use of various minerals and metals is dependent upon the technology of any particular period of our economic and scientific history. To date the number of such materials in use has increased. But there is no way of knowing whether in the next few decades shifts from one material to another may cause a mineral in the ground which today is an asset, tomorrow to be almost valueless. This possibility is illustrated by the increasing utility of the light metals and plastics. There would be no point in preserving for posterity metals or minerals for which it has little or no use. Better that we extract and use them now.

Nothing I have said should be so construed as to indicate a desire to shut off imports of metals, minerals, and other strategic materials of which there may be an obvious shortage. But I think it important that our public-land policy, our tariff policy and, perhaps, a subsidy policy, be planned so as to keep a healthy, progressive domestic mining industry operating within our borders. Such a subsidy policy should be aimed at extracting marginal ores now accessible and which might be permanently lost were the mines permitted to close.

Mineral stockpiles for defense

A sensible national stockpile policy, such as is now being considered by Congress, would cushion us against future wartime insufficiencies. There also have been suggestions made that a supplementary "buffer" stockpile designed to stabilize supply and demand might serve a useful purpose. Such a policy should, while not interfering with suitable acquisitions of material from abroad, favor under some "buy American" provision, the development of additional domestic sources both by encouraging discovery and aiding in improvement of the technology of extraction from lower grade deposits.

It seems to me that, entering into the picture of encouraging domestic mining is the necessity of tax-law revision which will permit the return of mining investments and adequate profits commensurate with the risks involved. Some changes in S.E.C. policy also might be helpful, although the S.E.C. probably is not as great a factor in limiting mining investment as sometimes is claimed.

Future of American industry

To sum it up, the future of the American mining industry appears to depend upon these factors, which are not necessarily listed in order of importance:

1. Tax laws which will provide inducement to invest in new mining ventures and which will permit adequately attractive returns to present and future operators.

2. S.E.C. regulations which will encourage the flotation of mining shares while at the same time giving reasonable protection to the investing public.

3. Protection from unreasonable floods of imported metals and minerals by means of tariffs, quotas, or both, planned so that domestic mining will have a fair share of domestic markets at prices which will permit mining enterprises to succeed in our high standard of living economy, without discouraging essential imports.

4. Government encouragement of marginal mining where conservation may be best served by continuous extraction, resulting in either sale or stockpiling of the production, whichever appears to be expedient at the moment. Such a program should be arranged so as to interfere as little as possible with private enterprise and probably should be accomplished by some variation of the premium system.

5. A comprehensive stockpiling law similar to that recently passed by the United States Senate (S-752), with reasonable "buy American" protection to encourage domestic private enterprise.

6. A long-range exploration program, both geophysical and physical, by the Department of the Interior, designed to add to our knowledge of potential sources of minerals, as well as continued research leading to improved mining and beneficiation methods.

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THE NATIONAL PICTURE

by

Evan Just*

In undertaking to discuss national policy in regard to natural resources, I proceed in the belief that the American people are sympathetic to the fullest exercise of private enterprise. Nevertheless, regardless of the ownership or control, we who discover, develop and produce these resources must assume a responsibility to exploit them with full regard for the public interest. In our generation, if we do not accept our job as a trusteeship, the public will move in on us and take over to the extent necessary to safeguard its interests.

The discharge of our responsibility to the public requires that we conduct operations efficiently and with a minimum of waste. Waste in this sense refers to material left behind in extraction, discarded in processing, or devoted to uses for which some grosser, or more abundant material would do as well. We must further seek to make a just apportionment between the demands for current consumption and probable future requirements, the latter including both the future needs of our generation and those of posterity.

The resource problems that concern me most today refer to a small group of minerals. Well meaning but poorly informed people caused considerable public confusion over mineral conservation.

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*Editor Engineering and Mining Journal. Extract from address given at 34th Annual Meeting Chamber of Commerce of the United States, Natural Resources Department, Atlantic City, New Jersey, May 2, 1946.

Of some minerals, we have such a plenteous supply that no interference with the normal course of private enterprise is advisable now. Also, there is a group of minerals that, however plentiful or scarce they may be, are convenient but not necessary to our economy. A third group, the "strategic" minerals, have apparent domestic reserves so small that any precautions against a national emergency should properly take the form of stockpiling.

Abundant and strategic minerals

In the plentiful category are coal, iron ore, magnesium, salt, potash, phosphates, molybdenum, limestone, sand, and construction and ceramic materials. To it I also add petroleum, aluminum, manganese, sulphur, and vanadium. Reserves of these minerals of a grade rated as commercial today are believed to be limited. However, they are supplemented by vast supplies of lower-grade material which modern technique can make available at somewhat greater cost and suitable installation of plant.

In the less essential class are barite, diatomite, fullers earth, garnet, corundum, scrap mica, and titanium. As an industrial raw material, gold is also in this class.

In the strategic group are tin, nickel, antimony, platinum, tantulum, cobalt, asbestos, flake graphite, industrial diamonds, and quartz crystal.

Uranium and thorium, the raw materials for atomic energy, present a special case. From being insignificant, they have suddenly been catapulted into a position of supreme importance. In terms of prewar economy we seem to have our share, and may overshadow all others now that a much greater value is put on low-grade materials. However, it is futile to guess about these minerals. None of us has any idea of the tonnage requirements or price levels of the future. As a component of the earth's crust, uranium is fairly abundant. With painstaking search and almost no price limits, we may find plentiful low-grade sources of production.

Limited reserves

The minerals which play what is rated an essential part in our current economy and whose known domestic reserves of commercial and nearly commercial grade are important, but limited, are mercury, lead, block mica, silver, zinc, tungsten, copper, fluorspar, cadmium, and chromite. The known reserves of commercial and nearly commercial grade have been estimated by the U.S. Bureau of Mines and Geological Survey to be less than a 60-year supply at the 1935-1939 rate of consumption. In quoting these figures I stress the terms "known reserves" and "commercial grade" because none of us knows or can even make reasonable guesses about our total reserves, the future rates of use, or the grade limits which progressive technology can utilize.

We are particularly in the dark as to the actual extent of our total reserves. The deposits on which we have drawn up to the present have been principally those which have surface manifestations easily found by prospectors or by elementary applications of geology and geophysics. Sound geological reasoning tells us that a great many more have no simple surficial expression or have been covered with detritus, sediments, soil, vegetative cover, or lava flows. It is certainly expectable that at least a portion of these concealed deposits will be detected by applied geological and geophysical science, or by chance, if public policy encourages the growth of science and the assumption of risk.

Furthermore, our generation has seen but few important new discoveries, except of petroleum. Of solid minerals, the mining industry has been able to provide our consumers' needs primarily by the painstaking extension of known deposits, by improved extractive technique, and by marvelous advances in beneficiation, reduction and refining.

What is conservation?

The steps that a public alarmed over alleged shortages instinctively seeks to take are to sequester most of the known reserves and to discourage domestic extractive industries, on the theory that we would thus have a backlog against the demands of a future emergency.

I submit that such a policy would be the most anti-conservational one we could adopt. It would cripple the industry without whose trained personnel, immense plant, and maintenance activities, a public reserve would have but little emergency usefulness. It would arrest the risk taking and technical progress by which we can expect to extend known reserves beyond our present imaginations.

Furthermore, it would condemn, possibly for all time, those low-grade reserves which are presently accessible but probably could not justify on their own account the reestablishment of abandoned operations. The reserves that will be made available for consumption by keeping a progressive industry in being, whatever they may eventually prove to be, will certainly be greater than those we can protect by a policy of "lock-up" conservation. Whenever we adopt this latter policy, then we are truly a have-not nation, both in minerals and in common sense!

In brief, the wisest conservational policy we can pursue in regard to these supposedly scarce minerals is to depend more heavily on imports than in the past, but to subordinate the rate of importation to a policy of encouraging a healthy domestic industry. Such an industry must embrace risk-taking progressive technology, and competent management. It must contain sufficient plant and trained personnel to make an adequate nucleus for meeting the demands of an emergency. These objectives should be achieved through intelligent tax policies which encourage development, and reasonable protection by tariff or some other form of non-discriminatory subsidy.

Need stockpiling and intelligent use

Beyond the matter of conservation, let us consider the extent to which future generations will require the minerals on the critical list in order to outstrip us either in civilized progress or fiendish destructiveness. Looking over the list, I think we can conclude that most, if not all, of their applications are susceptible to substitutions, or will be, in due course. To cover the possibility that this conclusion overrates the adaptability of our future technology, an intelligent stockpiling program will certainly provide for any indispensable needs.

Therefore, I cannot get excited over the depletion of mineral resources if we adopt a sound stockpiling program and resist the pleas of uninformed conservationists who would lock up our known reserves and cripple the extractive industries. The pressing problems of conservation are those connected with soil, timber, erosion, water, and the curtailment of waste.

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OREGON MINERALS MAPPED

A map showing the location of over 300 mineral deposits in the state of Oregon has just been published by the State Department of Geology and Mineral Industries. Principal localities of 43 minerals are shown in red on a base map measuring 22 inches by 34 inches. Brief explanatory notes describing 12 of the most important ores are printed on the margin. A small index map showing generalized locations of beach and stream gold placer deposits is also given. Copies of the map may be obtained at the department's office, 702 Woodlark Building, Portland, or at the field offices at Baker and Grants Pass. Price postpaid 10 cents.

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DREDGE STARTS IN SOUTHERN OREGON

The B-H Company, Medford, Oregon, has started dredging on Sucker Creek, Josephine County. Several buildings have been constructed and a road connecting the camp with the Oregon Caves highway has been built. Tom Gerety is in charge.

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GEM STONES IN 1945*

Domestic production continues at low level

No branch of mining except for gold has been so adversely affected by war as that of gem stones. According to the Bureau of Mines, United States Department of the Interior, production value in 1945 dropped to about $40,000, the lowest in a decade. The decline is attributed to shortages of labor, mining supplies, tires and gasoline. The gem hobbyists and the amateur and semi-professional lapidaries could not replenish their stocks of rough, and their best customers, the touring automobilists, almost completely disappeared. Further, the supply of most strategic minerals became adequate early in the year and pegmatite mining waned. It should be stated, however, the pegmatite mining during the war furnished disappointingly few gem stones. Late in the year, gasoline and other supplies became available and this, together with the return of men from the war, will doubtless encourage greater production in 1946.

The lapidaries in Oregon and Washington were active in 1945. There are at least 50 shops, the value of 1945 output being variously estimated at from $100,000 to $500,000.

For the first time, the value of jade produced certainly exceeded that of sapphire and probably that of turquoise. Wyoming in 1945 produced a number of tons of light-green nephrite and almost as much black jade. The publicity the press has given Wyoming jade (all produced from float) has attracted a number of outside prospectors to the state. At Lander there are three professional and a half dozen amateur cutters. The largest boulders yet found were located during 1945.

The Lander region remains the chief producer. Black nephrite, which takes a fine polish, is being obtained from the Red Desert. Discovery of jade in Laramie Range is reported. The white "jade" said to have been found near Kemmerer is, according to reliable information, chalcedony. The so-called jade as found is sold at one to over five dollars a pound. China, when peace is restored, may well become a good market for Wyoming jade.

Alaska jade appeared on the market in 1945. The locality is on the north side of the Kobuk River. Late in 1945 the Arctic Exploration Company of Fairbanks located mining claims in the district and flew a considerable shipment of jade to Fairbanks. Some of the material is stated to be of gem quality but most of it is fit only for objets d'art. The Chinese have purchased some of it. It is reported that three or four men were engaged last summer in collecting boulders from the bed of the Kobuk River. The better Alaskan material compares favorably with the better New Zealand nephrite. It is suitable for tourist jewelry and objets d'art.

Turquoise is occasionally found at the Castle Dome Copper mine in Arizona. It is "high graded" by the miners and sold in Miami or Globe. Some of it is of fine quality. A company official states: "As in the past, turquoise of an undetermined amount was recovered during routine mining operations. As a whole, the quality of the material recovered at greater depth has improved, both in hardness and in color the latter occurring in the lighter shades of blue."

Turquoise mining was relatively active in Nevada, particularly in the Tonopah and Battle Mountain districts. Most of the material is shipped to New Mexico, although some is cut locally, there being five cutting shops at Battle Mountain. Mr. Alfred L. Ransome states that the lessors, Messrs. Lee Hand and Paul Bare, of the Pedro claim on the Copper Basin property of the Copper Canyon Mining Company, Battle Mountain, produced 3601 pounds of cobbed turquoise in 1945. The Elko County mines appear to have made no shipments in 1945.

In Colorado, the King Mine, now renamed the Lickspittle, was operated in 1945 by Charles King of Manassa, Colorado. Twelve men were employed. The Hall Mine, near Villa Grove, Saguache County, will soon be operated again. There are rumors of a new turquoise deposit in the Cripple Creek district. New Mexico produced no turquoise, although Indians sorted some material from the dumps. Stuart A. Northrop states that the Indian jewelers are using chrysocolla, malachite, and chalcedony, largely from Arizona, as substitutes for turquoise. Reports indicate intermittent work on the turquoise deposit near Van Horn, Texas.

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*U.S. Bureau of Mines Mineral Market Report No. 1415, June 18, 1946.

The agate deposits on the Priday property in Jefferson County, Oregon, a large producer by hand methods, are to be operated mechanically in the future. ... The states and territories leading in gem production in 1945 were Wyoming, Oregon, Alaska, Nevada, Utah, and Arizona.

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ILLICIT TRADE IN GOLD THRIVES ON INFLATION

The World Report, Washington D.C., issue of July 1946, contains an illuminating article on the world-wide illicit trade in gold. According to the article widespread inflation has bred this "yellow market" which thrives especially in the Middle East and Latin America. This trade reflects the lack of confidence in government currency, even the strong currencies of the United States and the British Empire. The peculiar properties of gold, since it can be transported easily and hidden from tax collectors, provides the common man with the desired protection against depreciating currencies. It is reported that operators in the black market in Italy will pay three times as much in lire for gold as they will for dollars. In the Middle East and in some other countries gold circulates as the medium of exchange in illegal market operations because it has a dependable market value.

It is stated that the Bank of Mexico has sold a substantial quantity of gold at $40.53 an ounce. Recent reports are that gold is valued at $71 an ounce in Bombay, $108 in Cairo, and $110 an ounce in Athens. The United States gold mining industry, facing a depression because of rising costs and a fixed price for its product, wants access to world "open" markets. However, U.S. Treasury officials reportedly believe that such gold markets are "thin" and that release of American production into the world market would drive prices quickly down to the $35 floor which the United States maintains as a standard for purchase the world over. American operators would like to test out the statement but the Treasury officials point out that sales of gold to individuals abroad would be violating laws of other countries. Fifteen countries permit private gold holding and trade in gold. These are Egypt, India, Iran, Iraq, Palestine, Trans-Jordan, Syria, Lebanon, Greece, China, Cuba, Chile, Brazil, Mexico, and Argentina.

The world trade in gold is carried on in a sort of twilight zone of commerce built up around the open markets. It is stated that a gold peso bought legally in Mexico City may change hands 7 times legally but also there would be 13 other illegal transfers before being locked up in the vaults of an East Indian potentate.

Some governments profit through this strange mixture of legal and illegal traffic. Millions of dollars worth of gold have been smuggled out of Mexico to Cuba and then carried through the lax Spanish customs into Spain and over the borders into France and central Europe. The Bank of Mexico buys gold from Mexico mines at $35 an ounce and has purchased $109,000,000 worth from the U.S. Treasury at the same price in 1944. This gold is sold by the government at a 16 percent profit and buyers of this gold make their profit in putting it into world trade. Cuba charges a duty on gold declared at customs. It is reported that $1,800,000 worth of gold, which came mainly by plane from Mexico, went through Cuban customs in four months of last winter. This amount, of course, does not include that smuggled into Cuba.

Chile has exported gold to Argentina where it has brought as high as $50 an ounce. A weekly auction is held in Chile by the Chilean mint when gold pesos are sold to the public. Recently sales were at $44 an ounce. It is reported that the government of India, the British Dollar Pool, and the United States have all sold South African gold to Indians for as much as double the U.S. Treasury price. The United States paid in dollars at New York and received rupees in India from the proceeds of the sale at a rate considerably higher than the official exchange rate. United States troops in India were paid with these rupees.

The amount of gold that is hoarded or circulated privately throughout the world is a large question mark. The amount has been estimated in billions of dollars. Some governments are urging that authorities clamp down on the illicit traffic; Peru has called in all private gold holdings.

Inflation is the mainspring of this profitable trade in gold and it will continue as long as inflation exists.

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SILVER AT 90.5 CENTS

The price of newly mined silver was increased from 71.1 cents to 90.5 cents an ounce by action of the last Congress. The bill was signed by the President on July 31.

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MT. HOOD'S VANISHING GLACIERS

by

Ralph S. Mason[1]

Oldtimers who are fond of telling people that "the winters aren't as severe as they used to be . . ." may very well be telling the truth if present glacial activity on Mt. Hood and other continental peaks is taken into consideration.

A small group of Mazamas, led by Kenneth Phillips and accompanied by the writer, spent three days in the latter part of August, this year, on the slopes of Mt. Hood establishing control points by which changes in the mountain's ten ever-shrinking glaciers can be checked by aerial photographs taken each year in the future.

The Mazamas[2], cooperating with other groups engaged in a nationwide study of mountain glaciation, have been measuring Mt. Hood's glaciers for many years. These measurements were made by establishing reference points near the lower end, or snout, of several of the glaciers, and then making careful checks each year. Reference points consist of crosses painted on solidly placed moraine boulders. In addition to checking the relative position of the various snouts, some cross-section surveys of Eliot Glacier were made.

A glacier's terminal velocity, or better, movement (since a rate of speed that is confined to a few feet or inches per year can hardly be said to have velocity) is measured by means of a wire which passes through a device, consisting of a train of gears, which multiplies the movement of the wire many times. One end of the wire is attached to a pin driven into the terminal ice, while a lead weight is attached to the other end which supplies sufficient tension to ensure accurate measurement. A dial with calibrated divisions indicates the linear motion of the ice at the terminus.

The recently completed project will make unnecessary most of the arduous leg work which has been entailed in the annual measurements. Large bright-yellow crosses which will be visible from the air were painted by the group this year and should show up plainly in aerial photographs. Distance and bearing between the pairs of crosses were determined carefully, and these pairs of points will thus serve as a convenient means for measuring the amount of glacial advance or recession. Photographs will be taken late in October, just before the first snow falls and at a time when most of the previous winter's snow has melted away to expose the glacial ice.

The Mazama party found that all of Mt. Hood's glaciers had receded considerably during the past year - continuing a trend of many years' duration. The recession reflects a period of warmer weather and less rainfall which has characterized the climate of North America for the past several decades. A "healthy" glacier is one which receives sufficient new snow each year so that its upper surface remains convex in cross-section. A "dying" or receding glacier is concave or trough-shaped in cross-section. The surface of Eliot Glacier on the north side of Mt. Hood has rapidly become more concave; surveys made three years apart by the Mazamas reveal that the glacier surface in the center sunk 50 feet during that time. The snouts of all the glaciers have receded a great deal, as evidenced by terminal and lateral

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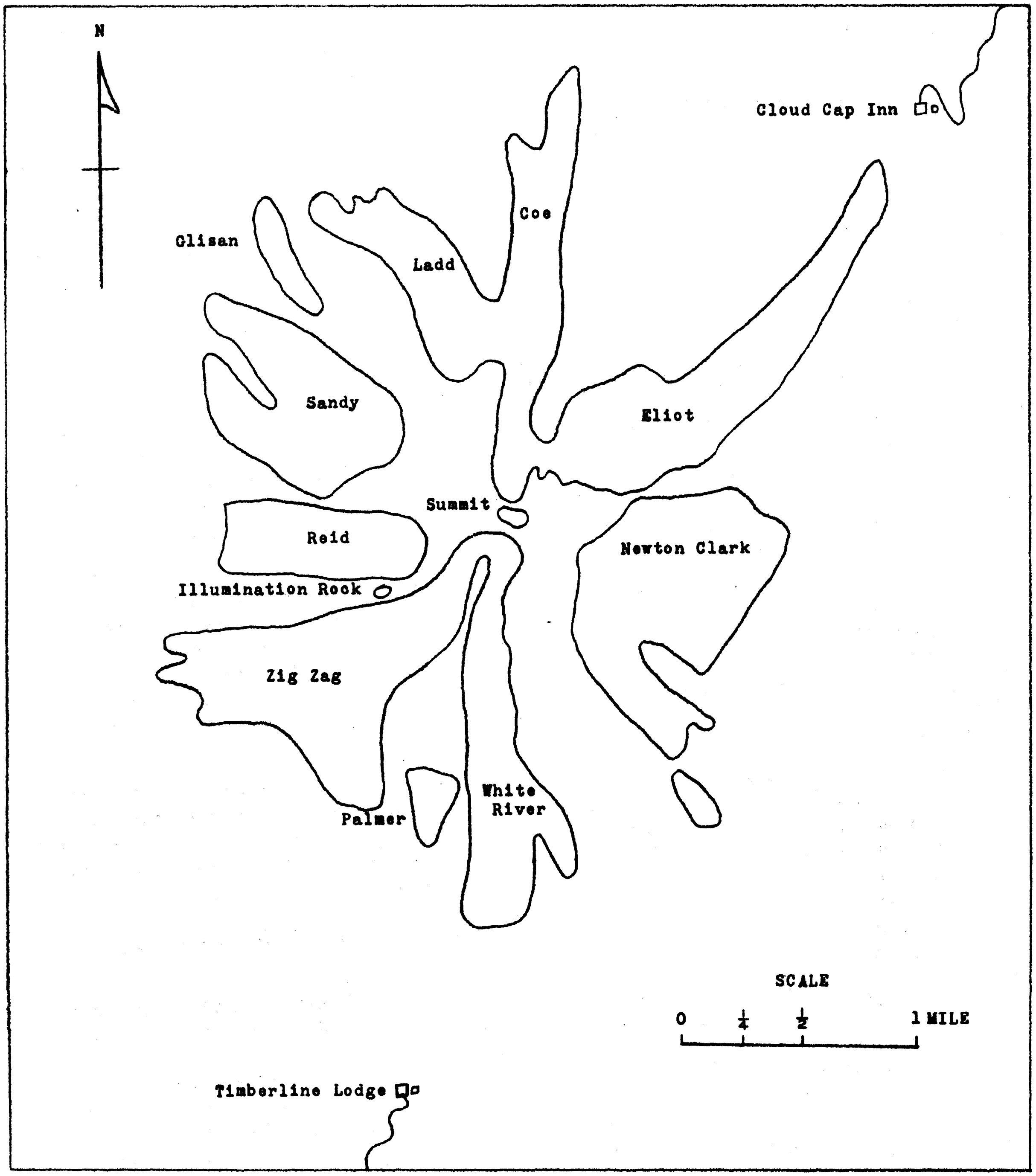
[1]Mining Engineer, State Department of Geology and Mineral Industries.

[2]Much of the factual material on glacial movement was obtained from Mazama, official publication of the Mazamas.

PLAN MAP OF THE GLACIERS OF MT. HOOD



moraines which are located far down the valleys from the glaciers. A lateral moraine is a ridge of rocks formed along the sides of a glacier. The rocks are obtained from the valley walls of the glacier and are carried along toward the terminus where they eventually form part of the terminal moraine. A receding glacier leaves both a terminal moraine, which is generally crescent-shaped, and lateral moraines, which are narrow winding ridges of unsorted rocks and debris. Glacial markings on rocks 500 feet above the present surface of Reid Glacier indicate the amount of shrinkage of one of Mt. Hood's now shrivelled glaciers.

The importance of glacial surveys such as those being carried out by the Mazamas becomes clear in the light of these findings. Such research will not influence the rate of recession of the ice nor the climate. However, it does indicate what has happened in the past, what is happening now, and what can happen in the future. Armed with the knowledge of what is happening, man may be better able to cope with the changes that the glaciers forecast.

Glaciers are of four main types: continental, plateau, piedmont, and mountain. During the ice age much of the northern part of this continent was covered by a vast, thick sheet of ice similar to that which covers much of Greenland to a maximum thickness of 8500 feet. Plateau glaciers are smaller than the continental, but are otherwise similar. Piedmont glaciers, such as the Malaspina Glacier at the foot of Mt. St. Elias, Alaska, cover hundreds of square miles but are more or less confined to valleys down which they move to the sea where they form icebergs. A mountain glacier is literally a "river of ice" which has its source high on the slopes of perpetually snow-covered mountains. Its channel is not unlike that of an orthodox river, the principal difference being in the shape of their cross-sections. A glacier "flows" in a manner strikingly like that of a river, passing around large obstacles in its path and re-forming beyond. A glacier moves most rapidly in midstream and even has eddies or countercurrents which "flow" in the opposite direction to the course of the glacier. The termini of most mountain glaciers, however, have little similarity to that of a river. Here the delicate balance between the rate of advance of the ice and the rate of melting and evaporation produces a nearly static condition. A mountain glacier, then, is a body of ice continually in motion but which never seems to get anywhere.

Mountain glaciers depend on an abundance of snowfall on the upper slopes of a mountain for their continued existence. Winter snows slowly become compacted by repeated thawing and freezing, and by the weight of later snows. This compacted snow, called névé, has a granular texture quite unlike the feathery flakes which originally fell on the snow field. Further compaction and burying of the névé gradually changes it into glacial ice. This ice, which forms the bulk of a glacier, moves slowly downward over the rocky slopes which it relentlessly wears away to form a U-shaped valley. A mountain glacier will ultimately destroy a mountain and itself by the removal of blocks of rock both large and small from the walls of the cirque at the head of the glacier. The eating away of the cirque wall eventually consumes the mountain top, causing a reduction in the annual snowfall to a point where the glacier can no longer exist.

A snow covered mountain may be considered to be a gigantic reservoir of water with a very sensitive thermostatic outlet valve. During winter months, when rainfall is abundant over the land, this valve remains closed. The flow of water from the snow fields and glaciers dwindles to a mere trickle. The high elevation, coupled with large heat losses through radiation because of relatively clearer skies, tends to keep most of the snow above the timber line frozen during the winter months. In the summer, however, warmer temperatures open the mountain's thermostatic valve and as the surrounding countryside dries out, water pours down to enter the irrigation laterals, power dams, and myriad other channels man has devised for his well-being. Nature is ever saving of her resources. Should a period of cool weather occur during the summer and the need for water become less, then the mountain obligingly gives the valve a twist to cut down the flow for a time. There is also a fine degree of control over the amount of water a mountain provides owing to the fluctuations in temperature between night and day. These variations are generally small but nonetheless measurable.

Today, the receding tongues of Reid Glacier have uncovered evidence that at one time in the not too distant past the glaciers suffered a shrinking back as profound as that now going on. Several years ago a buried forest was discovered on the ridge dividing Reid and Zigzag glaciers at an elevation of 6200 feet. The trees, now pressed flat and buried by glacial debris, measure from 1 to 3 feet in diameter. The nearest living trees of comparable size now grow far down in the valleys. Evidently the glaciers on Mt. Hood at one time receded until their snouts were far up on the mountain or had even vanished entirely for a time. This shrinkage may have coincided with a period of renewed vulcanism. During this time conditions permitted the growth of the now buried forest, which must have stood at an elevation considerably higher than that where it now lies. Eventually conditions changed. Increased rainfall caused packs to grow in size and the glaciers once again advanced down the mountain, overwhelming the trees, carrying and burying them at a point some distance below where they grew. Dr. E. T. Hodge[3] states that Zigzag Glacier may have continued its advance on past the site covered by the forest as far as Salmon Post Office in the Salmon River canyon, a distance of 12 miles. From that farthest point of advance, Zigzag Glacier, along with all the other glaciers on the mountain, has again receded, not yet as far as it once did but given time and a continuation of present climatic conditions, all the glaciers on Mt. Hood may well become a thing of the past in the not too distant future.

Let us suppose that the glaciers on Mt. Hood should become extinct. What would be the effect on the mountain itself, on vegetation, stream flow, and human life in the area? The mountain would perhaps fare reasonably well, bereft of its snowy coat. A glacier is at best a poor guest on any mountain. It continually plucks and carries away large quantities of rock which comprise the very structure of the mountain itself. Having rid itself of its destructive guest, Mt. Hood would suffer the lesser ravages of spring torrents which, implemented with abundant abrasive material in the form of rocks and sand, would carve V-shaped gullies and canyons in the bottoms of the former U-shaped glacial troughs. Most of the snow fields would also vanish - save for a few months in winter and spring.

From an aesthetic standpoint, Mt. Hood would no longer be the object of beauty it now is. Instead of being a mecca for thousands of mountain sports enthusiasts and lovers of snow-covered mountains, Mt. Hood would deteriorate into a mere pile of stone and ash swept by dust clouds, an attraction to only a few of the hardier "rock hounds". The spectacular glacial displays of huge, fractured blocks of ice and snow which form the bergschrund and seracs present on nearly all of Hood's glaciers would be replaced by jumbled piles of stone which formerly constituted the working tools and burden of the glaciers.

Plant life adjacent to the mountain would be adversely affected. The first botanic disaster to occur would most likely be the disappearance of the "red snow plant" or Sphaerella nivalis, a reddish algae which may be seen on snow fields as pinkish patches. These, when stepped on, turn a climber's footprints a bright red. Vegetation on the slopes of the mountain would tend to dry up since the myriad alpine rivulets and streams would cease to flow. Draughts of air, cooled by passage over snow and ice fields, which formerly tempered the summer weather, would give way to dry hot gusts of wind. Forests would dry out rapidly in the spring and low humidity would permit forest fires to level the wooded slopes. Stream flow from the many glacial streams would decrease to a trickle except during the spring months when uncompacted drifts of the previous winter's snow would melt rapidly, creating torrential conditions during which glacial silt and boulders would be deposited over fertile valley floors. Public utilities using water originating on the slopes of Mt. Hood might find that a glacierless mountain not only would fail to

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[3] Hodge, E.T., Stadter Buried Forest: Mazama, Vol. XIII, no. 12, pp. 82-86, Dec. 1931.

provide a sufficient flow of water during summer months, but that the fine silt carried down in the spring would be injurious to turbine blades by virtue of its abrasive quality. Dust storms would probably plague areas surrounding the mountain since it is composed of large quantities of volcanic ash and cinders which would be left exposed by the disappearance of the snow and ice.

The phenomenon of glacial movement has never been completely understood. The original European theory, that movement was accomplished by means of cracking and re-forming of the ice, has been discarded in favor of the theory of melting caused by pressure (which can be demonstrated) followed by re-freezing. This theory leaves some aspects of glacial flow still unexplained, and the final word is yet to be said on this matter.

How fast does a glacier move? That question is perhaps the one most frequently asked by persons viewing a glacier for the first time. To the uninitiated a glacier appears to be absolutely motionless and incapable of any movement. The presence of numerous crevasses and seracs, which are huge cracks and blocks of glacial ice caused by the ice moving over an uneven portion of its rocky valley, indicates even to the novice, however, that a glacier does move. Anyone who has been on a glacier when the ice suddenly cracked loudly due to strains set up by the slow movement of the ice, can never doubt that a glacier is in motion.

In order to determine just how fast some of Mt. Hood's glaciers do move, the research committee of the Mazamas has made numerous studies during the past 20 years. Eliot Glacier, because of its proximity to a road and because it has the longest ice stream of any glacier on the mountain, has been the most carefully measured. Movement measurements taken at various times reveal that a glacier (1) moves fastest in warm weather, particularly during and after a warm rain, (2) moves most slowly in the winter, and (3) moves more slowly at night than in the daytime. Average advance of the snout over a 6-year period was about 30 feet per year. Reduced to daily movements, this would be approximately one inch per day. Maximum rate of movement recorded amounted to 80 feet per year. Counteracting this forward motion is the removal of the surface ice by melting and evaporation. A receding glacier suffers removal of its terminal ice by these means at an average annual rate which is greater than its advance.

Measurements of the rate of flow of the ice at a point about a mile above the snout showed that the maximum rate of flow was in midstream and amounted to nearly 175 feet per year, or about 6 inches per day. The rate of flow was least near the edges of the glacier where the ice section was thinnest and friction of the rocky walls greatest. As would be expected, the ice moved progressively slower as it approached the snout.

Anyone who, upon peering down into a large glacial crevasse, has wondered what the bottom of a glacier is like, can satisfy his curiosity at Reid Glacier. Reid Glacier on the west side of Mt. Hood now is but a tiny ribbon of snow and ice in the bottom of a large valley gouged out in years past when the glacier was fed by a more abundant supply of snow from the catchment basin reaching almost to the summit of the mountain. At many places the nearly vertical walls of this glacial valley have been polished smooth; in others deep grooves have been cut. The floor is strewn with boulders which have fallen from the walls or have been left behind by the retreating ice. From the headwall, which abuts against Illumination Rock, the last vestiges of the once mighty glacier may be seen poised on the edge of an abrupt ice fall. Every so often, huge blocks of ice tumble down to the valley floor with a deafening roar, then all is still on the dying glacier.

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PLATINUM METALS

Ceiling prices of platinum metals were removed by the Office of Price Administration on April 29, 1946. Thereafter there was much hesitancy and confusion in quoting prices on the refined metals. Effective August 5, quotation on platinum was advanced to $80-$83 an ounce; ruthenium was raised to $70; osmium was normally quoted at $100 an ounce on August 15. On June 27 the quotation on iridium was advanced from $95-$100 to $125, which was $40 less than the OPA fixed price. Quotations on palladium and rhodium remained at $24 and $125 respectively. (Extracted from U.S. Bureau of Mines release on platinum metals September 18, 1946.)

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MINING AND MAIL

by

Lewis A. McArthur

In nearly a century of Oregon postal history, the influence of miners, geologists, and metallurgists has been sufficient to produce almost eighty post office names. Many of these names will be of interest to readers of The Ore.-Bin, and a list of them by counties is given below.

There are a number of intrusions in the list and possibly some omissions. The writer strained a point when he listed Rock Creek, Soap Creek, and Arock. These names have no particular mineral significance, but it is probably better to have them in the record than to leave them out. The fact that Jasper was named for Jasper Hills, a prominent Lane County resident, does not detract from the general interest of the name. Oretown in Tillamook County is a synthetic name with Oregon as a base, so readers need not go there with pick and pan.

Post office names only are included in this list.

Baker County: Chloride, Copperfield, Gem, Gypsum, Lime, Rock Creek.
Benton County: Soap Creek.

Clackamas County: Stone, Sandy.
Columbia County: Pebble.
Coos County: Coaledo, Gravel Ford.
Crook County: Silver Wells.
Curry County: Gold Beach, Sandstone.

Deschutes County: Crater, Lava.
Douglas County: Diamond Lake, Nugget, Ruby, Sulphur Springs.

Gilliam County: Alkali, Gumbo, Lone Rock, Oasis, Rock Creek, Rockville.
Grant County: Court Rock, Galena, Granite.

Harney County: Diamond.
Hood River County: Shell Rock.

Jackson County: Agate, Asbestos, Copper, Gold Hill, Gold River, Prospect, Rock Point, Soda Springs.
Jefferson County: Opal City, Warm Springs.
Josephine County: Golden, Granite Hill, Placer, Slate Creek.

Klamath County: Crystal.

Lake County: Hot Springs, Quartz Mountain, Silver Lake.
Lane County: Jasper, Mineral, Natron, Salt Springs.
Lincoln County: Agate Beach.
Linn County: Diamond, Diamond Hill, Lower Soda, Rock Creek, Soda Springs, Soda Stone, Sodaville.

Malheur County: Arock, Ironside, Rockville, Stone.
Marion County: Argenti, Pyrite, Silver Creek, Silverton.
Morrow County: Salineville.
Multnomah County: Sandy.

Polk County: Black Rock, Salt Creek.

Tillamook County: Oretown.

Union County: Hot Lake, Medical Springs.

Wallowa County: Copper.
Wheeler County: Barite.

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IMPORTANCE OF NEW MINES

(From Pay Dirt, publication devoted to the interests of the Arizona Small Mine Operators Association, September 23, 1946.)

Miners in the United States are gratified, even though not satisfied, to see that some countries appreciate the importance of bringing in new mines. It is reported that the Canadian government plans to continue its policy of encouraging new mines by tax exemptions and that, in the budget that is forthcoming shortly, some special provisions for the benefit of the industry again will be included.

Before the war, new mines were given a three-year exemption from income tax. In the war years, strategic mineral mines were required to pay income tax, but were relieved of the excess profits tax. For 1946 the excess profits exemption was extended to include gold mines.

If, as confidently predicted, the excess profits tax is eliminated in the budget, the government will have to look in another direction to maintain the tax advantage for this vital industry.

This line of Ottawa thinking leads to the conclusion that there will be special reductions in the income tax for the industry, particularly for mines coming into production. Another distinct possibility is that the request of the industry for larger depreciation and depletion allowances will be granted.

Canada seems to understand that mining is the one industry that brings in a new, indestructible and permanent wealth. The only new wealth created in any country is that which comes from agriculture, forests, fisheries, stock raising, and mining. While a few of the products of agriculture and the forests have some degree of life, most of them are quickly consumed. It is the products of the mines which add permanent wealth to the country. Thus there are additional reasons why new wealth from new mines should be encouraged by every means possible. Something is created which stays in circulation indefinitely.

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MINERAL LAND TITLE

The following is taken from the News Letter of the Mining Association of Montana, August 1946:

An interesting land title ruling has been made by Montana Attorney General R. V. Bottomly for Musselshell County Attorney J. M. Watts. The county had taken title to a tax-delinquent mining claim, including surface and underground mineral rights, and sold the surface rights only to a purchaser, who claimed he thought the mineral rights went with his purchase, and that the county had no right to divide the property. The Attorney General said that the county had the right to divide the property. The Attorney General said that the county had the right to divide such land any way it wanted to after the advertised sale date. Under state statutes, Bottomly explained, one party - a rancher for instance - could buy surface rights to that type of land, and another could purchase the mineral rights, with the latter having a lawful right to mine or drill under the surface owned by the rancher.

****

"EYE BALL" ASSAY?

We in the mining business have often heard of the "eye ball" assay; now we have an authenticated instance. The United Press sent out the following from San Francisco September 21:

Scientifically, the recent Crescent City gold rush slacked off to a faltering walk today.

The __________Company of San Francisco, one of the nation's leading mineralogy firms, took a look at a sample of red volcanic rock sent to the United Press by one of the "prospectors" and reported: "It contains no trace of gold." (Name of assay firm deleted because of their known reliability and high standing for many years. Ed.)

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BEAVER MONEY AND AN OREGON MINT

The early settlers in Oregon got along without a circulating medium for money. They were self-contained, and barter was used where necessary. As the population increased, however, this lack was felt more and more, and, when the gold came pouring in from California, there was great difficulty for the want of a standard, so that it might be used as a more precise medium of exchange. Also holders of the metal suffered loss by abrasion, etc. The Legislature, which convened early in 1849, determined to do something about this confused condition and passed an act to provide coinage. It allowed $16.50 an ounce for gold of "virgin purity and fineness without alloy". The act also provided for the coinage of 5 and 10 pennyweight pieces. However, the mint did not operate because, before any minting was done, General Joseph Lane, who had been appointed territorial governor by President Polk, arrived and the period of provisional government came to an end.

However, the local needs of the community for coins were supplied in part by private enterprise. Coins of 5 and 10 dollar denominations were issued by the Oregon Exchange Company. On the obverse side these coins bore the figure of a beaver above which were the letters K, M, T, A, W, R, C, S and below was O.T. 1849. The letters are said to be the initials of the names of the men who made up the company---Kilbourn, Magruder, Taylor, Abernethy, Wilson, Rector, Campbell, and Smith. On the reverse side of the coins was Oregon Exchange Company---130 grains native gold, 5 D for the 5 dollar pieces, and 10 pwts., 20 grains, 10 D. on the ten dollar pieces. These coins contained 8% more gold than 5 and 10 dollar pieces of U.S. money and quickly disappeared from circulation when the national money became more common in Oregon, obeying the rule (Gresham's) that inferior money always displaces superior money in circulation.

Later on in the early 1860's when miners were bringing in gold dust in large amounts from the camps of Eastern Oregon and Idaho there was much agitation for a branch U.S. mint at The Dalles. It almost became a reality. The matter is related in the Oregon Historical Quarterly, vol. 25 (1924) under "Reminiscences of Colonel Henry Ernst Dosch" by Fred Lockley, as follows:

> "So much gold dust was coming in that the citizens started an agitation for a mint, and in 1865 Congress appropriated $100,000 and a contract was let for the building of the mint. The rock was brought in from Mill Creek, about five miles from The Dalles. After the first story was completed, Congress decided that the mint at San Francisco was sufficient, and sold the site and building for a song."

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PUMICE PRODUCERS OF CENTRAL OREGON

Mr. Ollie Grub is currently shipping pit run pumice from a deposit on the east side of the Deschutes River near Tumalo.

Mr. Dillon Moore of Bend is shipping pumice from a deposit just south of Bend; shipments are made both to local building-block plants and to California points.

Mr. L. A. Williamson of Bend is operating a custom crushing plant to supply pumice for three concrete-block plants in Bend. Pumice is supplied by Dillon Moore.

Oregon Pumice Products Company of Bend, operated by Waldeen Upp and T. G. Becker, is currently manufacturing concrete blocks using pumice as an aggregate. The blocks and brick are produced with a vibrator-block machine, and present plans call for the erection of a steam drying shed in the near future. Production is limited by the supply of cement which is still difficult to obtain.

Mr. H. W. Christy of Chemult has enlarged the facilities at his plant on the Great Northern Railroad 1½ miles north of Chemult. A bulldozer delivers pit run pumice to a 3/8-inch grizzly with oversize passing through rolls. Gondolas are loaded with a scoopmobile. Mr. Christy plans to enlarge his plant further in the near future.

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THE FOSSILS CALLED "BUGS"

by

R. E. Stewart*

In the parlance of the trade, microfossils are frequently referred to as "bugs", micropaleontology as "bug work", micropaleontologists as "bug men", and micropaleontological reports and publications as "bug reports" and "bug papers".

Perhaps microfossils came by the nickname, "bugs", as a result of their abundance, small size, and myriad variety of form, but one is led to suspect that the name was originally applied by someone seeking to avoid the use of long words which, in addition to involving a lot of verbiage, are inclined to fall into the category of "tongue twisters".

Paleontology, the study of fossils, is commonly divided into three specialized fields: (1) vertebrate paleontology, which deals with the fossil record of animals that had backbones, or spinal columns; (2) invertebrate paleontology, which deals with the record of animals that had no backbones, or spinal columns; and (3) paleobotany, the study of the fossil record of plants.

Micropaleontology is the study of fossils of microscopic size or structure from all three of these groups, vertebrates, invertebrates, and plants.

Among the vertebrate microfossils are:

- Fish scales
- Teeth from fishes and other small animals
- Otoliths and other microscopic bones or bone-like parts

Among the invertebrate microfossils are:

- Silicoflagellata
- Coccoliths and Rhabdoliths
- Foraminifera
- Radiolaria
- Sponge spicules
- Echinoid spines and skeletal parts
- Holothurian elements
- Annelid worm jaws (scolecodonts), plates, and tubes
- Conodonts
- Bryozoa
- Microbrachiopoda
- Micromollusca: pelecypoda, gastropoda, scaphopoda
- Microarthropoda: trilobita, archaeostraca, branchiopoda, ostracoda

Among the plant microfossils are:

- Diatoms
- Algae
- Seeds
- Spores
- Pollen

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*Geologist, State Department of Geology and Mineral Industries.

After reading all of these names, it is not difficult to imagine someone with an aversion to profound vocabulary lumping them all together under the term "bugs" for short.

Vertebrate Microfossils

The vertebrate forms occur frequently in association with other microfossils, but to date most of them have received very little attention or study. Recent work on fish scales[1] has proved their value in correlation, and it seems probable that like attention to microscopic teeth and bones will likewise make them dependable indicators of geologic time and environment.

Scales, teeth, and various types of fish bones are no novelty to the average person, although few realize that they occur as microscopic fossils. For many people, however, "ear-stones" of fishes (otoliths) are something new under the sun. The following interesting historical sketch is quoted from a paper by R. B. Campbell.[2]

> "The micro-examination of Upper Cretaceous and Tertiary deposits frequently reveals small concretions of carbonate of lime not unlike seeds and which show definite sculpturing. These are easily recognized as 'fish otoliths' or 'ear-stones'. ...
>
> "As is the case with many fossilized forms we find that Aristotle, Pliny, and other Greek and Roman scholars were familiar with the otoliths of fishes. They contented themselves with noting their occurrence. Characteristically during the Middle Ages these fossils were regarded with superstition and they were frequently borne as amulets. Some, called St. Peter's Stones because they bore the imprint of St. Peter's keys, were comparatively recently to be found in apothecary shops. In this connection they were used as a preventative and cure for colic and headache.
>
> "Even after these otoliths began to be studied by men of science strange ideas concerning them were entertained. It was even the opinion of some that these stones in the heads of fishes frequently brought about their death by attracting the cold in winter thereby causing their brains to freeze. Gradually more tenable explanations were offered and it was recognized that there was some connection with the hearing of fishes, the existence of which sense had hitherto been denied.
>
> "Klein (1740) showed the existence of otoliths in thirty fish and was of the opinion that these otoliths correspond to the little bones found in the ears of higher vertebrates (Hammer, Anvil and Stirrup). This view ... was adhered to down to Cuvier's time. Though Cuvier occupied himself but little with fish otoliths he ascertained that they have nothing to do with bones but consist of carbonate of lime ... . He also regarded them as having excellent characteristics for the differentiation of species ... ."

Otoliths were not "made use of in the science of paleontology or stratigraphy until in 1884 Professor Ernst Koken of Berlin published"[2] on otoliths from the Oligocene of north Germany and the Oligocene and Eocene of Mississippi and Alabama.

Since Koken the otoliths have not been given much attention by workers in the field of stratigraphy and "the literature has grown mainly with the work of Bassoli in Italy, Priem in France, and Schubert in Austria."[2]

---

[1] David, Lore Rose, Use of Fossil Fish Scales in Micropaleontology, Carnegie Institution of Washington Publication 551, pp. 25-43, pls. 1-6, figs. 1-9, July 18, 1944. Reprinted as Contribution No. 353, Balch Graduate School of the Geological Sciences, California Institute of Technology (Pasadena).

[2] Campbell, R.B., Fish Otoliths, Their Occurrence and Value as Stratigraphic Markers, Jour. Pal., Vol. 3, No. 3, pp. 254-257, Sept. 1929.

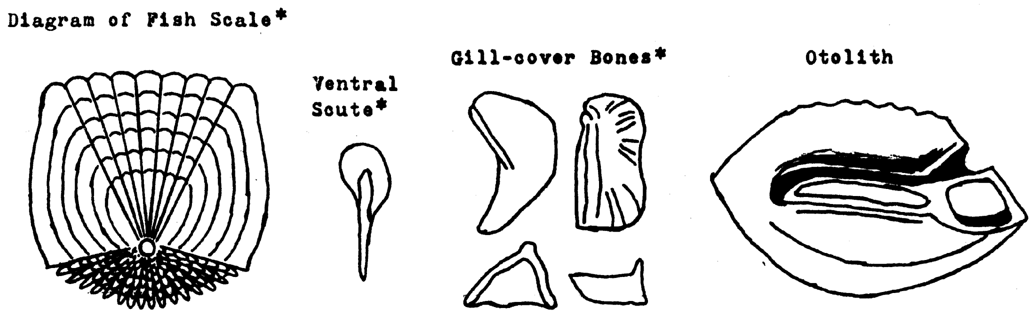

Fig. 1. Diagrams of Fish Microfossils

Single-celled Invertebrate Microfossils

The first five invertebrates listed belong to a major group or phylum of the animal kingdom called Protozoa. The Protozoa are unique among animals, in that all of them have one-celled bodies. All other animals are composed of many cells which are variously grouped to form specialized organs, such as those of sight, hearing, respiration, and digestion, and these cells differ one from another in accordance with the places they are to occupy and the purposes they are to serve in the functioning of the animal body. The living human body has been likened[3] to "an organization of 27 million million cells which live and work, die and disappear individually." 27,000,000,000,000 cells, that is! The protozoan is but 1.

The simple structure of the protozoan animal body stands in marked contrast to the myriad varieties of the tests or shell-like parts that are formed by most of these tiny creatures. In nearly all cases it is these hard parts that are found as fossils, and thousands of different forms (species) have been recorded - each having developed with the growth of a tiny single-celled protozoan.

Silicoflagellata

The following is quoted from a paper by Dr. G. D. Hanna.[4]

> "The Silicoflagellata form a small but exceedingly interesting order or class of protozoan animals. They have siliceous skeletons of unique structure and are known with certainty only from the upper Cretaceous to the present time. A few species are found living, widely distributed, near the surface of the sea, where they form a minor portion of the plankton.
>
> " ... the silicoflagellata as a group furnish most trustworthy horizon-markers ...
>
> "The features which make the silicoflagellates valuable as markers are: (1) they are usually common when they occur at all; (2) species are exceedingly limited as to number in any formation; (3) the species have a very short geological life; (4) being pelagic (free floating) in habitat they have a very wide geographic distribution; ....; (6) species are so distinct that they can be readily identified, and integration does not appear to have been noticed. In short these organisms are almost the paleontologist's ideal of marker-fossils."

Hanna points out, however, that these forms have not received the attention and study that they deserve.

3Harvey, B.C.H., Simple Lessons in Human Anatomy, American Medical Association (1931), p.270.
4Hanna, G. Dallas, Silicoflagellata from the Cretaceous of California, Jour. Pal., Vol. 1, No. 4, pp. 259-260, Jan. 1928.
*David, L.R., op. cit., p. 28.

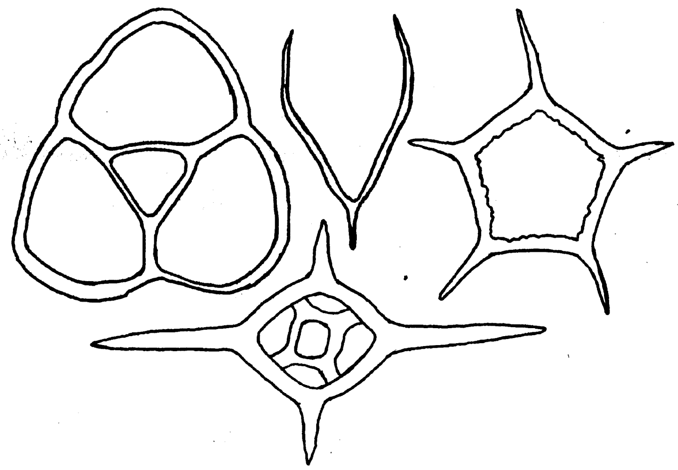

Fig. 2. Outline drawings of Silicoflagellata. Magnifications range from x375 to x650.

Coccoliths and rhabdoliths

There is a difference of opinion among investigators as to the true nature of small calcareous discs (coccoliths) and spicular bodies (rhabdoliths) which occur abundantly in modern marine-bottom deposits. Similar bodies have been recorded as fossils from rocks as old as the Cretaceous. Coccoliths and rhabdoliths are not visible under magnifications of much less than 700 diameters.

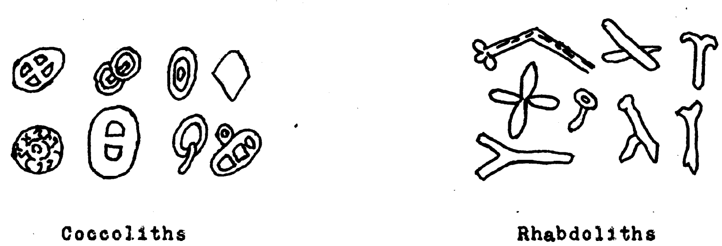

Fig. 3. Coccoliths and Rhabdoliths. Magnifications about x1200.

Foraminifera

Foraminifera are typically aquatic (water living) protozoans of microscopic size, although a few species are known to have attained sizes up to several inches in diameter. All except a few of the simplest forms secrete perforated protective and supporting skeletons called tests, and it is from this perforate or foraminate characteristic that the foraminifera get their name. Most tests are calcareous; a few completely siliceous. In many species the tests are composed of such foreign materials as sand grains, mica flakes, sponge spicules, or even other foraminiferal tests, more or less firmly cemented together by a secretion which may be calcareous, siliceous, ferruginous, or chitinous. One of the most primitive tests of all is composed solely of chitin.

Architecturally the tests may vary through a multitude of forms from a single simple chamber to a complicated, variously coiled multi-chambered structure. The following five plans or some modification of them are the characteristic arrangements for chambers in nearly all foraminiferal tests: single chambered, linear series, biserial series, plano-spiral coil, trochoid coil.

On the basis of ornamentation, also, there are thousands of easily recognized forms. Raised costae (ridges), knobs, spines, striations, and coarsely perforate areas form the most common types of ornamentation.

Numerous other variable details of the test structure such as details of the apertures, sutures, and general shape are used in distinguishing between genera and species of the foraminifera.

A few species live in fresh or brackish water, but the great majority are marine. About twenty-five species are pelagic and float at or near the surface of the ocean. Most species, however, are bottom dwellers, some being attached to plants, rocks, and other objects while others are free to crawl slowly about on the muds and oozes of the ocean bottom. In shallow waters today foraminifera are so abundant that the tests sometimes form obstructing shoals. The Globigerina oozes of the ocean depths are composed largely of foraminiferal tests. Thick limestones in Paleozoic and younger formations are composed largely of fossil foraminifera. The great pyramids of Egypt are constructed of such nummulitic limestones.

Fossil foraminifera occur from the Cambrian to the Recent and are abundant in rocks younger than the Devonian. Species have definite geologic and geographic ranges, and when these are known in detail it becomes possible to determine the age of sediments and the conditions under which they were deposited.

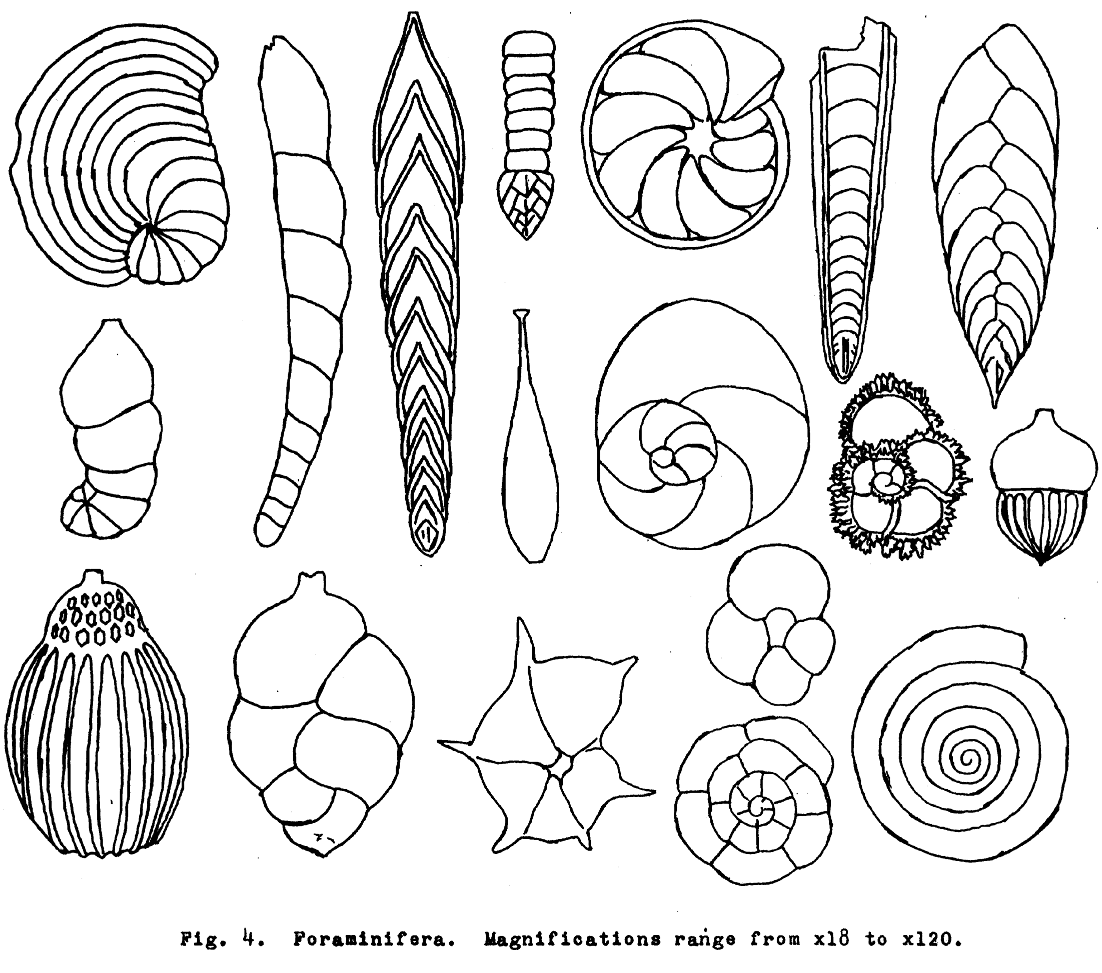

Fig. 4. Foraminifera. Magnifications range from x18 to x120.

The first discovery of foraminiferal tests was made by Janus Plancus[5 & 6], in 1730, on the beach of Rimini, Italy, and in the following year Beccari[6] made the first discovery of fossil foraminifera in the Pliocene of Bologna. Since then many workers have studied this group, and a voluminous literature has been built up. Previous to about thirty years ago, however, these studies were pursued primarily on an academic or pure science basis, with little thought for any practical economic application which they might have.

During the past thirty years the petroleum industry has spent millions of dollars on research in micropaleontology and its application to the discovery and production of oil and gas, and as a result of this work the foraminifera have come to take first place among fossils used in stratigraphic and structural geology. In 1940[7] it was estimated that more than one million dollars was being spent each year on the operation of oil-company paleontological laboratories. The value of micropaleontology as a tool in geologic mapping and other requirements of academic and economic work has been so conclusively demonstrated by the results of this application to petroleum geology that many progressive colleges and universities, government geological surveys, and purely research organizations have incorporated it as one of their major projects, and others are reported planning to do so.

Radiolaria

Last on our list of Protozoa are the radiolaria. These are minute single-celled animals which usually form exceedingly delicate siliceous skeletons that are typically spherical, discoidal, helmet-, cap-, or flask-shaped and variously ornamented with spines, bars, and lattice-work patterns.

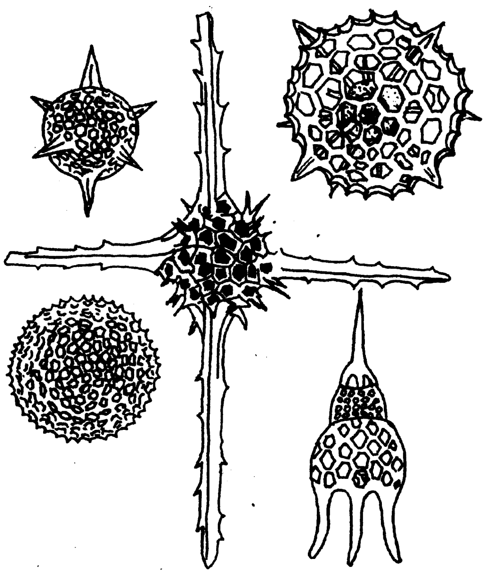

Fig. 5. Radiolaria. Magnifications about x6 (center fig.) to x250.

Radiolaria are exclusively marine organisms and are found in vast numbers at all oceanic depths. As fossils they date back to the pre-Cambrian, and, according to Barrios[8], they are the oldest of all known animal organisms, since they occur plentifully in the bituminous quartzites of Brittany, interbedded with pre-Cambrian gneiss. Although less frequently encountered in the fossil state than foraminifera, radiolaria have rather common occurrence and in some cases appear to have considerable value as guide fossils.

(To be concluded in November issue.)

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5 Plancus, Janus (Giovanni Bianchi), Ariminensis de conchis minus notis Liber, cui accessit specimen Aestus reciproci Maris Superi ad littus portunque Arimini, pp. 1-88, pls. I-V, Venetiis, 1739.

6 Zittel, Karl A. von, Text-Book of Paleontology, Second Edition Revised, edited by Eastman, Charles R., Vol. 1, p. 24, McMillan and Co., Ltd., London, 1927.

7 Schenck, H.G., Applied Paleontology, Bull. Amer. Assoc. Petrol. Geol., Vol. 24, No. 10 (October 1940) p. 1759.

8 Zittel, Karl A. von, op. cit., p. 43.

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SENATOR W. H. STRAYER

An Appreciation
by
E. B. MacNaughton

W. H. Strayer's life was a long and fruitful one. He was of that type of forthright citizen of which we need more and more and seem to see less and less. He sponsored many important undertakings in this state. Standing high on the list of his achievements is the State Department of Geology and Mineral Industries.

His mind conceived the plan of the Department and it was his effort which won legislative approval for that plan. He was appointed a member of the first Commission and was elected its first Chairman, a post he filled up to the time of his death.

It was my privilege to be with him on the Commission in the beginning years of its work and, as was the case with everyone who worked closely with the Senator, he won my confidence and my admiration as a farseeing, honest, and capable administrator and counselor.

Senator Strayer loved Oregon and he never overlooked an opportunity to develop the resources of the state. That deep interest explains his great contribution to the Commission's record.

It can be said of him and his work on the Commission, as it was of Christopher Wren, who designed and built St. Paul's cathedral in London, if you want to see his memorial, look around you.

****

NEW TEXAS COMPANY TEST

Texas Company geologist, Dr. F. D. Bode, announced on October 23 that his company would drill a test at a location near Mist in Columbia County. The legal description of the location is 3042 feet north and 1030 west of the southeast corner of sec. 19, T. 6 N., R. 4 W. The name of the test will be Clark and Wilson No. 6-1. A road was built to the location last spring. The drilling will be done by contract and it is expected that the hole will be spudded in about the first of the year.

****

OREGON BAUXITE EXPLORATION

Exploration of Oregon ferruginous bauxite by Alcoa Mining Company is being conducted at about the same tempo as that of the past year. Four drills are working in Columbia County in areas that will require several months to drill out. Oregon headquarters of the company are at Hillsboro.

****

COAL BRIQUETS WITHOUT BINDER

A method of briquetting coal without outside binder has been developed by the Illinois Geological Survey. Studies have been made using a commercial scale unit of special design. Among a number of procedures, one has been recently developed whereby minus 10-mesh coal is first briquetted under high pressure at room temperature, then partially devolatilized. According to an announcement by the Survey, the resulting briquets are firm and meet commercial standards of smokelessness as shown by combustion tests in a conventional heating stove.

****

PUMICE PRODUCED

The pumice operation of H. W. Christy, located on the Great Northern railroad about 1½ miles north of Chemult in Klamath County, has been stepped up recently. Loading facilities have been greatly improved. A bulldozer delivers the pumice from a pit to a 3/8-inch grizzly mounted at the top of a short incline. Oversize passes through rolls. Finished product is loaded on gondolas with a Scoopmobile. Some of the pink volcanic ash from a deposit located between the highway and the Southern Pacific railroad due west of the plant is added to each car shipped. The ash is said to serve as a natural cementing agent which materially reduces the amount of cement required. The deposit of ash is said to be at least 70 feet deep.

Christy holds numerous claims in the area surrounding his plant. He plans to enlarge his operation in the near future by increasing his siding to hold 15 cars and by installing a suction-hose loading device which would deliver pumice from pit to cars or crusher.

Present freight rates from Chemult for a minimum car of 70,000 lbs., based on a 1000 lbs. per yard agreement, are 34¢ per 100 lbs. to San Francisco, 32¢ per 100 lbs. to Medford, and 13¢ per 100 lbs. to Portland.

Shipments are being made to California points principally, with some cars going to Seattle, Klamath Falls, and Portland.

Although pumice blocks and brick were formerly manufactured at this plant, only bulk pumice is being shipped now.

****

OREGON QUICKSILVER MAP

All known quicksilver deposits in Oregon are shown in red on a black and white map of the State which has just been issued by the State Department of Geology and Mineral Industries. The map on a scale of four miles to the inch was prepared by Mr. Francis Frederick, consulting mining geologist of San Francisco, who studied Oregon quicksilver deposits in 1943 and 1944. In addition to showing location of these deposits, the map has a table in the margin which lists all mines according to counties and the amount of their total production.

This map may be obtained at the Portland office of the Department at 702 Woodlark Building, or at the field offices located at Baker and Grants Pass. The price is 25 cents postpaid.

****

BUFFALO MINE SOLD

The well-known Buffalo Mine, located north of Granite in eastern Grant County, has been sold by Bruce Dennis, operator of the property for the past eight years, to E. R. Ramsey and Alan Kissock of New York according to the Record-Courier, Baker, under date of October 24.

The Buffalo Mine, under Mr. Dennis and Frank Allen, superintendent, has been producing steadily for a number of years except during some of the wartime years when gold mines were closed by Government order. An extensive development program is planned by the new owners. High grade encountered in development work will be stored during the winter for shipment in the spring. Mill ore will be stockpiled against operating the mill when the roads are opened. Mr. R. G. Amidon is superintendent for the new owners.

****

MORMON BASIN PLACER OPERATION

The Placeritas Mining Company - a partnership among A. N. Crawford, Huntington; Arman Schrieber, Placerville, California; and Ernest Schrieber, Los Angeles - has tested the Colt estate placers in Mormon Basin, located about 22 miles west of Huntington, and is installing equipment. Mormon Basin placers were worked in the early 1860's by hydraulicking operations but were handicapped by lack of gradient and a limited water supply. Operations planned by the Placeritas Company will have the advantage of dragline equipment and a floating washing plant. All heavy equipment has been delivered to the property. The plant is in process of being installed.

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THE FOSSILS CALLED "BUGS"*
by
R. E. Stewart**

Many-celled Invertebrates

The remainder of the invertebrates listed on page 69 belong to various major groups or phyla of the animal kingdom, but all have one feature in common which distinguishes them from the Protozoa: the animal body in each case is multicellular (made up of many cells), whereas the protozoan is always a single-celled animal.

Sponges

The sponges comprise a group of multicellular, chiefly marine animals, the body form of which tends to be vase-like. Most modern sponges secrete skeletons of fibrous, horny material frequently reinforced by hollow siliceous or solid calcareous spicules of various shapes. In many of the older extinct species the spicules were thicker and united to form a solid trellis or framework. Sponges are sessile (attached) bottom-dwellers. Calcareous sponges predominate in shallow coastal waters; many of the siliceous forms inhabit moderately deep to deep water. Due to their usual poor state of preservation and the difficulty of identifying them accurately, sponges are somewhat limited in value as index fossils.

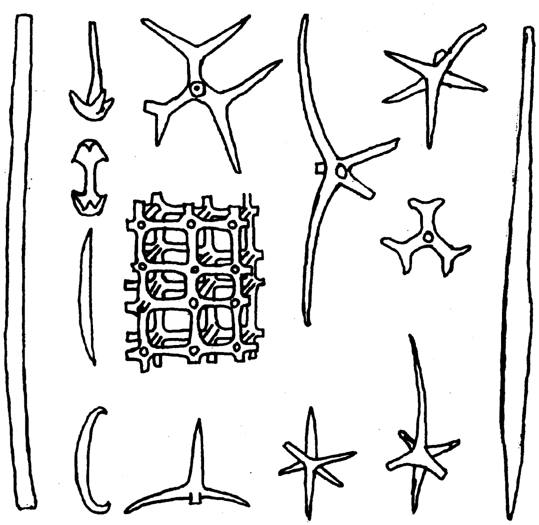


Fig. 6. Sponge spicules. Magnifications range from x12 to x36.

Corals

In the sense that magnification is frequently required in the study of their internal structure, corals should perhaps be included in any list of microfossils. However, since determinable minute individuals or parts are not commonly encountered or dealt with in microfossil studies, they are given only passing mention here.

*Continued from October issue.

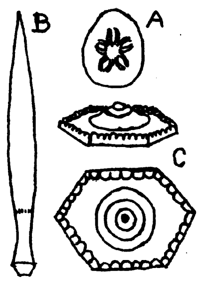
**Geologist, State Department of Geology and Mineral Industries.

Echinoderma

Similar mention should be given to the fact that crinoids (sea lilies) and several other groups belonging to the phylum Echinoderma (spiny-skinned animals) may eventually come to have important application in micropaleontology. Crinoid, echinoid and holothurian fragments have already received some attention. Whether any of the Echinoderma will become important microfossils in other than fragmental form remains to be seen. At present we know them primarily as megafossils.

Echinoids

Echinoids (sea urchins) are marine animals with hollow, subglobular to discoidal shells or tests composed of numerous thin, closely joined calcareous plates to which are attached superficial spines. A species with which most people are familiar is the "sand dollar" so commonly found on our present-day beaches. Unlike sponges, corals, and crinoids, which remain attached throughout their lives, echinoids are unattached and free to move about in and upon the sand, silt and mud of the ocean bottom. The depth range of living echinoids is from low water to nearly 18,000 feet.



Fossil echinoids range from Ordovician to Recent, but they are of importance as index fossils only since the Cretaceous. Only the plates, spines and a few separate skeletal parts are small enough to be classed as microfossils.

Fig. 7. A, Very small echinoid. Natural size. Most echinoids are much larger than this. B, Echinoid spine. Some are as large as this; many much smaller. C, Ambulaceral plate from a large echinoid. Some plates are larger than this; many much smaller.

Holothurians

Croneis and McCormack[9] have given a good general description of holothurians, a portion of which is here quoted.

> "The holothurians (sea cucumbers) are stubby, worm- or cucumber-like creatures, varying in length from less than an inch to more than three feet. ... They constitute a fairly sharply defined group of marine invertebrates that is represented in modern seas by about 750 known species. They are especially abundant in tropical waters, but occur in temperate and polar seas as well; many of them form a part of the benthos, some indeed, being found as high as high water mark, but others have been dredged from depths as great as 2900 fathoms.
>
> " ... Their future potential importance to the paleontologist results chiefly from the fact that their body wall is generally beset with calcareous particles, which have been found (though heretofore quite generally unrecognized or disregarded) in strata of several geologic periods.
>
> "The calcareous bodies of the Holothuroidea are usually microscopic, but plates several millimeters across occur. Their shapes and sizes differ to such an extraordinary degree in the various genera and species that they constitute one of the fundamental bases for classification in the group. Indeed, the plates assume such unusual forms that we are convinced that many of them, although observed by the micropaleontologist, have been looked upon as indeterminate objects."

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[9] Croneis, C. and McCormack, J., Fossil Holothurioidea, Jour. Pal., Vol. 6, No. 2, pp. 112-114, June 1932.

A number of the different calcareous parts are then noted, their names depending partly upon their locations and functions and partly upon their general shapes; military granules, supporting rods, rosettes, plates, tables, anchors, baskets, cups, wheels, hooks, and others.

Fossil holothurians are rather sparsely scattered through the geologic column from Cambrian to Recent.

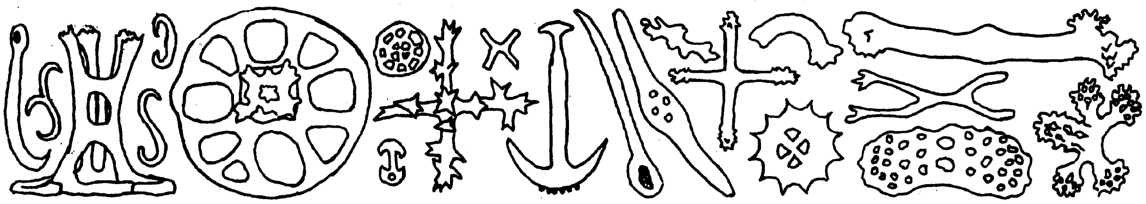


Fig. 8. Holothurian elements. Magnifications approximately x250.

Annelid worm jaws (scolecodonts), plates and tubes

Annelid worms are elongated, segmented, bilaterally symmetrical animals, some of which are marine and some non-marine. The non-marine forms are unknown as fossils, and therefore do not concern the paleontologist.

Marine annelids are equipped with small silico-chitinous jaws and denticulated plates called scolecodonts which are frequently preserved as lustrous black fossils, and are unaffected by ordinary weak acids. Chitinous, scalelike surface plates and agglutinated chitinous or arenaceous tubes are also occasionally preserved, but their occurrence as fossils is rather rare. However, the small shiny black jaws may appear in rocks of all ages from Cambrian to Recent, and are especially common at many horizons in the Middle Paleozoic. The marine annelids have a questionable fossil record in the pre-Cambrian.

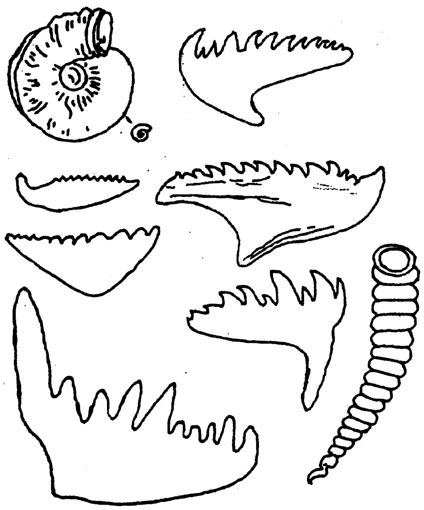


Fig. 9. Scolecodonts and annelid tubes. Magnifications x16 to x45, except tube at lower right which is about x3.

Conodonts

Conodonts, which comprise another group of toothlike microfossils, appear in marked abundance in the rocks of certain parts of the geologic column, and, within their restricted range, are very valuable tools in micropaleontology. Important differences between conodonts and scolecodonts are: (1) conodonts are composed of calcium phosphate, whereas the material of scolecodonts is chitin and silica; (2) although unaffected by acetic acid, conodonts are quickly destroyed by weak hydrochloric acid, whereas scolecodonts are unaffected by ordinary acids; (3) conodonts, although usually shiny, are translucent or nearly transparent and range in color from pale amber to light brown, as distinguished from the opaque, highly lustrous blackness of scolecodonts; (4) the known geologic range of the conodonts is confined to the Paleozoic, while that of the scolecodonts extends from the Cambrian, possibly pre-Cambrian, to the present time; (5) the derivation of conodonts is uncertain, but scolecodonts are known to be the jaws of annelid worms.

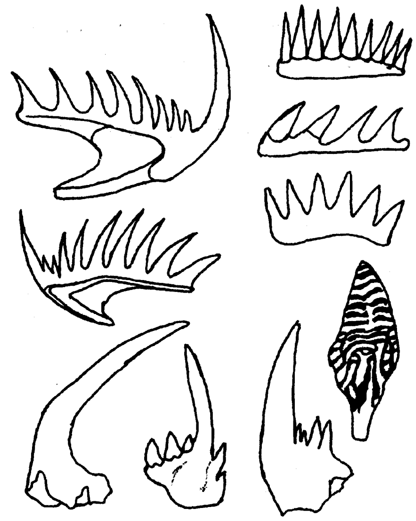


Fig. 10. Conodonts. Magnifications in the order of about x25 to x35.

Conodonts have been variously attributed to vertebrates, annelids, gastropods, cephalopods, and crustaceans, but they are now rather generally assumed to represent the jaw armor of an extinct group of primitive fishes. The fact of the matter is, however, that nobody knows for sure just what they really are.

Their native environment appears to have been in moderately shallow water near shore, possibly near the mouths of inflowing streams.

Bryozoa

The Bryozoa, whose name is derived from the Greek meaning moss animals, fall into somewhat the same category as the corals in the sense that magnification is more frequently applied to the study of the internal structure of their megascopic remains than to the study of separate microscopic individuals. The difference here, however, is that with the Bryozoa what appear to be megafossils are in reality colonies composed of many microscopic individuals variously grouped or linked together, whereas with the corals the megascopic forms frequently represent single individuals of very considerable size. With few exceptions, Bryozoa live associated in colonies, and the few that do not are minute in size. Bryozoan megafossils are colonies of Bryozoan microfossils.

The colonies display infinite variety of form. Of common occurrence are plantlike tufts and branching stems and fronds of various types, the branches at times forming regular and beautiful open-mesh lacework. Other forms spread over shells and various foreign bodies in the form of delicate interwoven threads, crusts of exquisite pattern, and nodular, globular and hemispherical masses of considerable size.

Most Bryozoa are marine and are attached throughout the greater part of their lives to the bottom and to various extraneous objects at all oceanic depths. A few genera live in fresh water. Their food consists chiefly of diatoms, infusorians and larvae. Their geologic range is from earliest Ordovician to the present time.

Brachiopoda

The Brachiopoda comprise a group of exclusively marine animals whose shells consist of two parts or valves so fastened together as to open and close like those of a clam. Clams, however, are not brachiopods. Brachiopods are found at all oceanic depths and are usually attached to various objects by extending muscles or by cementation. Their known geologic range is from lowermost Cambrian to the present, with maximum development in the Silurian and Devonian, and they have furnished many important index fossils. Microbrachiopods have not as yet received much study, but it is not improbable that the future will see many of them added to the already long list of important larger forms.

Mollusca (Pelecypoda, Gastropoda, Scaphopoda)

The major group or phylum, Mollusca, contains five subgroups or classes, all of which are best known from their megascopic forms. Three of these, however, the Pelecypoda, Gastropoda, and Scaphopoda, frequently appear in microfossil material and are therefore included here.

Pelecypoda

Pelecypoda are clams and similar animals with bivalve shells, many of which have common occurrence on our present-day beaches. They live in both fresh and salt waters in all parts of the earth, at all depths, and under all ordinary temperatures. Their known stratigraphic range is from the Ordovician to the present, with questionable occurrence in the Cambrian. Although micropelecypods have as yet received but minor attention in paleontologic literature, future study will doubtless show that they have some value in stratigraphic paleontology.

Fig. 11. Pelecypoda.

Gastropoda

The Gastropoda or snails have a worldwide distribution as both fossil and living land, marine and fresh-water animals. Of all the molluscs they exhibit the most manifold variety. Their record begins in the Cambrian and they are today at the height of their development and vigor. Literature on the megascopic fossil and living forms is voluminous. The microscopic forms have received considerable attention, but they merit and will doubtless receive much more study in the future.

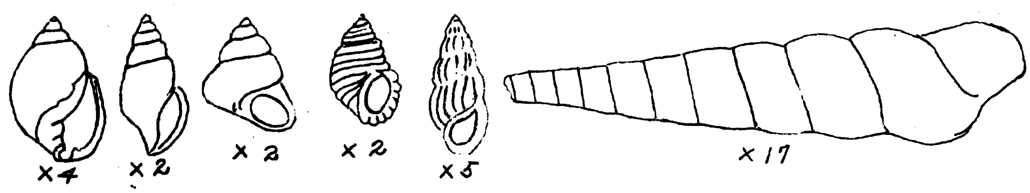


Fig. 12. Gastropoda.

Scaphopoda

The scaphopod shell is tubular, generally somewhat curved (toothlike), and open at both ends. Scaphopods are exclusively marine dwellers, and for the most part inhabit deep water. They range from the Ordovician to the present time, but are of minor importance as stratigraphic horizon markers.

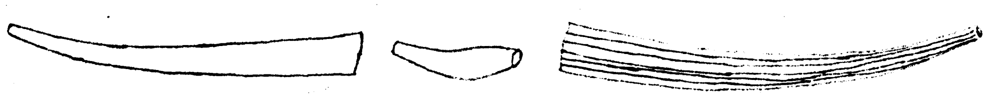
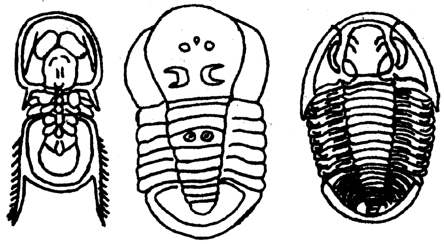


Fig. 13. Scaphopoda. Magnifications about x3.

Arthropoda (Trilobita, Archaeostraca, Branchiopoda, Ostracoda)

The phylum Arthropoda contains five classes, one of which, the Crustacea, contains four subclasses from which microfossils are known. Another of these classes is the Insecta. Among the Arthropoda, therefore, we find a possible source of suggestion for the term "bugs" as applied to microfossils, since a dictionary definition for "bug" is, "In popular language ... any animal resembling an insect, such as a spider or small crustacean ... A micro organism ..."

Trilobita



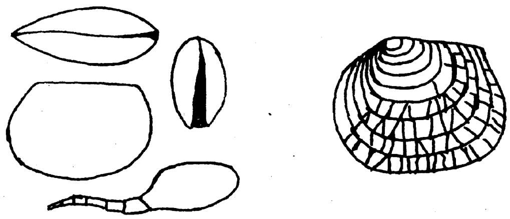
x5 x3 x1

Fig. 14. Trilobita.

No Trilobites are known to have lived since Permian time. From their fossil remains, however, it appears that they were marine dwellers inhabiting relatively shallow to deep waters, where they swam, crawled, and sometimes lived practically buried in the soft bottom mud. Their distribution was world-wide.

Trilobites had their origin in the pre-Cambrian, attained maximum development in the Cambrian and Ordovician, then waned in both numbers and variety to become extinct in the Permian. They constitute one of our most important fossil groups, but to date owe their importance primarily to megafossil forms. Microtrilobites should, and doubtless will receive further study.

Archaeostraca and Branchiopoda



Archaeostraca x4 Branchiopod x8

Fig. 15.

The Archaeostraca and Branchiopoda are of minor importance in paleontology, but many of them have small bivalve shells or carapaces much like those of ostracods and micropelecypods. Distinguishing features have to do largely with the animal body; sometimes with the material, shape, or ornamentation of the test. The Archaeostraca are extinct. The Branchiopoda range from Cambrian to Recent, their present day forms living mostly in fresh water and salt lakes.

Ostracoda

The ostracods constitute one of our most important microfossil groups, and in some areas and some parts of the geologic section rank with the foraminifera as index fossils. They occur abundantly in fresh, brackish, and salt waters from strand line down to depths of about 500 feet. Some occur at greater depths, but for the most part ostracods are not deep-water animals. Some are very active free swimmers while others crawl about on the bottom or on weeds and various other objects in the water. From the accompanying figures it is evident that it is a far cry from the simple, single-celled protozoan to the complex little animal that occupies the bivalve shell of the ostracod.

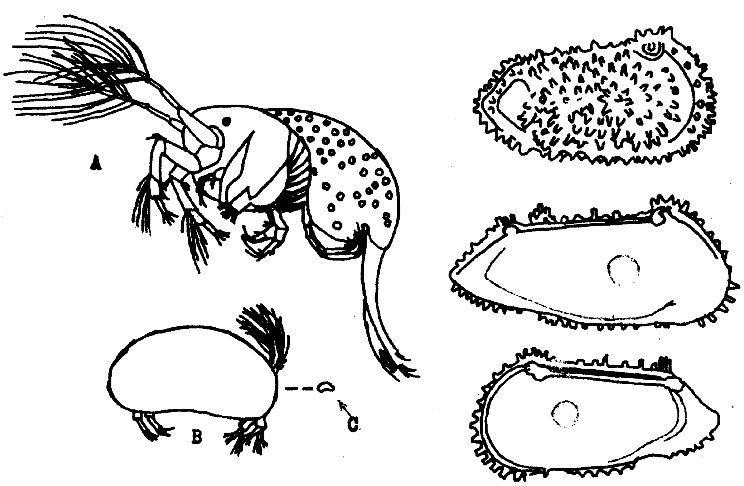


Fig. 16. Ostracoda. Magnifications of 3 figures at right about x40.

Figure 16-A is an enlargement of the animal that occupies the shell of figure 16-B, and figure 16-C shows the approximate actual size of the shell represented by figure 16-B. The geologic range of the Ostracoda is from Ordovician to Recent.

Plant Microfossils

The fossil record of plants extends back into geologic history as far as that of animals. For the most part plants are less commonly encountered than animals, however, and they are but sparsely represented in strata older than the Pennsylvanian.

Diatoms

Most important among the microfossil plant forms are the diatoms. They are single-celled, largely pelagic, fresh-water and marine plants whose fossil record dates back to the Cretaceous where they are found so highly developed as to indicate an earlier period of evolution. They are important rock builders and are believed to have been the source of most of the petroleum in California. Their siliceous skeletons display an infinite variety of forms, and within their known geologic range are excellent horizon markers. In places they have accumulated in very extensive deposits which are mined for a variety of industrial uses.

Algae and miscellaneous forms

Calcareous algae are very important rock builders on present day "coral" reefs and probably were of equal importance in the construction of ancient reefs. Their fossil record extends from the pre-Cambrian to the present. They give promise of being useful in correlation and as indicators of environmental conditions, but need much more study than they have received to date to develop their full possibilities along these lines.

Various other plant forms such as seeds, spores, and pollen are found as microfossils, and have some correlative importance in geological work.

The reader who desires further information on microfossils is referred to the following two publications, both of which contain extensive bibliographies as well as much authentic information and many excellent illustrations.

Cushman, Joseph A., Foraminifera, Their Classification and Economic Use, 3d ed., VIII + 480 pages, 78 plates, 8 text figs. Harvard University Press, 1940.

Shimer, Harvey W. and Shrock, Robert R., Index Fossils of North America, IX + 837 pages, 303 plates, 5 text figs. The Technology Press, Massachusetts Inst. of Technology, 1944.

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COLUMBIA COUNTY GEOLOGY DESCRIBED

The geology of the St. Helens quadrangle is described in Bulletin No. 31 which has just been issued by the Oregon Department of Geology and Mineral Industries. The area covered is from 25 to 40 miles north of Portland in Columbia County and extends about 10 miles west of the Columbia River. The extreme northeastern part of the quadrangle is in Washington.

The area is important economically because it contains limonite iron ore and ferruginous bauxite deposits. Both structural geology and the stratigraphy outlined in the bulletin are important in the studies of oil and gas possibilities.

Bulletin No. 31 was prepared to supplement and accompany the geologic quadrangle map issued by the Department last spring. Joint authors of both the bulletin and the map are W.D.Wilkinson, Oregon State College, and W.D.Lowry and E.M.Baldwin of the Oregon Department of Geology and Mineral Industries.

Both the bulletin and the map may be obtained from the Department at 702 Woodlark Building, Portland, and from the field offices at Baker and Grants Pass. Price of the bulletin including the map is 45 cents postpaid.

****

OREGON GOLD PRODUCTION

According to a release of the Metals Economics Division of the U.S. Bureau of Mines, dated November 5, 1946, production of gold in Oregon during September 1946 was 1,800 ounces. Total production for the first 9 months of the year was 12,981 ounces.

****

MELTING GLACIER UNCOVERS SILVER

(From the Oregonian, Portland, November 9, 1946)

Hot weather on the west coast of Canada recently melted the blueish-white blanket of ice at the foot of a glacier in British Columbia. As a result the Dominion has a new silver mine.

The new find - at a time when silver prices have zoomed to better than 90 cents an ounce, causing a rush among prospectors - is said by the Financial Post to contain one 800-foot vein of rich ore. (Editor's note: There is no thought of attempting to connect this news item with the article in the September Ore.-Bin on "Mount Hood's Vanishing Glaciers")

****

ALUMINUM PREFABS

Assembly line methods may soon be applied to the production of aluminum houses in order to ease the present housing shortage in southern California. Harry Woodhead, president of Consolidated Vultee Aircraft Corp., said his company has under construction at the Vultee Field Division, Downey, California, a prototype of the aluminum home. The two-bedroom house and lot are expected to sell in the $7000 to $8000 range. When the program gets fully underway next spring, Convair expects to turn out 80 to 100 houses a day. Douglas Aircraft Company is reported as also considering the possibilities of building a prefabricated aluminum house. (From West Coast Edition of the Iron Age, October 24, 1946.)

****

CLEARING HOUSE

CH-88: For sale or lease, diatomaceous earth deposit in Del Norte County, California, located on Redwood Highway, 44 miles southwest of Grants Pass. Information and samples may be obtained from Philip L. Swager, 1245 W. 74th Street, Los Angeles 44, California.

CH-89: Mr. I. N. Shults, P.O.Box 127, Medford, Oregon, wishes to buy a 25-ton rotary quicksilver furnace.

****

SUMPTER VALLEY NARROW GAUGE ABANDONED

(From The Record-Courier, Baker, Oregon, November 7, 1946)

The Sumpter Valley Railroad company, according to a report from Washington, received authority from the Interstate Commerce commission to abandon the 57-mile rail line from South Baker to Bates and to substitute truck service over a different route. The yard switching and interchange facilities will be retained at Baker to serve the local mills.

Application for abandonment of the 57-mile railroad was filed April 10, 1946, on the grounds that operation of the Oregon Lumber company mill at Bates, with production severely cut under the sustained yield program of the forest service, could not provide for the expenses of railroad operation and maintenance.

The march of progress will remove one of the few and famous narrow gauge railroads left in the United States. The Sumpter Valley line construction started in 1890 was an important early day venture to tap the rich timber and mining resources of southwestern Baker county and adjacent areas in Grant county. The section from Baker to McEwen was completed in the spring of 1892, the line being extended to Sumpter during the years 1895 to 1897. The line was completed to Whitney in 1901, to Tipton in 1904 and to Austin the following year. In 1910 the railroad reached on to Prairie City and carried both passenger and freight until the line from mile post No. 62 to Prairie City was abandoned in January, 1933. Passenger service on the Sumpter Valley has been negligible in recent years and was discontinued in 1937.

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****

THE COPPER CONTENT OF CERTAIN OREGON MINE WATERS

by
William E. Caldwell[1] and Donald Sumner[2]

The water that runs from or is pumped from most copper mines contains some dissolved copper mainly as copper sulfate. The amount of copper in water from a given mine is dependant on many factors, some of which are: magnitude of the ore body, nature of the ore body minerals, amount of moving ground water and the oxidizing quality of such ground water, the porosity of the ore body, and the volume of underground workings exposing the ore and trickling water to oxygen. Analysis for copper content of Oregon mine waters should give some clue to these factors regarding Oregon copper mineral deposits. Furthermore, profit is made by many copper mining companies by running copper containing mine water over scrap iron such as old detinned cans after the chemical equation:

$$CuSO_4 + Fe \longrightarrow FeSO_4 + Cu$$

The powdery copper deposit may be washed from the iron and is sold as a high copper concentrate sludge to smelters.

Samples of run out mine water were collected from one mine in northern California and from three mines of southern Oregon. The Blue Ledge mine is 40 miles southwest of Medford across the state line in California. The Silver Peak and Umpqua Consolidated mines (near Riddle, Oregon,) are 40 miles south of Roseburg. The Champion mine is in the Bohemia mining district 35 miles east of Cottage Grove. The volume of water running from the mines was evaluated by spouting the water into an open top five-gallon oil can and averaging the number of seconds required to fill it.

In a laboratory at Oregon State College, standard $CuSO_4$-containing solutions were made up. Rough runs on the Cu^{++} content of the mine waters were obtained by adding NH_4OH and colorimetrically evaluating the blue color of ammoniated Cu ion ($Cu(NH_3)_4^{++}$). Blue coloration was obtained only from the Blue Ledge and Silver Peak mine samples.

More accurate colorimetric analyses were made using sodium diethyldithio carbamate, $[(C_2H_5)_2N - CS - SN_a]$. A brownish yellow color is attained as this chemical is added to very dilute solutions of copper.

The solutions prepared for the analysis of small amounts of copper in the mine water were as follows: A standard Cu^{++} solution was prepared by dissolving 39.3 mg. of selected blue crystals of $CuSO_4 \cdot 5H_2O$ in a liter of distilled water, which gives a solution containing 0.01 mg. of Cu^{++} per milliliter. The white sodium diethyldithio carbamate was dissolved in distilled water in amount one gram per liter. The ammonium hydroxide used was concentrated solution diluted one to five.

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[1] Associate Professor, Dept. of Chemical and Metallurgical Engineering, Oregon State College.
[2] Student, Dept. of Chemical and Metallurgical Engineering, Oregon State College, Corvallis, Oregon.

For the blue ammoniated copper ion colorimetric estimation, Nessler tubes of 100 ml. capacity were used and color matching done in a Nesslerimeter. No coloration resulted as NH_4OH was added to the Umpqua Consolidated or Champion mine water samples. Considerable color developed on addition of NH_4OH to the higher copper content Blue Ledge and Silver Peak mine waters. Such waters were even diluted 20 ml. to 100 ml. in Nessler tubes in matching the blue color to a series of standard copper containing solutions ranging in concentration from 1.1 to 2.0 mg. per liter. Results on estimation of copper content of the mine waters by blue ammoniated copper ion colorimetry are given in table 1.

Table 1.

Source of sample	Rate of flow from mine gal/min.	Cu^{++} present
Silver Peak mine	3	0.09 gm/l
Blue Ledge "	5	0.065 gm/l
Umpqua Consol. mine	2.25	none detected
Champion mine	100	none detected

Nessler tubes were also used in the sodium diethyldithio carbamate colorimetric copper determinations. The Nesslerimeter was found very useful in color matching. As ammonium hydroxide is added to some of the mine water samples, a visible precipitate of iron hydroxide was seen, resulting from soluble iron salts in the mine water. Filtration of the iron hydroxide with possible other occluded metal hydroxides was resorted to prior to colorimetric analysis on the $Cu(NH_3)_4^{++}$ containing filtrate.

In a specific colorimetric run 50 ml. of mine water had added to it 5 ml. of about 8 percent ammonium hydroxide. Filtration followed. To the approximately 50 ml. filtrate containing copper ions was added 5 ml. of the prepared sodium diethyldithio carbamate solution and diluted to volume of 100 ml. in a Nessler tube. Comparison was made with standard copper containing solutions ranging from 0.005 mg. to 0.02 mg. of copper per liter, the standard copper solutions being likewise treated with ammonium hydroxide and sodium diethyldithio carbamate in Nessler tubes. Results on the estimation of the copper content of the mine waters by accurate sodium diethyldithio carbamate yellow coloration is given in table 2.

Table 2.

Source of sample	Rate of flow from mine gal/min.	Cu^{++} present
Silver Peak mine	3	0.18 gm/l
Blue Ledge "	5	0.16 gm/l
Umpqua Consol. mine	2.25	0.006 gm/l
Champion mine	100	0.005 gm/l

Herewith is an estimate of how much copper flows to waste per year.

Silver Peak mine:

1 liter = 0.18 gm Cu^{++}
0.18 x 3.77 = 0.6786 gms Cu^{++}/gal.
0.6786 x 3 = 2.0358 gms Cu^{++}/min.
2.0358 x 60 x 24 = 2931 gms/day.

2931 x 365 ÷ 453.6 x 12.5¢ = $294.74 per year.

Blue Ledge mine: $435.81

Umpqua Consol. mine: $ 6.79

Champion mine: $273.75

The mine waters were sampled in July of 1945. Check samples were procured from all but the Blue Ledge mine in April of 1946. The reruns on copper content checked quite closely with runs of the year before. Since there was still some snow in April 1946 above the Champion mine, the total water flow was up, but total copper content about the same.

A sample of the mine water from the Bonanza Mercury mine near Sutherlin, Oregon, was taken in the Spring of 1946. No copper could be colorimetrically discerned in the water. Furthermore, addition of hydrogen sulfide showed no trace of dissolved mercury in the water.

Since the authors have solutions made up for colorimetrically determining copper in mine water, they would welcome receipt of quart samples of mine water from other Oregon mines. Samples should be accompanied by information on rate of mine water flow and location of the mine.

References:

1. Standard Methods for the Examination of Water and Sewage, Am. Public Health Assoc., 8th ed., 1936.
2. Colorimetric Determination of Traces of Metals, E. B. Sandell, Interscience Publishing Co., N.Y.
3. Colorimetric Analysis, F. D. Snell, D. Van Nostrand Co.

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MINING INSTITUTE

The 20th Annual Mining Institute of the College of Mines, University of Washington, will be held in Mines Laboratory on the campus in Seattle on Thursday, January 16. The morning and afternoon sessions will consist of addresses and motion pictures on current affairs in the mineral industry, also demonstrations of new pieces of equipment. In the evening the Institute will hold a joint dinner at the Faculty Club with the North Pacific Section of the American Institute of Mining and Metallurgical Engineers, to be followed by an evening program prepared by the section.

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PROSPECTOR'S COURSE

According to Dean Milnor Roberts of the College of Mines, University of Washington, the Prospector's Course authorized by the last session of the legislature will begin a new session on Monday, January 6, which will continue until March 20. These courses are open to men past high school age at very low cost. The instruction includes geology, chemistry, practice with prospecting, mining, and milling equipment, handling of ores and minerals in great variety, showings of motion pictures and views of current operations. Field trips are made on weekends.

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GEOCHEMICAL PROSPECTING

In recent years considerable research work has been done to investigate the possibility of prospecting for mineral deposits by analyzing soils, soil gases, plants, and ground water in places where the geology is thought to be favorable for buried deposits. Spectrographic, spectrochemical, and microchemical methods of analysis have been useful in this type of research. Techniques have been tried out in attempts to locate petroleum along these lines, and some success has been claimed.

The U.S. Geological Survey has announced that a geochemical unit has been set up to carry on such investigations, and that several field problems are under investigation at the present time. The announcement states that "One of the test areas selected for trying out methods of geochemical prospecting is in western New York, southwest of Clarendon, Orleans County. A number of peat bogs in this area, when drained for muck farming, developed a toxicity to plants. This toxicity was proved by analyses made by E. F. Staker of Cornell University to be due to high concentrations of zinc. Results of this work and a description of the area are given in Vol. 6 of the Proceedings of the Soil Science Society of America, pp. 207-214, 1941.

"A preliminary reconnaissance of the area has been undertaken by the Geological Survey, and samples of soil, water, and plants have been collected in an effort to determine the origin and mode of occurrence of the zinc. The area is underlain entirely by a thickness of Lockport dolomite which has been known for years to contain small amounts of sphalerite along its extensive outcrop. Certain toxic areas near the margin of the muck have proved to be directly associated with portions of the underlying Lockport dolomite which contain conspicuous crystals of sphalerite. Because of poor exposures, it is not possible to determine directly the quantitative abundance of zinc in the underlying dolomite, but it is hoped that an indirect interpretation of the distribution of the zinc can be made from the geochemical data. The leaching and transportation of the zinc by ground water evidently accounts for the concentration found in the peat."

****

EOCENE AGE ASSIGNED SHALES AT TOLEDO, OREGON

The Toledo formation has been assigned to the lower Oligocene by most students of Oregon Tertiary stratigraphy, but in many cases they have expressed the opinion that at least a portion of it may eventually turn out to be of Eocene age.

Microfossil studies now in progress substantiate this opinion. Shales from the Toledo formation exposed in a hillside cut behind Minnie's Sunset Cafe near the center of the south line of SE¼ sec. 7, T. 11 S., R. 10 W., in Toledo, Lincoln County, Oregon, contain an excellent foraminiferal faunule which corresponds very closely with Beck's Cowlitz fauna from sec. 28, T. 11 N., R. 2 W., Lewis County, Washington, (Jour. Paleontology, vol. 17, no. 6, pp. 584-614, Nov. 1943), and with an upper Eocene assemblage from Helmick Hill, sec. 13, T. 9 S., R. 5 W., Polk County, Oregon. It appears, therefore, that the Toledo shales from this hillside exposure are upper Eocene in age.

****

NEW MINING SCHOOL
Stanford University

According to the San Francisco Call dated November 23, Dr. Donald B. Tresidder, president of Stanford University, has announced the establishment of a new school of mining sciences at Stanford.

Dr. Tresidder stated that the new school, which is a combination of the department of geology and the department of mining, will open January 1, with an enrollment which has been estimated to be 100 students.

The dean of the new school will be Professor A. Irving Levorsen, now head of the geology department.

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INDEX
to
Volume VIII - 1946

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