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STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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STRATIGRAPHIC IMPLICATIONS OF SOME CENOZOIC FORAMINIFERA FROM WESTERN OREGON

By
R. E. Stewart+

The stratigraphic sequence of fossil foraminifera in the Cenozoic of western Oregon and Washington is very similar to that of California. There are differences, of course, just as there are local variations within the two areas, but in a broad sense the resemblance is rather striking.

Due to the relatively few surface and well sections now available for use in published reports on the Pacific Northwest, as compared with California, it is impossible to zone the Cenozoic of Oregon and Washington in anywhere near the detail reported for the more arid oil-producing Cenozoic basins to the south. At the present time we have nothing comparable with Laiming's 16 detailed control sections and numerous well sections of Eocene strata (6++, p. 193), Goudkoff's well sections from 18 or 20 oil fields in west-side San Joaquin Valley Eocene to Pleistocene strata (6, p. 248), Kleinpell's 8 stratigraphic columns of central and southern California Miocene strata (6, p. 200), Ferguson's well sections from 17 oil fields in east-side San Joaquin Valley lower Miocene and Pliocene strata (6, p. 240), Wissler and Dreyer's 16,000 samples from oil fields in Santa Maria district middle Miocene to Pleistocene strata (6, pp. 235-237), and Wissler's 200,000 samples from Los Angeles Basin oil wells in middle Miocene to Pleistocene strata (6, p. 210).

During recent years, however, efforts to locate oil and gas have led to extensive detailed geological surveys and exploratory drilling in the Pacific Northwest by major oil companies. It is reasonable to assume that much of the information from these activities will eventually be released for publication, as has been the case in other explored areas (6++). In the meantime a very good general idea of local biostratigraphic relationships can be developed from scattered exposures and surface sections in the state.

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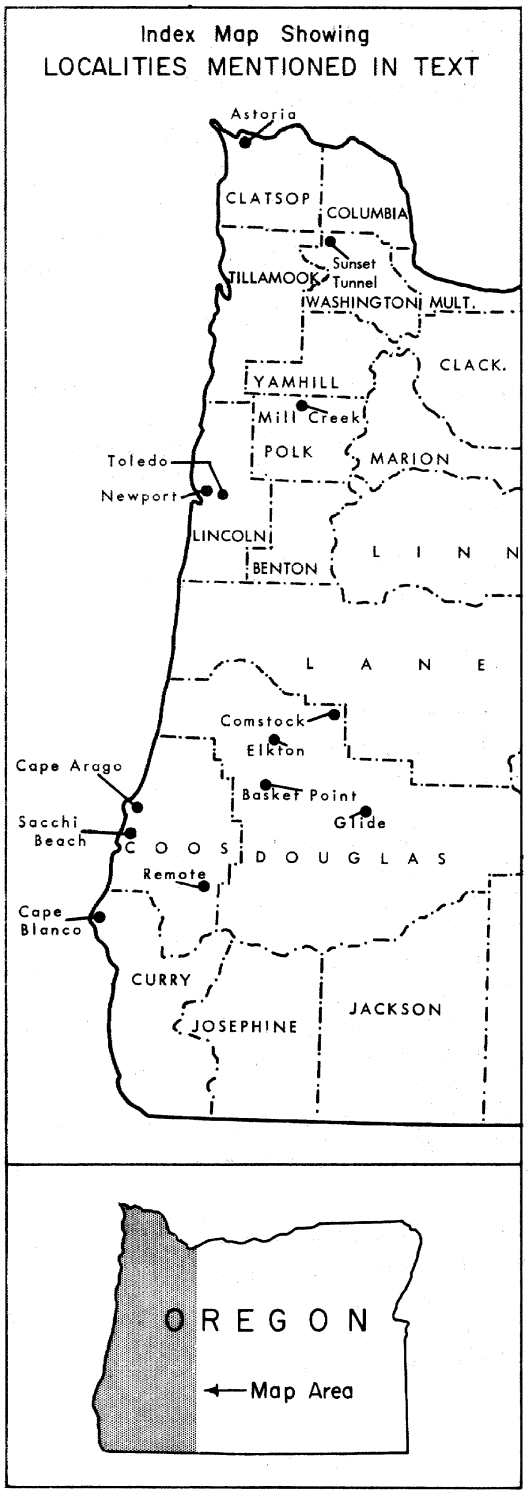
++ See bibliography.



The present paper is preliminary to the publication of more comprehensive studies which have been in progress over a period of years (10, pp. 3-4; 13, pp. 61-62; 19, pp. 32-33). It deals with apparent biostratigraphic relationships of only a few species of Cenozoic foraminifera from Oregon. Lists of species from several publications are given, but the inclusion of species in these lists does not necessarily indicate that they are restricted to the stratigraphic ranges covered by the publications from which they are taken.

No new formational names are proposed and no attempt is made to pass upon the merits of those that are already in the geological literature of the state. This paper is based primarily upon Pleistocene and Pliocene formations in the Cape Blanco area (see index map), Miocene in and near Astoria and Newport, Oligocene near Newport and Cape Arago, upper Eocene near Cape Arago, questionable upper or middle Eocene in Mill Creek (Polk County) and at Sacchi Beach south of Cape Arago, and middle Eocene near Comstock, Elkton, Glide, Basket Point, and Remote. Reference is made to other areas.

The basis for stratigraphic control is shown in figure 1 (see page 3). It is realized that the section as outlined is rather generalized, that there may be differences of opinion as to detail, and that future studies may result in considerable refinement and revision, but it is believed that the general stratigraphic sequence is approximately correct.

PLEISTOCENE

Elk River formation: Only one species of foraminifera, Elphidiella hannai (Cushman and Grant), has been observed in Pleistocene samples collected by the writer. However, Cushman and Grant (2, p. 79) named another, Elphidiella oregonensis (Cushman and Grant), from a sea-cliff locality 3 miles south of Cape Blanco, and Bandy (12, p. 272) listed 15 species, 5 of which were new, from two localities south of Cape Blanco. Bandy listed the following species from two foraminiferal zones which he recognized

in this area. They are listed according to their relative abundance, considering the entire foraminiferal fauna as constituting one hundred percent.

Rotalia tenerrima zone

Rotalia tenerrima Bandy 18%, Discorbis ornatissimus var. oregonensis Bandy 15%, Elphidium granulosus (Gallowy & Wissler) 13%, Cibicides lobatus (d'Orbigny) 10%, Elphidiella hannai (Cushman & Grant) (weathered and reworked) 10%, Rotalia subcorpulenta Bandy 10%, Cassidulina limbata (Cushman & Hughes) 5%, Fissurina lucida (Williamson) rare, Globigerina bulloides d'Orbigny rare, Quinqueloculina akneriana var. bellatula Bandy rare, Uvigerina bradyana Cushman rare.

Elphidiella zone

Elphidiella hannai (Cushman & Grant) 86%, oregonensis (Cushman & Grant) 5%, Elphidium hughesi Cushman & Grant 2%, Eponides blancoensis Bandy 2%, Nonionella basispinata (Cushman & Moyer) 2%, Quinqueloculina akneriana var. bellatula Bandy 2%, Cassidulina limbata (Cushman & Hughes) rare, Cibicides lobatus (d'Orbigny) rare, Elphidium granulosus (Galloway & Wissler) rare, Globigerina bulloides rare.

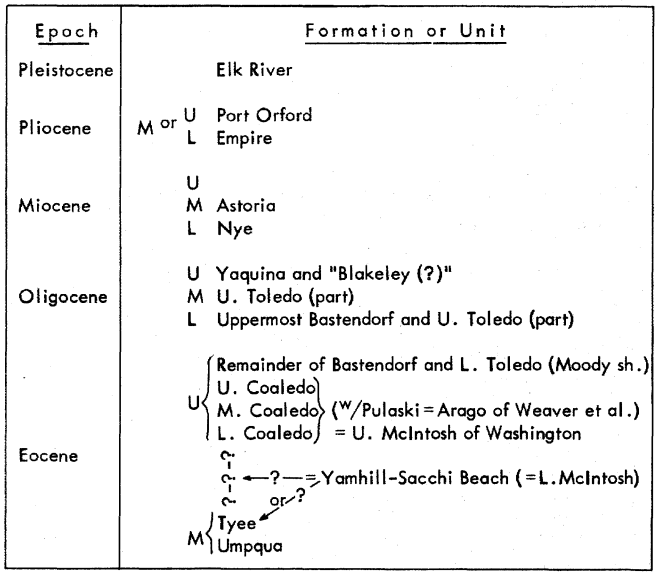


Figure 1. Generalized Stratigraphic Column on Some Western Oregon Marine Tertiary Formations

It is noted that the faunas of these zones indicate a very shallow cool-water type of environment.

Both of the Elphidiellas and Elphidium hannai occur in the upper Wildcat formation of Humboldt County, California, which appears to have been deposited under somewhat similar depth and temperature conditions during late Pliocene time.

PLIOCENE

Port Orford formation (middle or upper Pliocene): The only Oregon Pliocene strata from which foraminifera have been reported has a thickness of about 150 feet according to Bandy (12, p. 271), who lists the following foraminiferal fauna from the Port Orford formation: Elphidiella hannai (Cushman & Grant) 60%, Nonionella basispinata (Cushman & Moyer) 15%, Eponides frigidus (Cushman) 5%, blancoensis Bandy 3%, Gaudryina arenaria Galloway & Wissler 3%, Nonionella miocenica Cushman 3%, Textularia abbreviata d'Orbigny 3%, Polymorphina oregonensis Bandy 2% Buliminella elegantissima d'Orbigny 1%, Cibicides lobatus d'Orbigny 1%, Marginulina glabra d'Orbigny 1%, Robertina californica Cushman & Parker 1%, unidentified fragments 2%.

Bandy states that this fauna correlates rather well with the Pliocene foraminifera of Humboldt County, California, and indicates a very shallow, cool environment of deposition.

Empire formation (lower Pliocene): In the Cape Blanco area the Empire formation is approximately 400 feet thick and contains a molluscan megafauna, but no foraminifera.

MIOCENE

The writer knows of no occurrence of marine sediments containing upper Miocene foraminifera in Oregon. The lower Montesano formation of Washington is probably of this age.

Astoria formation(middle Miocene): The Astoria foraminiferal fauna appears to be that of Kleinpell's upper Saucesian Stage, which may be uppermost lower Miocene in age (5, fig. 14). In this paper, however, the Astoria formation appears as middle Miocene in conformity with past general usage in the Pacific Northwest. The city of Astoria, Oregon, at the mouth of the Columbia River, is the type locality for both the Astoria formation of Oregon and Washington and the Miocene of the west coast (1, p. 295).

In pointing out the resemblance between the Astoria fauna and the fauna of his upper Saucesian Stage, Kleinpell lists the following species (4, p. 17; 5, p. 70): Anomalina (?) sp., Bolivina marginata Cushman, Bulimina inflata var. alligata Cushman & Laiming, Cassidulina limbata Cushman & Hughes, Cibicides floridanus (Cushman) ?, Dentalina pauperata d'Orbigny, D. quadrata Cushman & Laiming, Orbulina universa d'Orbigny, Pulvinulinella parva Cushman & Laiming, Robulus americanus var. spinosus Cushman, R. simplex (d'Orbigny), R. warmani Barbat & von Estorff, Siphogenerina branneri (Bagg), S. kleinpelli Cushman, S. transversa Cushman, Sphaeroidina bulloides d'Orbigny.

The following species from an exposure of Astoria shale at Tenth Street and Harrison Avenue in Astoria was published by Cushman, Stewart and Stewart (10, pp. 12-39): Angulogerina astoriensis Cushman, Stewart and Stewart, Anomalina glabrata Cushman, Bolivina advena Cushman and Kleinpell, B. marginata Cushman var. adelaidana Cushman and Kleinpell, Bulimina alligata Cushman and Laiming, B. ovata d'Orbigny, Buliminella subfusiformis Cushman, Cancris cancriformis (Kleinpell), Cassidulina cf. globosa Hantken, C. laevigata d'Orbigny var. carinata Cushman, C. modeloensis Rankin, Cibicides floridanus (Cushman), Cyclammina incisa (Stache), Dentalina pauperata d'Orbigny, D. quadrulata Cushman and Laiming, Eponides healdi R. E. and K. C. Stewart, E. umbonatus (Reuss), Marginulina cf. dubia Neugeboren, Nodogenerina advena Cushman and Laiming, N. sp., Nodosaria anomala Reuss, N. parexilis Cushman and K. C. Stewart, Nonion cf. belridgense Barbat and Johnson, Planulina astoriensis Cushman, Stewart and Stewart, P. mexicana Cushman, Plectofrondicularia californica Cushman and R. E. Stewart, P. miocenica Cushman var. directa Cushman and Laiming, P. sp., Robulus cf. calcar (Linne), R. nikobarensis (Schwager), R. sp., Saracenaria cf. acutauricularis (Fichtel and Moll), S. sp., Siphogenerina branneri (Bagg), S. kleinpelli Cushman, Sphaeroidina cf. bulloides d'Orbigny, Uvigerina subperegrina Cushman and Kleinpell, Valvulineria araucana (d'Orbigny).

In the vicinity of Depoe Bay and farther south along the coast between Otter Rock and Newport are other beds of Astoria age which have usually been referred to by authors as Astoria or "Astoria." Herron (18, pp. 17, 71), in a recent unpublished Masters thesis, has proposed

the name Agate Beach formation for these beds. He gives the following list of foraminifera: Angulogerina astoriensis Cushman, Stewart and Stewart, Bolivina advena Cushman, B. astoriensis Cushman, Stewart and Stewart, B. basisenta Cushman and Stone, Bulimina ovata d'Orbigny, B. pyrula d'Orbigny, Buliminella bassendorfensis Cushman and Parker, B. elegantissima d'Orbigny, Cassidulina laevigata d'Orbigny var. carinata Cushman, Cyclammina cancellata Brady var. obesa Cushman and Laiming, Cyclammina incisa (Stache), C. cf. simiensis Cushman and McMasters, C. sp., Eponides mansfieldi Cushman var. oregonensis Cushman, Stewart and Stewart, Globigerina bulloides d'Orbigny, Lagena acuticosta Reuss, L. costata (Williamson), Nonion costiferum (Cushman), N. incisum (Cushman), Nonionella miocenica Cushman, Pseudoparrella parva (Cushman and Laiming), Pyrgo sp., Quinqueloculina cf. vulgaris d'Orbigny, Q. sp., Robulus americanus (Cushman), R. nikobarensis (Schwager), R. cf. orbicularis (d'Orbigny), R. sp., Uvigerina subperegrina Cushman and Kleinpell, Virgulina punctata d'Orbigny.

Thirteen of the species in Herron's list had been recorded previously from Agate Beach by Cushman, Stewart and Stewart (10, pp. 43-55). They recorded one other species, Virgulina californiensis Cushman.

Nye shale (lower Miocene): In the area northward from Yaquina Bay toward Otter Rock, the "Astoria" beds for which Herron has proposed the name Agate Beach formation are underlain by other beds which have been variously called Nye shale, Nye mudstone, and Nye formation.

Kleinpell (4, p. 18; 5, p. 70) lists the following species from the Nye shale near Newport, of which he writes, "The closest affinities of the Nye shale Foraminifera are with the fauna from the 'Middle Member' of the Rincon shale in Los Sauces Creek, Ventura County, California. . . ." Bolivina advena Cushman, B. marginata Cushman, Bulimina pyrula (d'Orbigny), Buliminella curta Cushman, B. subfusiformis Cushman, Cassidulina laevigata var. carinata Cushman, Glandulina laevigata d'Orbigny, Globigerina bulloides d'Orbigny, Lagena perlucida (Montagu), Nodogenerina advena Cushman and Laiming, Nonion costiferum (Cushman), N. incisum (Cushman) ?, Plectofrondicularia miocenica var. laimingi Kleinpell, Sphaeroidina bulloides d'Orbigny, Uvigerina auberiana d'Orbigny, Uvigerinella obesa var. impolita Cushman (Laiming), Virgulina bramletti Galloway and Morrey.

Heacock (16, pp. 4-5, 15) lists 40 species from the upper 2325 feet of the Nye formation. His list contains all of Kleinpell's species except Lagena perlucida (Montagu), but he refers Bulimina pyrula d'Orbigny, Bolivina marginata Cushman, Glandulina laevigata d'Orbigny, and Virgulina bramletti Galloway and Morrey of Kleinpell's list to Bulimina ovata d'Orbigny, Bolivina marginata var. adelaidana Cushman and Kleinpell, Pseudoglandulina laevigata (d'Orbigny), and Virgulina californiensis Cushman respectively.

The species from Kleinpell's list which are common to both Heacock's and Kleinpell's lists are not repeated in the following list from Heacock's thesis: Anomalina glabrata Cushman, Bulimina alligata Cushman and Laiming, Cassidulina margareta Karrer, Cyclammina cf. cancellata H. B. Brady var. obesa Cushman and Laiming, Dentalina cf. isidroensis Cushman and Renz, D. subspinosa Neugeboren, Ellipsolagena bidens Cushman, Elphidium minutum (Reuss), Eponides mansfieldi Cushman var. oregonensis Cushman, Stewart and Stewart, Gyroidina soldanii d'Orbigny, Hemicristellaria (?) beali (Cushman), Lagena striatula (Egger), L.

strumosa Reuss, Marginulina dubia Neugeboren, Nodogenerina lapidula (Schwager), Nonionella miocenica Cushman, Plectofrondicularia californica Cushman and Stewart, P. vaughani Cushman, Pseudoparrella parva (Cushman and Laiming), Robulus inornatus (d'Orbigny), R. nikobarensis (Schwager), Triloculina sp., Uvigerina beccarii Fornasini, U. subperegrina Cushman and Kleinpell.

Heacock concludes that the 2325 feet of the Nye formation which is covered by his thesis ". . . is 'Oligo-Miocene' in age, and represents at least part of the lower Saucesian Stage as that term is used in the California Miocene." Kleinpell's Saucesian Stage is part of the lower Miocene of his middle Tertiary section of California. (To be continued.)

NOLAN HEADS GEOLOGICAL SURVEY

Dr. Thomas B. Nolan has been appointed Director of the U.S. Geological Survey to succeed Dr. William E. Wrather, who is retiring. Dr. Nolan has been Assistant Director since December 1944 and with the Survey since 1924. In recent years he has been in charge of the Survey's studies of tungsten deposits in this country. Dr. Nolan is past president of the Society of Economic Geologists and a member of many scientific and professional organizations.

BROGAN TO HEAD METEOR STUDIES

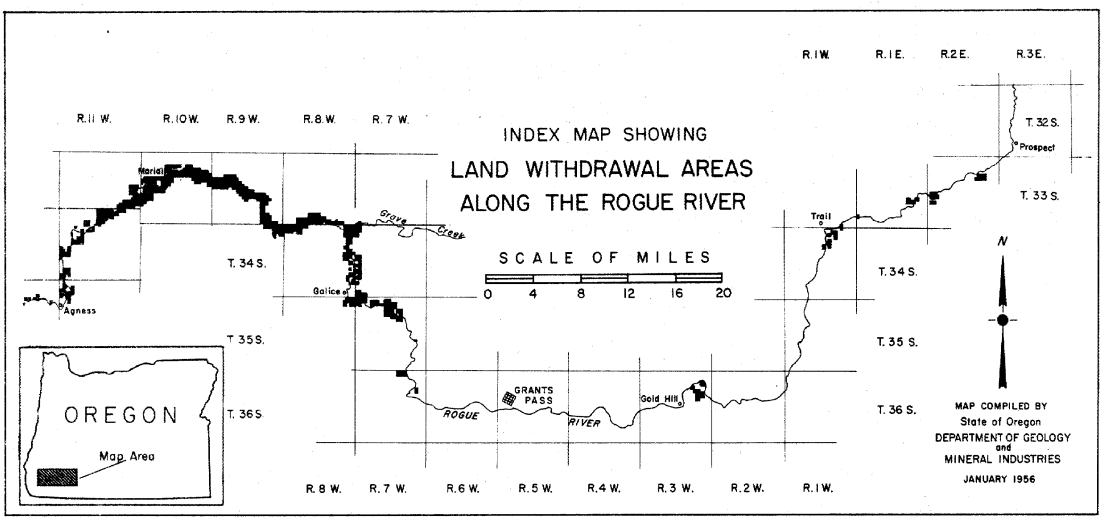
Phil F. Brogan of Bend, Oregon, has been appointed Pacific Northwest Regional Director of the American Meteor Society, a position formerly held by the late J. Hugh Pruett, whom Brogan for many years assisted. Mr. Brogan is Associate Editor of the Bend Bulletin, and is widely known for his column on geological subjects which appears each Sunday in The Oregonian. As regional director of the AMS, he will be in charge of determining the paths of meteors in Oregon, Washington, Montana, Idaho, and northern California, and will supervise studies and research on meteoric astronomy.

VOLUME III OF MINERALS YEARBOOK AVAILABLE

Volume III of the U.S. Bureau of Mines Minerals Yearbook for 1952 is now available. This 1050-page book is made up of chapters covering the mineral industry of each of the forty-eight states, Alaska, and the Territories and possessions. It was prepared through the cooperation of industry and the various state geological surveys and mining bureaus. Volume III may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. The price is $3.75, cloth bound. Volume I on mineral commodities, priced at $4.00, and Volume II on mineral fuels, priced at $2.25, were published in 1955 and are also available from the Superintendent of Documents.

LAND WITHDRAWN ALONG ROGUE RIVER

The U.S. Bureau of Land Management has recently withdrawn or, within the next few months, will attempt to withdraw from mineral exploration a total of 23,248.73 acres of public land (see map) along the Rogue River in southwestern Oregon. Purpose of the withdrawals, according to Virgil T. Heath, State Supervisor of the Bureau of Land Management, " . . . is to ban mining claims and other forms of entry under the public land laws except the lease and sale of public domain lands under the terms of the Recreation Act of June 14, 1926." Since the land to be withdrawn is in a region long known for its mineral potential, a conflict results with the interests of prospectors and miners.



For more than thirty years power site withdrawals have prevented the location of mining claims on these lands along the Rogue River but the Mining Claims Rights Restoration Act of 1955 passed by the last session of Congress would have reopened them to mineral exploration. Government agencies, it would appear, anticipated passage of the bill and resorted to the "recreational withdrawal" so that they still might have complete control over the area and prevent possible mining. The necessity for continued mineral development on the public lands to maintain the long-range economy of a region and to insure national security is apparently being overlooked by these Federal bureaus and the organizations who feel that the "wilds" should not be disturbed except on weekends and holidays.

The withdrawals in the Rogue River area are being made in three separate actions. One notice (embracing 10,000 acres) was published in the Federal Register around the middle of 1955. Because no protests were received, the withdrawal was made. The lack of protests is not surprising for the Federal Register has a limited distribution and is seen only by a few people. Beginning July 1955, the Bureau of Land Management was supposed to give wider publicity to its official actions (see The Ore.-Bin, August 1955, page 64). The second notice of withdrawal, announced in the Federal Register and the press December 1955, resulted in protests from many interested parties, including the Oregon Mining Association and the Grants Pass and Josephine County Chamber of Commerce. It seems quite likely that hearings will be held on

this withdrawal according to a news article in the January 23, 1956, Grants Pass Courier. Whether or not they will be held is entirely up to the discretion of the State Supervisor of the Bureau of Land Management. The third notice of withdrawal has not been published but an application by the U.S. Forest Service for withdrawal has been filed with the Manager of the Land Office and this is sufficient to prevent location of mining claims until the withdrawal has been acted upon. When this notice is published it is hoped that the Bureau's revised method for giving publicity will be strictly adhered to rather than the minimum announcement made in December. Only by letting the people know what is being done with their land can sound public land policy be determined with any degree of satisfaction to the public.

Withdrawal of public lands has reached such proportions that the House Interior and Insular Affairs Committee is holding hearings to investigate the real needs of the various agencies of the Government. According to the Mining Congress Journal the Assistant Secretary of Interior for Land Management, Wesley A. D'Ewart, has halted the processing of all requests for land withdrawals, pending outcome of the hearings. The halt appears not to have been recognized in the local echelons of Government, however, for already this month three notices, in addition to those along the Rogue River, of Oregon withdrawals, totaling 9,634.13 acres, have been published in the Federal Register. These withdrawals are not in known mineralized areas.

H.M.D.

HOLDING OF GOLD COINS MAY BE RELAXED

According to an article in the January 4 Wall Street Journal the Treasury Department will soon announce that United States citizens can hold as many gold coins as they choose. If this announcement is made, it will acknowledge a situation that has been evident for some time: it is not practical to enforce the law prohibiting holding of all gold coins except those that are rare or unusual. Following passage of the April 5, 1933, law ordering surrender of gold coins, bullion, and certificates, the government soon found it very difficult and expensive to determine what was a rare or unusual coin. By the summer of 1952, attempts to police the holding of gold coin were practically nil and a new order was issued allowing collectors to import coin, provided it was minted before 1933. In 1954 export of gold coin was legalized.

The easing of the 1933 law is interpreted by Mitchell Gordon of the Wall Street Journal as another sign of gold's growing freedom in a world market. Earlier trends toward a "free" world gold market are Belgium's action in reopening of a "free" market January 3, 1956, a similar action by Britain early in 1954, and the liberalizing of gold trading rules in West Germany, France, and Italy. Increased confidence in local currencies is given as a factor in the relaxing of gold restrictions outside the United States.

The January 1956 Engineering and Mining Journal quotes Pick's World Currency Report on the world's price of "free" gold per fine ounce as follows:

	Coins Dec. 31	Bars Dec. 31
Hong Kong	$40.75	$37.85
Bombay	51.75	50.75
Paris	42.10	35.85
Manila	40.25	36.50
Tangier	40.00	35.00

Note: Prices are computed at the free or black market value of the U.S. dollar in the local markets.

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OREGON'S MINERAL INDUSTRY IN 1955

By
Ralph S. Mason*

To Niles C. without whose help I would never have produced this— R. S. M.

Oregon's mineral industry in 1955 ran up an all-time record of an estimated $33,050,000 and it is likely this record will be surpassed in the years immediately ahead. The upward trend was most noticeable in the industrial minerals, a good indicator of the economic condition of an area. Metals turned in mixed reports. Gold nose-dived to a new low, and chromite was off 20 percent as termination of the stockpile program neared. Mercury more than doubled its 1954 value, and nickel and uranium, newcomers to Oregon's family of mineral products, made impressive first strides.

With the exception of chromite sold to the federal stockpile at Grants Pass and nickel sold under government contract, Oregon miners and mineral producers operated without federal assistance in the form of subsidies, price support, or direct aid. Metal prices fluctuated considerably during the year, mostly in response to normal supply and demand, but partly, as in the case of mercury, to government "cloak and dagger" manipulations which left the mercury miner wondering what his future was to be.

Exploration for oil and gas was conducted at a record rate in 1955, but no significant showings were found. Twelve permits to drill were issued by the Department during the year, and at year's end one company was drilling at a depth of 12,000 feet, a record for the Northwest.

Nonmetallic Minerals

Limestone. A continuing strong demand for limestone in the Northwest kept Oregon's six quarries operating at full capacity throughout the year. Three quarries produced rock principally for the manufacture of cement, one for calcium carbide manufacture, one for paper mills and sugar refineries, and one wholly for agricultural use.

Oregon Portland Cement Company opened a new quarry on their property at Lime, Baker County, and announced additions to their quarry facilities at Dallas, Polk County. According to the Baker Record Courier the Chemical Lime Company of Baker purchased a plant site at Wingville on the Union Pacific Railroad 4 miles north of Baker and announced that a 30-car siding was being built and that a lime-burning plant to treat ore from their high-grade Marble Creek deposit was in the planning stage.

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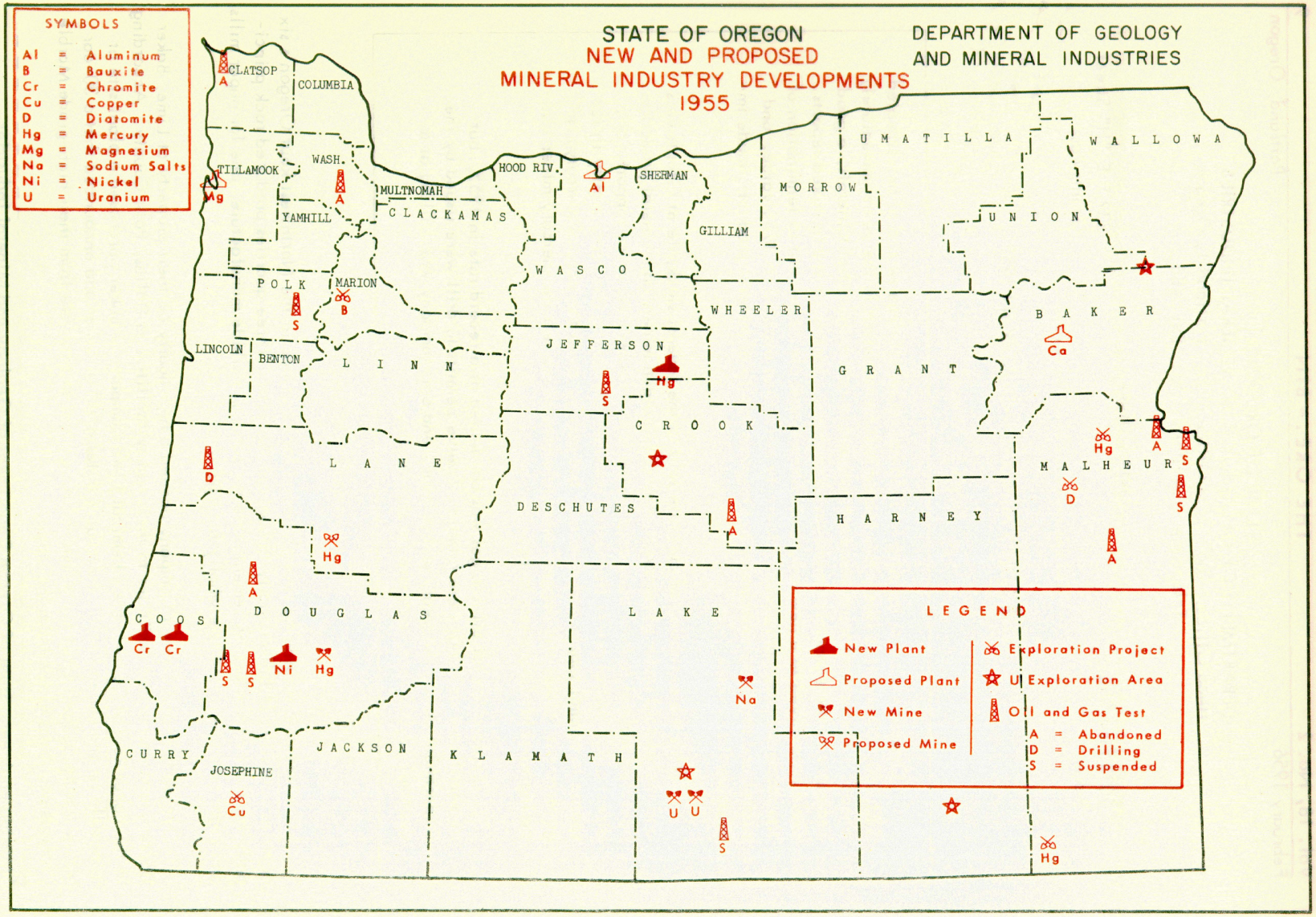

SYMBOLS
Al = Aluminum
B = Bauxite
Cr = Chromite
Cu = Copper
D = Diatomite
Hg = Mercury
Mg = Magnesium
Na = Sodium Salts
Ni = Nickel
U = Uranium
STATE OF OREGON
NEW AND PROPOSED
MINERAL INDUSTRY DEVELOPMENTS
1955
DEPARTMENT OF GEOLOGY
AND MINERAL INDUSTRIES
CLATSOP
COLUMBIA
TILLAMOOK
WASH.
MULTNOMAH
CLACKAMAS
YAMHILL
HOOD RIV.
SHERMAN
GILLIAM
MORROW
UMATILLA
WALLOWA
UNION
WASCO
POLK
MARION
WHEELER
BAKER
JEFFERSON
LINCOLN
BENTON
LINN
GRANT
CROOK
LANE
DESCHUTES
HARNEY
MALHEUR
COOS
DOUGLAS
LAKE
CURRY
JOSEPHINE
JACKSON
KLAMATH
LEGEND
New Plant
Proposed Plant
New Mine
Proposed Mine
Exploration Project
U Exploration Area
Oil and Gas Test
A = Abandoned
D = Drilling
S = Suspended

National Industrial Products Company shipped more than 150,000 tons of high-grade limestone from their quarry at Durkee, Baker County. The bulk of their production went to sugar refineries in Idaho with some going to Northwest paper manufacturers. Ideal Cement Company operated its Marble Mountain quarry, Josephine County, at full capacity and trucked crushed limestone to their cement plant at Gold Hill, Jackson County. Formerly rock was transported over the C&OC and Southern Pacific railroads. Pacific Carbide and Alloys Company operated their quarry near Enterprise, Wallowa County, during all but the winter months. The bulk of their production went into the manufacture of calcium carbide at the Portland plant.

Total tonnage of agricultural limestone produced in the State in 1955, as reported to the State Agriculture Department, was 32,117 tons. Approximately 51,000 tons of limestone were spread on Oregon farms in 1955, however, with some lime coming from Washington and some recovered from carbide sludge.

Cement. Business was good-to-booming in cement during 1955. In addition to top-capacity production from the three plants located in the State, a considerable quantity of cement was imported from outside the area to meet the demand. During the year Oregon Portland Cement Company announced plans to enlarge the capacity of their Oswego plant by 50 percent and to double the capacity of their Lime plant. Included in their $6,000,000 expansion program started in 1947 are new kilns, additional storage space, and new machinery. Ideal Cement Company's Gold Hill plant operated at full capacity during the year.

Demand for cement came from accelerated domestic and industrial construction. Added to this is the present and anticipated future construction of massive concrete dams for power and flood control.

Sand, gravel, and crushed stone. One of the best indices of business activity in an area is the production of sand and gravel. Used as a basic ingredient in the construction of all concrete structures, sand and gravel reflect promptly the trends in domestic and industrial growth. Construction of dams consumes large quantities of this commodity but the greatest single continuing use is in road and highway construction.

Although accurate statistics for the industry are difficult to obtain due largely to the transient nature of many small operations plus production by companies not normally regarded as stone producers, the overall picture for 1955 was one of continued large-volume production. Dollar value of sand and gravel and crushed stone for Oregon in 1955 is estimated at slightly more than $22,000,000 or almost two-thirds of the total of all mineral production for the State.

In the past it was common practice to use locally obtainable supplies in road construction. This picture is changing rapidly in Oregon with the advent of lightweight, large-capacity, high-speed haulage units. This practice points up the growing problem of obtaining suitable aggregate in sufficient quantity to meet the ever increasing demand and stringent construction requirements. In western Oregon there is, in certain areas, a shortage of acceptable crushed stone and the supply is steadily decreasing. Movement of concrete and plaster sand from the Portland area to points as far away as Astoria has become regular practice.

Building stone. Demand for building stone saw a decided increase during the year with the bulk of the supply coming from out-of-state quarries. The trend toward "outdoor living" with stone-covered patios, barbecue pits, stone-veneered exterior and interior walls, and fireplaces fashioned from rough and surfaced stone appears to be gaining momentum.

Five Oregon quarries were active during 1955. Though none of them could be said to be large operations, most of them reported that business was good. Without exception all the quarries were producing some form of volcanic rock. Rocky Butte Quarry on the northeast side of Rocky Butte, Multnomah County, and Faoro & Sons Quarry near Carver, Clackamas County, sold rough and surfaced blocks of lava for retaining walls, fireplaces, and other uses. Rainbow Rock Quarry near Pine Grove, Wasco County, installed a wire quarry saw and circular resaw to prepare veneer and patio slabs of brightly colored volcanic tuff. Shipments from this quarry were made to Grants Pass, Portland, and Seattle, Washington. Pacific Cut Stone Company produced a banded, dark pink tuff from their quarry at Willowdale, northern Jefferson County. Most of the production was in the form of gang-sawed veneer stock which was shipped largely to Seattle with a small amount moving into the Portland area. Tuff Stone Company produced a light gray tuff from a quarry located just east of Sublimity, Marion County.

Oregon's Mineral Industry at a Glance

Chromite	$ 400,000 -
Clays	352,000 +
Copper	3,700 +
Gold	51,450 -
Lead	1,490 +
Mercury	305,000 +
Nickel (included in undistributed)	+
Pumice	200,000 +
Sand and gravel	14,000,000 =
Silver	6,109 -
Stone	8,000,000 +
Undistributed	10,807,134 +
TOTAL	$33,050,000 +

(symbols indicate relation to 1954)

Granite produced by the Northwestern Granite quarry at Haines, Baker County, is limited primarily to monumental stone. The quarry has operated for many years.

Large blocks of dark red scoria were produced from several pits in the Bend-Redmond area of central Oregon for use in garden walls and rock gardens.

Expanded shale. Expanded-shale production continued in much the same manner as it has in former years. Smithwick Concrete Products obtained raw shale from a quarry near Vernonia, Columbia County, and railed it to Portland for expansion. Empire Building Materials quarried and furnaced shale at their operation near Sunset Tunnel in northwest Washington County and trucked the expanded material to their block plant in Portland. Expanded-shale aggregate, in addition to being used in modular precast units and monolithic construction, was finding a new field in the construction of prestressed structural members such as roof and bridge trusses. The strength and comparative lightness of such units may bring them into competition with structural timbers and steel. One manufacturer shipped prefabricated bridge trusses to Alaska during the year.

Pumice. Pumice producers enjoyed their biggest year in 1955 with the three producers (Williamson Cascade Pumice Company, Bend; Central Oregon Pumice Company, Bend; and Harney Concrete Tile Company, Burns) reporting construction of additional plant facilities or the acquisition of more deposits. Both Central Oregon and Williamson Cascade produced, besides pumice, an aggregate from volcanic cinders or scoria. The bulk of the pumice aggregate went into lightweight concrete blocks but considerable quantities were also sold for plaster sand, loose fill insulation, and sweeping compound. Harney Concrete opened a new pit near Burns, Harney County, of buff-colored, hard lump pumice which mixes well with mortar to form blocks and makes a pleasing color contrast with the more common white material. Shipments of abrasive-grade pumice by Cascade Pumice form a deposit located in Newberry Crater were about the same as in previous years.

Through modern processing plants and rigid controls, pumice producers in the State have improved their product, found new markets, some at considerable distances from their plants, and developed new uses for the various pumice fractions.

Diatomite. The Dicalite Division of Great Lakes Carbon Company operated steadily during 1955 at its Lower Bridge site, Deschutes County, and was the sole producer of diatomite in the State. At Lower Bridge a thick deposit of diatomite is stripped with heavy equipment, windrowed for air drying, and then processed and bagged for shipment. The company also did considerable exploration work on the diatomite near Drewsey, Harney County, where large diameter holes were drilled for sampling and inspection. Numerous deposits of diatomite, some of them very large, occur throughout central and eastern Oregon. Those in the Harper-Westfall area of Malheur County have been investigated by several companies in the past year and leases have been taken. Some exploration activity on a deposit at Telocaset, Union County, is reportedly scheduled for 1956.

Scoria and volcanic cinders. Large quantities of unconsolidated scoria and volcanic cinders are used annually for aggregate in highway construction in central and eastern Oregon where the mileage of "red roads" has been increasing rapidly. Lightness of material, which permits hauling greater yardage, plus excellent drainage and low frost damage characteristics, make this type of material exceptionally suitable for road aggregate. Local cinder cones, spotted across much of eastern Oregon, supply the bulk of this product which is easily quarried and crushed.

Scoria and cinders found increased use as concrete aggregate during the year. Two central Oregon operators reported substantial shipments from cinder cones in the Bend-Redmond area. Cinders are slightly heavier than pumice but much lighter than crushed basalt or river gravel and produce blocks having higher crushing strengths than pumice.

Perlite. There was no production of crude perlite (a type of volcanic glass) in the State in 1955, although large deposits are known to exist. Supreme Perlite Company continued to expand crude ore shipped in from Pioche, Nevada, at their plant in Portland.

Carbon dioxide. The Gas-Ice Corporation plant near Ashland recovered carbon dioxide from a group of drilled wells during the year (see The Ore.-Bin, July 1955). A simple separator removes the gas from the water after which it is processed into solid 80-pound cakes for shipment in cardboard containers as "dry ice." Portland Gas & Coke Company reclaims carbon dioxide by scrubbing flue gases and distributes it in liquid form.

Salines. A. M. Matlock, Eugene, removed 100 tons of solid salines from "potholes" at the south end of Alkali Lake, eastern Lake County. The material, a residue formed by dessication of large Ice Age lakes, consists primarily of sodium carbonate. Considerable tonnages of dried salines have been concentrated in Alkali, Abert, and Summer lakes and numerous investigations of the deposits have been made in the past.

Silica. Bristol Silica Company, Rogue River, Jackson County, remained the State's sole producer of silica, a position the company has maintained for nearly 20 years. A white, nearly chemically pure quartz deposit near the plant is mined, washed, crushed, and screened for shipment to manufacturers of ferrosilicon, refractories, and silicon carbide. Some of the product is used directly for poultry grit, roof granules, petrochemical tower packing, and acid hearth ramming material. Demand for silica in Oregon exceeded the supply and considerable exploration work was done.

Brick and tile. There was little change in Oregon's oldest mineral industry during the year. Twenty kilns of varying sizes and mostly concentrated in the Willamette Valley produced fired clay brick, tile, and hollow tile. Reserves of suitable clays are large.

Processing plants.

Vermiculite. Vermiculite-Northwest, Inc., operated an exfoliation plant in Portland for processing raw vermiculite ore shipped in from Libby, Montana.

Calcium hydrate. Industrial Processing Company prepared powdered calcium hydrate from calcium carbide sludge at its Portland plant.

Limonite. Orr Engineering and Chemical Company produced limonite for pigments and activated limonite for use as a sulphur scrubber in petroleum gas plants. Limonite is obtained from a deposit near Scappoose, Columbia County, and trucked to the plant at Scappoose for fine grinding and calcining with caustic soda.

Metallic Minerals

Nickel. Nickel mining and smelting, a newcomer to Oregon's industrial family, proved to be a robust child and gave a substantial boost to the State's economy. The Hanna operation at Riddle, Douglas County, is the only nickel mine in the United States. Nickel is one of the most important alloying metals, and long ago the Federal Government labeled it a strategic and critical material for stockpiling. In 1954 the United States consumed 94,733 net tons of nickel of which only 2,645 tons were produced domestically. The Hanna production of 3,250 tons in 1955 amounts to 3.4 percent of the 1954 domestic requirements for the United States.

New Oregon Mineral Products
Nickel
Uranium
Salines

The open-pit mine on the top of Nickel Mountain, Douglas County, is operated by Hanna Coal and Ore Corporation which trams the ore 1½ miles down the mountainside to the smelter operated by Hanna Nickel Smelting Company. Size of the whole operation is indicated by the 1955 production of 390,000 tons of ore and 15 million pounds of ferronickel which contained 6½ million pounds of nickel. In addition, large quantities of ferrosilicon, for use in the ferronickel smelting process, were manufactured. Production during 1955 was obtained with two electric melting furnaces. Two additional furnaces are scheduled to be put in operation early in 1956.

Interest in other nickeliferous deposits in southwestern Oregon continued during the year and several localities were investigated.

Uranium. 1955 marked the end of Oregon being a "have not" state for uranium. Discovery in mid-year of promising looking outcrops northwest of Lakeview, Lake County, touched off a rush of prospectors to the area. To John Roush and Don Tracy of Lakeview goes the honor of finding the first commercial body of uranium ore in the State. Their discovery, the White King prospect, and its neighbor, the Lucky Lass prospect located by a group headed by Bob Adams, Jr., were taken over by Lakeview Mining Company. Three carloads of ore were shipped from the properties during the year to Salt Lake City, Utah, under an AEC contract. Exploration and development is continuing. Numerous other occurrences of uranium were reported in the State during the summer and fall (see The Ore.-Bin, December 1955) and exploration work was started in some of the more promising areas. The wide distribution of rocks similar to those at the Lakeview deposits offers considerable hope that other commercial-grade ore bodies will be found. The outlook for 1956 is one of increased prospecting and exploration activity.

Chromite. Oregon shipments of concentrates and lump chromite to the General Services Administration depot at Grants Pass declined from 6,665 short tons in 1954 to an estimated 5000 tons in 1955. Value of production dropped from $536,387 in 1954 to an estimated $400,000 in 1955. The decline was attributed to the reluctance of operators to continue exploration for new deposits in the face of impending termination of the GSA ore-buying program in mid-1957. Many producers feel that a minimum of 5 years is required to prospect, explore, develop, and mine an ore body of several thousand tons. Operations in the State were concentrated in two main areas: the John Day district of Grant County and southwestern Oregon (see list). In Grant County four mines were active and three mills shipped concentrates to the stockpile. Not all properties were steady producers, however. In southwestern Oregon activity was reported in Coos, Curry, Douglas, Josephine, and Jackson counties where a total of 20 mines made shipments of lump ore and 14 mills concentrated disseminated ore.

CHROME MINES	CHROME MILLS
Curry County	Curry County
Fourth of July	McCaleb
McCaleb	Sourdough
Pearsoll	Wonder
Sourdough	
Uncle Sam	Douglas County
	Fitzpatrick
Douglas County	Triple L
Black Boy	
	Grant County
Grant County	Comstock-Uranium & Tungsten Co.
Gardner Ranch	John Day Mining Co.
Haggard New	Tri-County Milling Co.
Red Hill	
Ward	Jackson County
	Ashland Mining Co.
Josephine County	
Black Otter	Josephine County
Black Prince	Bowers
Chrome King	Foster
Crown Chrome	Gallaher
Deep Gorge	Grants Pass Chrome
Lucky L & R	McTimmonds
Nickel Ridge	Radcliffe
Oregon Chrome	Six Mile
Sad Sack	Waldo Milling Co.
Sordy	

In Coos County, Pacific Northwest Alloys concentrated black sands accumulated during World War II for upgrading in the now defunct Defense Plant Corporation mill. Pacific uses an electromagnetic and electrostatic circuit to obtain chromite, magnetite, garnet, zircon, and ilmenite concentrates. The chromite fraction is shipped to the company plant at Mead, Washington, for use in the manufacture of ferrochrome. At the close of the year it was reported that Pacific was investigating black sand deposits in the area north of Bandon.

In the Whiskey Run area about 6 miles north of Bandon, Mineral Sands Company erected a black-sand treatment plant that is scheduled to go into operation about April 1, 1956. The plant will use Humphreys spirals, electromagnets, roasting, and acid leaching to produce concentrates which will include a low-iron chrome product. Overburden stripping operations to obtain the ore to be treated were carried on about a mile south of the plant. Approximately 60 feet of overburden must be removed to reach the black-sand horizon which will be dug with a "sandhog," a tractor-mounted continuous digger feeding directly onto a rubber belt that discharges into trucks.

The Department continued its detailed study of chromite deposits in southwestern Oregon and results will be published in 1956.

Bauxite. Announcement by the Department in 1954 of the distribution of high-iron bauxite in the Salem Hills area of Marion County resulted in exploration activity in 1955 by Aluminium Laboratories, Limited, Canada. Four drill crews using light power drills sampled the area during the summer and fall. Although no tonnage figures have been published, the Department estimated in the April 1955 issue of The Ore.-Bin that a total area of more than 1500 acres may be underlain with bauxitic laterite having an average thickness of about 14½ feet with about 3½ feet of overburden. Analysis of the ore sampled from 23 holes drilled by the Department showed an average of 35.40 percent Al_2O_3, 6.67 percent SiO_2, 30.60 percent Fe_2O_3, and 6.56 percent TiO_2.

Copper, gold, silver, lead, and zinc. The Buffalo mine near Granite, Grant County, operated by the Boaz Mining Company of Seattle, contributed the bulk of Oregon's gold production of $51,450. The Pyx mine in the Greenhorn district on the Grant-Baker county line operated by the Greenhorn Mountain Development Company was also active. No dredges were active during the year and only small seasonal hydraulic mines were run for a few months by 14 different operators. Production of copper, lead, and silver (estimated value of $11,300) was obtained largely as by-products from gold mining. Some copper was shipped from the Standard mine, Grant County, by Ray Summers. Fall Creek Mining Company leased the Fall Creek copper mine, Josephine County, from J. A. Phillips of the United Copper Gold Mines and commenced exploration work late in the year. There was no zinc production during the year.

Tungsten. Northwest Mining Company shipped low-grade tungsten ore from their property on Foots Creek in Jackson County to the Laughlin Alloy Steel Company plant at Eagle Point. Mining was suspended in December reportedly due to the low tungsten content of the ore.

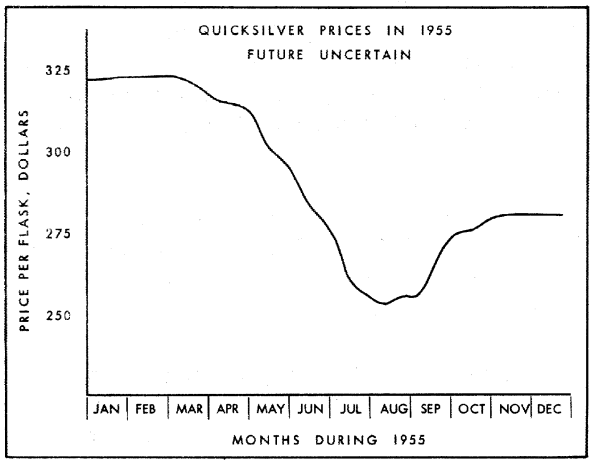
In Grant County, Tony Brandenthaler explored a new scheelite deposit discovered by Lester E. Thornton near the head of Lemon Creek in the Morning mine district. No activity was reported at either the Bratcher or Mattern mines in Jackson County which shipped ore a few years ago.

Magnesium. Plans to erect a plant near Tillamook, Tillamook County, to recover magnesium from sea water were announced in the press by Hatch Bros. Chemical Company, Tillamook.

Mercury. The wide fluctuations in the price of mercury during the year seemingly acted as a damper on operators to open new mines or reopen old ones. Production nevertheless rose to an estimated 1000 flasks, highest since 1951. Value based on an average New York price per flask of $290.05 was estimated at $300,000. Only two mines ran continuously: the Bonanza east of Sutherlin, Douglas County, owned by the Bonanza Oil and Mine Corporation, and the Horse Heaven mine east of Ashwood, Jefferson County, owned by Cordero Mining Company.

The Horse Heaven mine plant was erected late in 1954 on the site of a former furnace destroyed by fire 10 years earlier. Ore broken underground at the time of the fire was furnaced as well as newly mined ore developed during the year. At the Bonanza mine a 1953 DMEA loan was reactivated and exploration and development were done principally on the 800 North level with some work on the 1000 and 1100 levels. A rise in the ground-water level due to unseasonable rainfall and power failures combined to flood the lower levels of the mine in late December, causing a shutdown.

The Black Butte mine, Lane County, once an important producer but inactive for a number of years, was purchased by the Mercury and Chemical Corporation of New York in December. The company announced plans to spend $250,000 in exploring and developing the property and in the construction of a new mill. Shawano Development Company of New York announced in May that the Bretz mine, southern Malheur County, had been acquired and that a churn-drilling program would be conducted during the summer. The Hope Butte prospect near Vale, Malheur County, owned by B. E. and R. L. Jordan, was the scene of considerable exploration activity by H. K. Riddle, lessee. In Douglas County the Buena Vista mine carried on exploration and refurbished a 50-ton Gould furnace in



preparation for operation in 1956. About 20 men were employed under the supervision of B. A. Young, Roseburg. Winter Creek Mining Company furnaced ore from the Blue Ridge mine, Crook County, and from the McCammon mine in Coyote Hills, Lake County. Small production came from several mines in the Prineville area including the Maury Mountain, Mother Lode, and Towner mines. No activity was reported at the Roba quicksilver mine in Grant County where considerable exploration under a DMEA loan was carried on in 1953.

Electro-process industries. Reynolds Metals Company operated their Troutdale smelter continuously in 1955 using alumina imported from Jamaica. Announcement was made in the press that construction on the long-delayed Harvey Aluminum plant at The Dalles would get underway in the near future. Capacity of the 65 million dollar plant will be an estimated 100 million pounds of aluminum annually. The National Metallurgical Corporation electric furnace at Springfield produced aluminum-silicon alloy by direct reduction of aluminum-bearing clay from California and silicon metal by the reduction of silica obtained largely from the Bristol silica deposit. Electro Metallurgical Company produced ferrosilicon and calcium carbide in their Portland plant using silica and lime obtained from deposits in Oregon and other sources. Pacific Carbide and Alloys used high-calcium limestone from their Enterprise quarry in Wallowa County and petroleum coke obtained from Portland Gas & Coke Company to produce calcium carbide in their Portland plant. Zirconium and hafnium sponge and ingot metal production at the U.S. Bureau of Mines Northwest Electrodevelopment Laboratory at Albany was discontinued July 1.

Mineral Fuels

Oil and gas exploration. Oil and gas exploration in 1955 was the most active in Oregon's history, but significant amounts of oil are yet to be discovered and commercial quantities of gas to be proved. During the year twelve new permits to drill were granted by the Governing Board of the Department, bringing the total to seventeen issued since the Oil and Gas Conservation Law was passed by the 1953 Legislative Assembly. At year's end one test was drilling, two tests were suspended but may do further drilling, five operations were suspended and unlikely to do more work, and seven tests had been abandoned. One operator was drilling sporadically and another had the location graded in preparation to drill. (See The Ore.-Bin, vol. 17, no. 8.)

Sinclair Oil and Gas Company was approaching a depth of 12,000 feet in their test near Mapleton, Lane County, setting a record for deep holes in the Northwest. Other deep drillings made in the State during 1955 were Standard Oil Company of California's Hoagland Unit No. 2 in Clatsop County and their Pexco No. 1 in Crook County, Sinclair Oil and Gas Company's Eastern Oregon Land Company No. 1 in Malheur County, and Uranium Oil and Gas Company of Klamath Falls Ziedrich No. 1 in Douglas County.

The Department of Geology and Mineral Industries published Misc. Paper 6 in January 1955 which listed more than 200 wells drilled in Oregon during the years. Including the 1955 drillings, a total of 15 tests have reached a depth between 3 and 5 thousand feet in Oregon, 11 tests a depth between 5 and 10 thousand feet, and one test in excess of 10,000 feet. This makes a total of only 27 tests which could have significance in the exploration of Oregon's 96,000 square mile area.

In June the Governing Board of the Department held a public meeting at which time the bond requirement for drilling was increased from $2,000 to $4,000 for each new test and the provision allowing for a "blanket" bond was struck out. Other minor changes in the rules and regulations were made. (See The Ore.-Bin, vol. 17, no. 6.)

Coal. With the closing of the South Slough mine in Coos County last May, Oregon coal production dropped to a new low. Only one mine, the Mandrones Big Dipper near Wilhoit in Clackamas County, maintained any activity. Some exploration work was done at Eden Ridge in Coos County by Roy Rannells on several of the exposed seams.

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DOMESTIC METAL PRICES

From E&MJ Metal and Mineral Markets, February 16, 1956

Copper - 43.015 cents per pound, refinery (domestic average).
Lead - 16 cents per pound New York.
Zinc - 13½ cents per pound East St. Louis.
Quicksilver - $268-271 per 76-pound flask New York.
Silver - (foreign) 1.375 cents per ounce New York; (domestic) 90½ cents government price.
Aluminum - per pound f.o.b. shipping point (freight allowed) 30-pound ingot 99+ percent, 24.4 cents; in pigs, 22.5 cents.
Antimony - 99½ percent grade, domestic, bulk, Laredo, 33 cents per pound.
Cobalt ore - per pound of cobalt contained f.o.b. Cobalt, Ontario, 9 percent grade, $1.30; 10 percent, $1.40.
Germanium - per gram f.o.b. Miami, Oklahoma; 10,000-gram lots, first reduction 44½ cents.
Iridium - per ounce troy $100-110.
Lithium - per pound 98 percent $11-14.
Nickel - per pound electrolytic cathodes f.o.b. Port Colborne, Ontario, 64½ cents duty included.
Osmium - per ounce troy $80-100.
Palladium - per ounce troy $23-24.
Platinum - per ounce troy $97-111.
Selenium - producers quote $13.50 per pound; distributors, $15.50, effective February 1.
Titanium - per pound 99.3+ percent, maximum .3 percent iron, $3.45, f.o.b. shipping center.
Titanium ore - per long ton, ilmenite 59.5 percent TiO_2 f.o.b. Atlantic seaboard $26-29; rutile per pound, minimum 94 percent, concentrate 10-15 cents.
Tungsten - per pound 98.8 percent, minimum 1,000-pound lots, $4.50.
Zirconium - per pound, sponge, $10.
Bismuth - $2.25 per pound in ton lots.
Cadmium - delivered, $1.70 per pound.

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STRUCTURAL DATA FROM THE CHROME RIDGE AREA JOSEPHINE COUNTY, OREGON

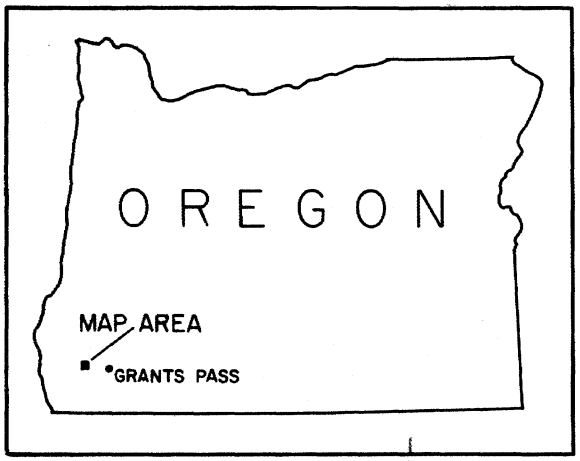
By
Len Ramp*

Len Ramp

Introduction

General. This report is of a preliminary nature and represents part of the work being done in connection with a study of chromite deposits in southwestern Oregon.

Geography. Chrome Ridge is located in Josephine County about 20 miles west of Grants Pass (see index map). The area mapped in this report is about 6 miles long and 2½ miles wide extending N. 20° E. through the eastern part of T. 36 S., R. 9 W., into the southeastern portion of T. 35 S., R. 9 W. It is reached by about 19 miles of good Forest Service road from Galice. The area is very rugged and elevations range from about 2,400 to a maximum of 4,581 feet at Freeland Mountain. It is usually inaccessible during the winter months due to rain and snow.



Index Map Showing Area Covered by Geologic Map in Text

Previous work. The geology of a portion of the Chrome Ridge area was mapped on a scale of 1:2400 and the chromite deposits described by Wells, Page, and James (1940). The area is included also on the geologic map of the Kerby quadrangle (Wells and others, 1949).

Geologic setting

Chrome Ridge is underlain largely (see geologic map) by sill-like intrusives of peridotite which have been altered in part to serpentine. The peridotite is composed of the minerals olivine (60 to nearly 100 percent), enstatite, serpentine minerals, and accessory chromite and magnetite. Feldspar is lacking. Wells and others (1940) designated the ultramafic rocks as saxonite with small bodies of dunite.

Peridotite of the Chrome Ridge area has intruded the Upper Jurassic Rogue formation which is mainly an amphibole (hornblende) gneiss with lesser amounts of green phyllite, schist,

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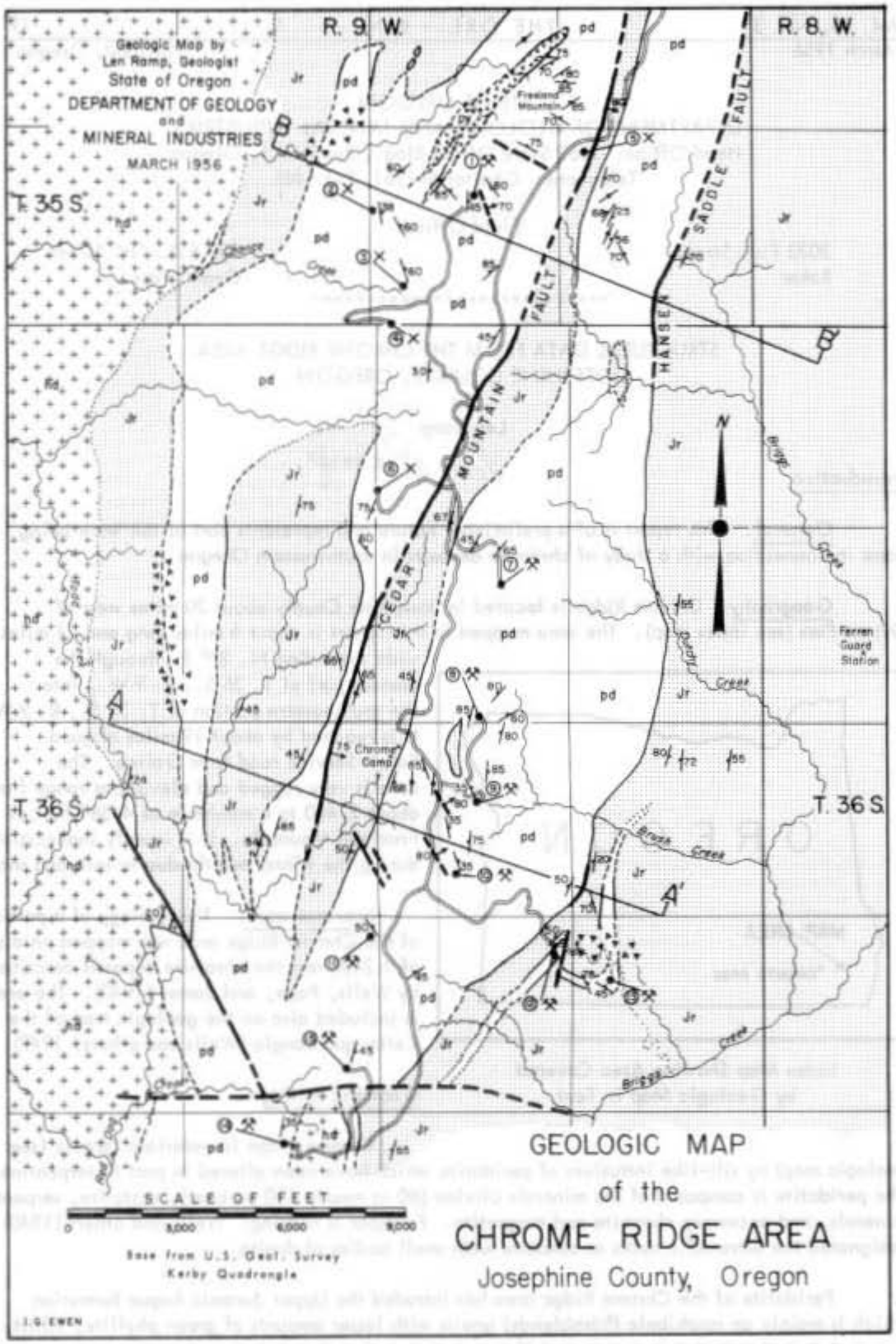
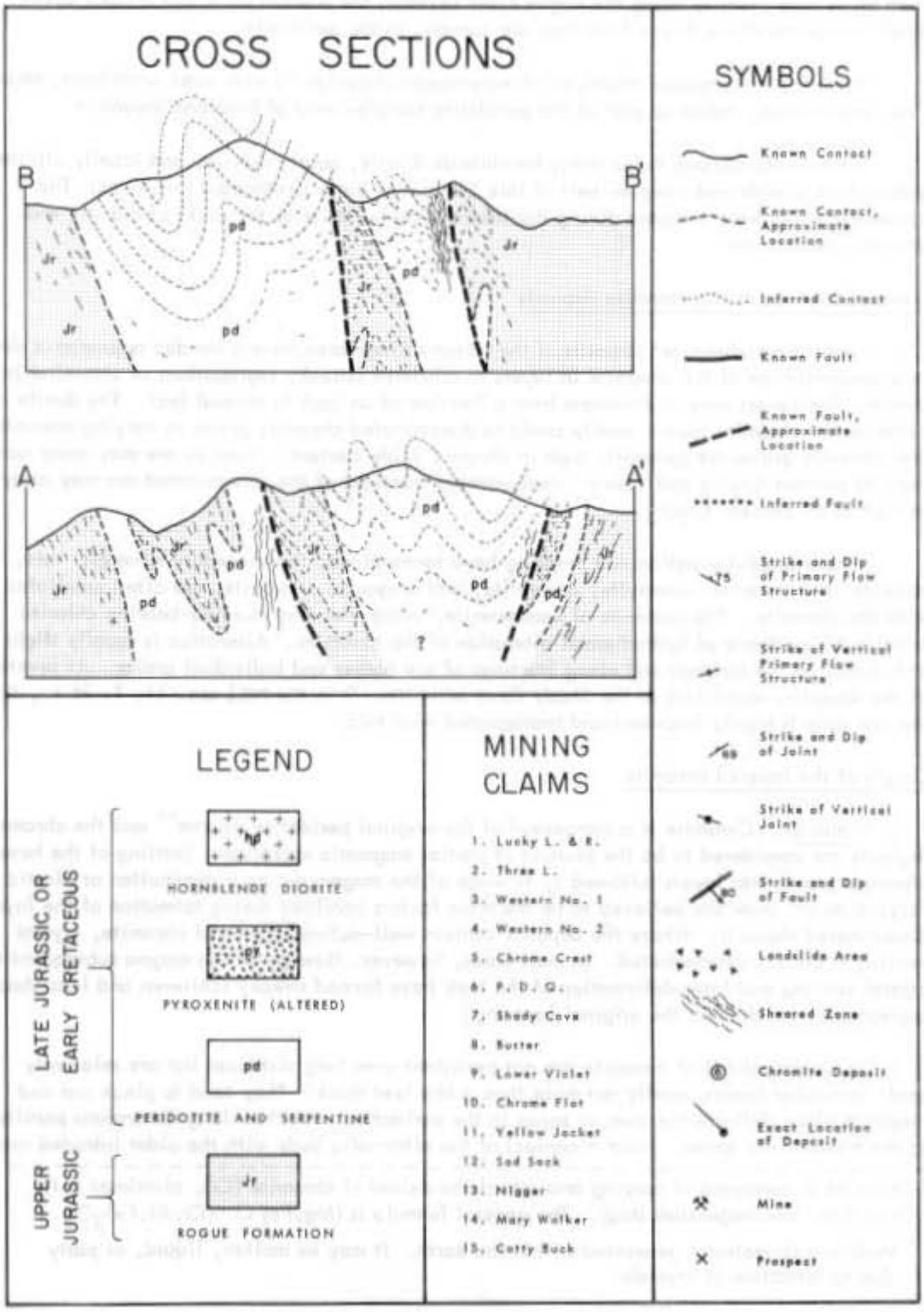
*Geologist, Oregon Department of Geology and Mineral Industries.


Geologic Map by
Len Ramp, Geologist
State of Oregon
DEPARTMENT OF GEOLOGY
and
MINERAL INDUSTRIES
MARCH 1956
R. 9 W.
R. 8 W.
T. 35 S.
T. 36 S.
T. 36 S.
CEDAR MOUNTAIN FAULT
HANSEN SADDLE FAULT
Freeland Mountain
Ferren Guard Station
Briggs Creek
Chrome Camp
N
SCALE OF FEET
0
3,000
6,000
9,000
Base from U.S. Geol. Survey
Kerby Quadrangle
GEOLOGIC MAP
of the
CHROME RIDGE AREA
Josephine County, Oregon
J.G. EWEN


CROSS SECTIONS
B
B'
A
A'
Jr
pd
?
LEGEND
LATE JURASSIC OR EARLY CRETACEOUS
UPPER JURASSIC
HORNBLENDE DIORITE
PYROXENITE (ALTERED)
PERIDOTITE AND SERPENTINE
ROGUE FORMATION
MINING CLAIMS
1. Lucky L. & R.
2. Three L.
3. Western No. 1
4. Western No. 2
5. Chrome Crest
6. P. D. Q.
7. Shady Cove
8. Butter
9. Lower Violet
10. Chrome Flat
11. Yellow Jacket
12. Sod Sock
13. Nigger
14. Mary Walker
15. Catty Buck
SYMBOLS
Known Contact
Known Contact, Approximate Location
Inferred Contact
Known Fault
Known Fault, Approximate Location
Inferred Fault
Strike and Dip of Primary Flow Structure
Strike of Vertical Primary Flow Structure
Strike and Dip of Joint
Strike of Vertical Joint
Strike and Dip of Fault
Landslide Area
Sheared Zone
Chromite Deposit
Exact Location of Deposit
Mine
Prospect

and locally impure quartzite. The Rogue formation is more highly metamorphosed in this area than at its type locality along the Rogue River between the Almeda mine and Whisky Creek. Small inclusions of the Rogue formation are common in the peridotite.

Pyroxenite, composed mainly of clinopyroxene (diopside ?) with some amphibole, serpentine, and olivine, makes up part of the peridotite complex west of Freeland Mountain.

West of the Chrome Ridge area, hornblende diorite, quartz diorite, and locally olivine gabbro form a wide and complex belt of late Jurassic or early Cretaceous intrusives. The ultramafic rocks were intruded during the same period but prior to the rocks of dioritic and granitic composition.

General features of the chromite deposits

Most of the chromite* deposits of the Chrome Ridge area have a banded appearance due to a concentration of the chromite in layers or schlieren (streaky segregations of chromite) in dunite. The layers vary in thickness from a fraction of an inch to several feet. The dunite in between the chromite layers usually contains disseminated chromite grains in varying amounts. The chromite grains are generally high in chromic oxide content. Massive ore may assay more than 50 percent Cr_2O_3 and "clean" concentrated fractions of the disseminated ore may assay as high as 60 percent Cr_2O_3.

Where serpentinization and shearing have taken place, the secondary minerals, talc, chlorite, kammererite, uvarovite, deweylite, and aragonite or calcite, are often associated with the chromite. The presence of kammererite, uvarovite, and alumina-bearing chlorite is believed evidence of hydrothermal alteration of the chromite. Alteration is usually slight and occurs on the surfaces and along fractures of ore bodies and individual grains. At several of the deposits, especially at the Shady Cove mine (no. 7) in the NE$\frac{1}{4}$ sec. 11, T. 36 S., R. 9 W., the ore zone is highly fractured and impregnated with talc.

Origin of the layered chromite

General. Chromite is a component of the original peridotite magma** and the chromite deposits are considered to be the product of partial magmatic segration. Settling of the heavier chromite grains into layers followed by flowage of the magma during a semimolten or plastic "crystal mush" state are believed to be the main factors involved during formation of the layered-disseminated deposits. Where the deposits contain well-defined layers of chromite, crystal settling is clearly demonstrated. In most cases, however, flowage of the magma subsequent to crystal settling and later deformation of the rock have formed streaky schlieren and lens-shaped segregations which mask the original layering.

The segregations of chromite are not persistent over long distances but are relatively small lenticular bodies usually not more than a few feet thick. They tend to pinch out and reappear along definite horizons or zones in the peridotite with their long dimensions parallel to the trend of the zones. Near a contact of the ultramafic body with the older intruded rocks,

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* Chromite is composed of varying amounts of the oxides of chromite (Cr), aluminum (Al), iron (Fe), and magnesium (Mg). The general formula is $(Mg,Fe)\,O \cdot (Cr,Al,Fe)_2O_3$.

** Mobile rock material generated within the earth. It may be molten, liquid, or pasty due to formation of crystals.

the ore zones parallel the contact and have attitudes similar to the older rocks. A knowledge of the distribution and trend of the chromite segregations provides a good guide to development and prospecting for ore bodies.

Layered chromite at the Lower Violet mine. An excellent exposure of layered-disseminated chromite in a zone about 5 feet thick is exposed in the vertical north wall of the glory hole at the Lower Violet mine (no. 9), sec. 14, T. 36 S., R. 9 W. The zone, striking N. 10° E. and dipping 85° E., is made up of more than 20 separate chromite-rich layers (chromitite) in dunite. The layers range from a fraction of an inch to nearly 2 feet in thickness, although most are less than half an inch thick. The greatest amount of chromite in any single layer was estimated to be 70 percent. The chromitite layers are separated by light-green altered dunite containing 1 to 20 percent chromite disseminated through it. The size of the chromite grains where concentrated in the chromitite layers is as much as 2 mm in diameter; whereas sparsely disseminated chromite grains in the dunite layers average about 0.5 mm in diameter and are often as small as 0.2 mm.

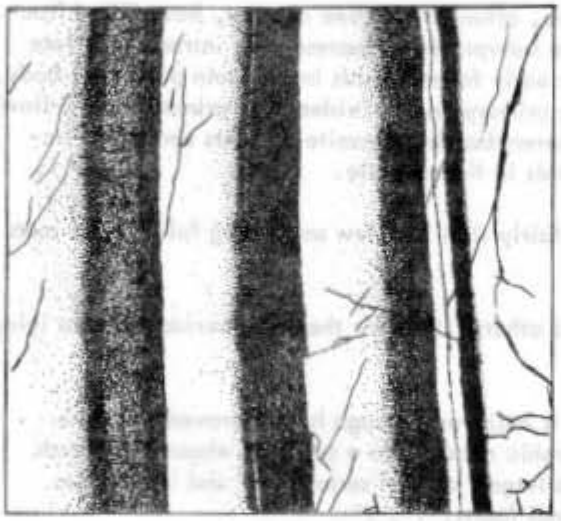

Plate 1 - Ink tracing from photograph of layered chromite exposed in vertical north wall of glory hole at Lower Violet Mine. Note composite nature of layers and gradational west edges. Layers strike N. 10° E. and dip 85° E.

At the Lower Violet exposure the western contacts of the chromitite layers with the dunite are nearly always gradational while the eastern contacts are usually fairly sharp (see plate 1). This can be explained as follows: In the formation of layered-disseminated chromite ore the precipitation of chromite and olivine is simultaneous, with the chromite crystallizing in an intermittent or cyclic manner due to a sensitive balance in at least one of the oxide components, possibly Al_2O_3 (Smith, 1953, indicated the importance of alumina in precipitation of the Newfoundland chromites). It is believed that precipitation of chromite begins more rapidly than it ceases; consequently the base of each chromite layer tends to be sharp and the top of each layer gradational. Precipitation of olivine would have little or no influence on the layering effect, as it would be continuous. It seems most likely that deposition of the chromite crystals occurred in horizontal planes due to gravitational settling. Similar conclusions regarding origin of layered chromite were proposed by Westgate (1921) and Peoples and Howland (1940) who studied the Stillwater Complex, Montana, where individual chromite layers may be traced for several miles. Since the western edges of the nearly vertical chromitite layers in the Lower Violet mine are in most cases gradational, they are interpreted as being the upper side.

Structure of the ultramafic rocks

Faulting. There are apparently two main sets of faults in the area: those which trend north and those which trend northwest. The northerly set appears to be the older of the two as it has been offset by the northwesterly set. The large east-west fault in the southern part of

the area is probably related to the later northwest-trending set. Several small northwest-trending faults in the area around Chrome Camp are shown on the map of Wells and others (1940), and have a northwestward displacement of their southwestern blocks. During the present investigations, similar faults were seen cutting some of the chromite deposits. Where the displacement was determined, the direction of horizontal movement along the faults agrees with the observations of Wells and others (1940).

Two large high-angle longitudinal faults, the Cedar Mountain and Hansen Saddle faults, are projected southward into the area of the map from the geologic map of the Galice quadrangle. These major faults strike approximately N. 20° E.

Folding. The ultramafic rocks in the Chrome Ridge area have apparently undergone considerable folding as well as jointing and faulting. (See geologic map and cross sections.) Closely spaced vertical joints or cleavages (?) and occasional shear zones have developed at or near the crests and troughs of some of the folds.

Narrow veinlets of pyroxenite and dunite, often cutting one another, have filled fractures cutting the peridotite. Such veinlets are interpreted as representing intrusions of late residual portions of the ultramafic magma into early formed joints in the main peridotite body. These secondary structures tend to obscure the primary ones. Evidence of primary (platy-flow) structures is best seen in the layered and schlieren-banded chromite deposits and in the occasional streaky distribution of pyroxene crystals in the saxonite.

Folding in the peridotite appears to be fairly tight. A few small drag folds whose axes plunged at high angles were observed.

Folding was first suggested by Wells and others (1940) for the large peridotite area lying east of Chrome Camp as follows:

> "The sill-like body of peridotite is believed, though hardly proved, to have been folded, together with the metamorphic rocks, into a syncline whose axis trends northeastward through the middle of the largest area of serpentine, and it may also have been displaced by large longitudinal faults. . . ."

If the interpretation of origin of the chromitite layers at the Lower Violet glory hole is correct and their western edges indicate the direction of the upper side, it can be assumed that the peridotite at this exposure has been overturned and is on the steeply dipping eastern limb of a syncline. About 1500 feet south of the mine, the eastern limb of this same syncline is more steeply dipping than the western limb, but it does not appear to be overturned (see highest point of cross-section A - A').

Structural data collected here is insufficient to present a complete and accurate interpretation of the area as a whole. It does, however, support the fact that the ultramafic rocks have been folded, in some places intensely. Folding of the peridotite probably took place shortly after its intrusion. In northern California, Wells and others (1949) concluded that the peridotite was folded while the rock was still plastic, since flowage took place from the limbs to crests of folds with no evidence of any concommitant fracturing.

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MORE ON ROGUE RIVER WITHDRAWALS

The March 14, 1956, Federal Register carried a notice of proposed withdrawals from location or entry under the mining laws of 7,870 acres of land along the Rogue River in the Siskiyou National Forest, Curry and Josephine counties, Oregon. The stated purpose of the withdrawal is to reserve the land for use by the U.S. Forest Service as a public recreation area.

The proposed action is a companion to the withdrawal and proposed withdrawal by the U.S. Bureau of Land Management made in June and December 1955 in this same area (see Ore.-Bin, January 1956). If these withdrawals are consummated, essentially all of the area immediately bordering the Rogue River will be closed to prospecting, mining, and mining property access from Agness to several miles upstream beyond Galice.

If no protests are made, the withdrawal will be established. If sufficient protests are received, the State Supervisor of the Bureau of Land Management may order a public hearing on the proposal. Persons interested in filing a protest should write to Mr. Virgil T. Heath, State Supervisor, Bureau of Land Management, 1001 N.E. Lloyd Blvd., P.O. Box 3861, Portland 8, Oregon. Expiration date for filing of protests is April 13, 1956.

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NIEL ALLEN REAPPOINTED

Niel R. Allen, Grants Pass, was recently reappointed to the Governing Board of the Oregon Department of Geology and Mineral Industries by Governor Elmo Smith. The appointment was made February 28, 1956, and is to run through February 29, 1960. Mr. Allen, senior partner in the law firm of Allen, Schultz & Salisbury, Grants Pass, was first appointed to the Governing Board by Governor Earl Snell in October 1943, and has since been reappointed by Governors Hall and McKay. For six years Mr. Allen served as Chairman of the Board, a position now held by Mason L. Bingham, Portland. The other member of the Governing Board is Austin Dunn, Baker.

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AIME TO MEET IN SEATTLE

The 1956 AIME Metals and Minerals Conference, Pacific Northwest Region, will be held on May 3, 4, and 5 at the Olympic Hotel in Seattle. The program will be devoted primarily to meetings of the various conference sections at which technical papers on geology, mining, milling, industrial minerals, petroleum, iron and steel, and metallurgy will be presented.

The annual banquet will be held at 7:00 p.m. Friday, May 4, at which Grover J. Holt, AIME President-elect and General Manager of the Ore Mining Department of the Cleveland-Cliffs Iron Company, Ishpeming, Michigan, will speak. The Mining Branch luncheon on Friday will be addressed by Mr. Desmond F. Kidd, Past President of the Canadian Institute of Mining and Metallurgy. Speaker at the Metals Branch luncheon on Thursday will be Dr. J. Gordon Parr, Associate Professor of Metallurgy, University of Alberta.

Other activities scheduled for the three-day program will include a mineral industries education session at 8:00 p.m. Thursday, May 3. A symposium on X-ray analysis and X-ray equipment will be held at the University of Washington campus Friday afternoon and all day Saturday. Industrial plant tours are scheduled for Saturday morning, May 5. Titles and authors of a few of the papers to be presented at sessions of the Mining Branch are listed below:

"Petroleum and Natural Gas in British Columbia," by Dr. Courtenay E. Cleveland, Senior Geologist, Pacific Petroleums Ltd., Vancouver, B.C.

"Importance of Washington Coal Reserves in the Regional Power Picture," by J. Frank Ward, Managing Director, Washington State Power Commission, Olympia, Washington.

"Localization of Ore in the Kootenay Arc," Dr. M. S. Hedley, Senior Geologist, and Dr. J. T. Fyles, Geologist, British Columbia Department of Mines, Victoria, B.C.

"Tectonic Patterns of the Western United States," by Dr. Peter Misch, Department of Geology, University of Washington, Seattle, Washington.

"Granites of Magmatic Origin as Distinguished from Granites of Metasomatic Origin," by Professor G. E. Goodspeed, University of Washington, Seattle, Washington.

"Industrial Mineral Industries of the Pacific Rim - Recent Developments and Expected Trends," by R. J. Anderson, Assistant to the Director, Battelle Memorial Institute, Columbus, Ohio.

"Requirements for Industrial Silica in the Pacific Northwest," by Dr. E.E. Mueller, Associate Professor, Department of Ceramics, University of Washington, Seattle, Washington.

"Olivine," by Kermit Bengtson, Graduate Student, Chemical Engineering Department, University of Washington, Seattle, Washington.

"A Review of Uranium Milling Practice to Date," by Edmund C. Bitzer, Metallurgical Engineer, Golden, Colorado.

"Recent Advances in the Structural Clay Products Industry," by Neal R. Fosseen, President, Washington Brick & Lime Company, Spokane, Washington.

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ADMINISTRATIVE ORDER NO. G.M.I. 3

At a public hearing held March 16 and 19, 1956, in the State Office Building, Portland, Oregon, Rule L of the Rules and Regulations for the Conservation of Oil and Natural Gas promulgated September 15, 1953, as Administrative Order No. G.M.I. 1, was amended by Administrative Order No. G.M.I. 3 as follows:

Rule L

ORS 520.095 (1) (13)

Abandonment, Unlawful Abandonment, Suspension, Well Plugging

A. Oil, Gas, and Water to be Protected

Before any well or any producing horizon encountered therein shall be abandoned, the owner or operator shall use such means, methods, and procedure as may be necessary to prevent water from entering any oil or gas-bearing formation, and to protect any underground or surface water that is suitable for domestic or irrigation purposes from waste, downward drainage, harmful infiltration and addition of deleterious substances.

The operator of any hole drilled for oil and gas which penetrates a usable fresh-water horizon, except those drilled for the purposes of seismic prospecting, shall be required to set casing through this formation and cement such casing from top to bottom, unless special exception is granted by the Board.

B. Suspension: Removal of Equipment: Application: Extension

The Board may authorize a permittee to suspend operations or remove equipment from a well for the period stated in the Board's written authorization, given upon written application of the permittee and his or its affidavit showing good cause. The period of suspension may be extended by the Board, upon written application therefor made before expiration of the previously authorized suspension, accompanied by affidavit of the permittee showing good cause for the granting of such extension.

C. Abandonment: Notice of Intention: Presumptions

1. Before any work is commenced to abandon any well drilled for oil or gas, the permittee shall give written notice to the Board of his intention to abandon such well. The notice shall be upon forms supplied by the Board and shall contain the permit number of the well and such other information as reasonably may be required by the Board.

2. After operations on or at a well have been suspended with the approval of the Board pursuant to Section B of this rule, if operations are not resumed within six months from the date specified in such approval of suspension, an intention to abandon and unlawful abandonment shall be presumed unless the permittee has obtained from the Board an extension of time of such suspension, upon his or its written application and affidavit showing good cause for the granting of such extension.

3. Whenever operations on or at any well shall have been suspended for a period of six months without compliance with these regulations, the well shall be presumed unlawfully abandoned.

4. A well shall be deemed unlawfully abandoned if, without notice given to the Board as required by these rules, any drilling or producing equipment is removed.

5. Any unlawful abandonment under these regulations shall be declared by the Board and such declaration of abandonment shall be entered in the Board minutes and written notice thereof mailed by registered mail both to such permittee at his last known post office address as disclosed by the records of the Board and likewise to the permittee's surety; and the Board may thereafter proceed against the permittee and his or its surety.

6. All wells abandoned or declared abandoned as herein provided shall be plugged as required by law and by these regulations.

7. The bond furnished by permittee shall not be released until all procedures required by these regulations shall have been completed and the Board in writing shall have authorized such release.

D. Plugging Methods and Procedure

(No change)

E. Affidavit on Completion: Copies

(No change)

F. Seismic Core and Other Exploratory Holes to be Plugged: Methods: Affidavit

Before abandoning any hole drilled for seismic, core, or other exploratory purposes, which hole penetrates a usable fresh-water horizon, it shall be the duty of the owner or driller of such hole to plug the same in such manner as to protect properly all water-bearing formations; and within sixty (60) days after such plugging, an affidavit shall be filed with the Director by such owner or driller, setting forth the location of the holes and the method used in plugging the same to protect water-bearing formations.

G. Wells Used for Fresh Water

When the drilled well to be plugged may safely be used as a fresh-water well and such use is desired by the land owner, the well need not be filled above the required sealing plug set below fresh water; provided, however, that authorization for use of any such well shall be obtained from the State Engineer, in conformance with Chapter 708, Oregon Laws 1955.

Application for leaving the well partially unplugged as a fresh-water well may be made to the Board by the land owner, accompanied by his affidavit as to his need of water and the intended use of the well, together with certified copy of the State Engineer's order or permit, or that officer's statement that no permit is required.

The operator shall leave the fresh-water well in a condition approved by the Board.

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STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
Head Office: 1069 State Office Bldg., Portland 1, Oregon
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MINING CLAIM HOLDERS, TAKE NOTE

Do you hold a valid mining claim? This is what the U.S. Bureau of Land Management and the U.S. Forest Service are going to determine. Starting this year, every claim on lands under their jurisdiction will be examined, a job that the Forest Service expects to complete by 1965. The Bureau of Land Management and Forest Service have always had authority to do this, but now they have greater incentive than ever before because management of the surface of mineral claims can be theirs if the claim can be shown to be invalid or if the claim holder does not take certain measures required by a new law.

Public Law 167 amended the mining law to the effect that all claims located after July 23, 1955, are subject to the right of Government bureaus to manage the surface resources and to use as much of the surface as may be necessary as long as this does not materially interfere with prospecting or mining. It also provides that mining claims located before passage of the law can be challenged and, failing to be proved valid, the surface of the claim can be managed by the bureaus in the same manner as if the claim had been located after passage of the law. With the authority to manage the surface at stake, appropriations to finance the examinations of claims were pressed for and obtained by the bureaus, and procedures have been put into operation for determination of surface rights. The first area to receive the Forest Service's attention in the Pacific Northwest Region is on the North Fork of the Snoqualmie River, Washington. Districts in Oregon that will reportedly receive examination early this summer are Hunters Creek (Curry County), Quartzville (Linn County), and Blue River (Lane County). The Bureau of Land Management has not made announcement of the areas it expects to investigate first.

The following, extracted from the Forest Service's manual, "Policy and Instructions for Determination of Surface Rights on Mining Claims," is the procedure the Forest Service announces it will follow in making determinations. The Bureau of Land Management, to the best of the Department's knowledge, does not have such a manual, but it seems likely that a similar procedure would be followed.

The preliminary step by the Forest Service will be the examination of an area for evidence of persons in actual possession of or engaged in working claims. This will be a physical examination and will be made to determine if location notices are posted on the lands; if there is any kind of house, cabin, shack, camp, or other evidence of living or other actual occupancy of the area; if there is any new work, assessment work, development work, pits, shafts, drifts, surface diggings, or other workings; if there is any road construction, clearing of timber, machinery in place, or other evidence of mining activity. At this time, the tract indexes in the county courthouse will be searched in an attempt to find the name or address of persons found in possession or actually working a claim. Following the physical examination of a property,

a notice will be filed in the office of the Secretary of Interior requesting publication of a notice to mining claimants for determination of surface rights. The notice will be published in a newspaper having general circulation in the county in which the lands involved are located. Within 15 days after the first publication of the notice by the Department of Interior, letters will be sent to each person in possession of or engaged in working a claim in the examined area and to each person who has filed a request for notice. The requirements of the law are met by mailing of the notice; it does not require that the notice be received.

After publication of the notice in the newspapers, the claim holder must file a verified statement,* setting out certain facts about his claim, otherwise the Government bureaus will automatically have the legal right to manage the surface resources. If the mining claimant does file a verified statement, the Forest Service will send a mineral examiner to the mining claim to determine whether the claim should be recognized as valid. Where appropriate, according to the Forest Service manual, the mining claimant will be contacted and stipulations provided for in the law will be discussed. In the case of a clearly valid claim for which the locator has filed a verified statement, an agreement may be entered into which will make it unnecessary to go to hearing as to the claim. In some instances this agreement will state that the United States does not contest the asserted rights of a mining claim for which a verified statement has been filed.

If a verified statement is filed by a mining claimant on which the Forest Service thinks there may be some doubt as to the validity of the mining claim, the Department of Interior will fix a time and place for a hearing. The place of the hearing will be in the county where the lands in the claims are located unless the mining claimant agrees otherwise. Any single hearing will be limited to a maximum of 20 mining claims unless otherwise agreed. The procedures with respect to notice and conduct of hearings as well as appeals therefrom will follow those relating to contests or protests already set up within the Department of Interior. The hearing will determine whether the mining claim is valid and effective or whether it is invalid and ineffective. On the claims declared valid and effective, the owner of the mining claim may conduct his operation as if Public Law 167 had never been passed. Claims declared invalid or ineffective will have their surface subject to management and disposition by the Government bureaus.

So far, everything given above has been concerned with the procedures the Government bureaus might take to determine if they could manage the surface of mining claims. The claim holder or person having an interest in the claim cannot prevent this determination. However, the claim owner or any person owning an interest in a claim can take one precautionary measure in order to be notified of a determination by the bureaus. The law provides that any person desiring to receive a copy of a published notice to mining claimants may file in the county office of record a request for a copy of any such notice. The request for notice should set forth:

(1) Name and address of the person requesting copies.

(2) The date of location.

(3) The book and page of the recordation of the notice or certificate of location.

(4) The section or sections of the public land surveys which embrace such mining claim; or if such lands are unsurveyed, either the section or sections which would probably embrace such mining claim when the public land surveys are extended to such lands or a tie by courses and distances to an approved United States mineral monument.

*Verified statement: a statement under oath. Notary publics and most county officials are qualified to perform this service.

Failure of the Government department or agency to comply with this request would cause the publication of the notice to be ineffectual as to the mining claim of that person.

Whether or not a "request for copy of notice" has been filed, the claim holder must file a verified statement within 150 days from the time of first publication in the newspapers of the notice to determine surface rights, if he wishes to keep the status of his claim the same as before passage of Public Law 167. The verified statement should give the following information:

(1) The date of location.

(2) The book and page of recordation of the notice of certificate of location.

(3) The section or sections of the public land surveys which embrace such mining claims; or if such lands are unsurveyed, either the section or sections which would probably embrace such mining claim when the public land surveys are extended to such lands or a tie by courses and distances to an approved United States mineral monument.

(4) Whether such claimant is a locator or purchaser under such location, and

(5) The name and address of such claimant and names and addresses so far as known to the claimant of any other person or persons claiming any interest or interests in or under such unpatented mining claim.

This statement must be filed with the office specified in the published notice. The office, according to the Bureau of Land Management and Forest Service, will likely be the State Supervisor of the Bureau of Land Management or the Land Office of the Bureau of Land Management.

Failure to file the verified statement within 150 days of the date of the first notice shall be considered as conclusive evidence that the mining claim owner:

(1) Waives and relinquishes any right, title, or interest under such mining claim as regards the surface rights.

(2) Constitutes a consent by the mining claimant that the mining claim shall be subject to the limitations and restrictions of Public Law 167.

(3) Precludes thereafter any assertion of such mining claimant of any right or title or interest in the mining claim contrary to or in conflict with Public Law 167.

The Department, as a public service through The Ore.-Bin, will try to keep miners and prospectors notified of the determinations of the Forest Service and Bureau of Land Management as they proceed. It should be emphasized, however, that The Ore.-Bin comes out but once a month and it is possible the Department will not be informed of all determinations in the State. Therefore all claim holders or persons holding interests in claims should file in the appropriate county courthouses their "request for copy of notice."

H.M.D.

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IMPORTANT MINING BILLS INTRODUCED IN CONGRESS

A series of bills has been introduced in Congress that, if passed into law, would assure the nation of at least a minimum live strategic-minerals industry -- an industry that is so essential to a sound mobilization base. Also, the bills would strengthen the economy of the western states by allowing strategic mineral mining to continue at about the same level as in the past few years. Although all the bills are only "stop gap" measures they are absolutely necessary ones. If legislation of this type is not passed, practically all strategic mineral mining in the United States will cease, for the present Government purchase programs are either filled or are so close to their termination dates that exploration and development for new deposits are not warranted.

Of particular interest to Oregon are Senate bills Nos. 3453, 3497, and 3504. S. 3453 would continue all present mineral programs through June 30, 1961, by paying the producers a production bonus of a sum equal to the difference between the present Government purchase program price and the price actually obtained by selling on the open market. If successful in becoming law, the provisions of S. 3453 will go into effect when the present purchase program on each of the minerals ends. The administration of the act would be by a new agency within the Department of Interior and not under the control of the General Services Administration or the Office of Defense Mobilization, the agencies which presently control the purchase programs. The mechanism of S. 3453 is patterned after the Wool Act which was approved by President Eisenhower.

S. 3497 would provide for extension of the purchase program for mercury until June 30, 1961, with the price to be paid for domestic metal increased to $275 per flask. The existing purchase program for mercury has been wholly unsuccessful due to the unrealistic price of $225 per flask now offered. (Average New York price for 1955 was $290 per flask.) Of the quota of 125,000 flasks authorized to be purchased, only a token 5 flasks has been acquired.

S. 3504 would provide for continuation of the existing chromite purchase program to June 30, 1961. Price, quantity, administration, and buying depot (Grants Pass, Oregon) would remain the same as at present. Under the existing program, which was initiated in 1951, a little more than 50 percent of the authorized 200,000 long tons had been acquired by the end of 1955. This would mean that the chrome miners would have 5 years to produce under 100,000 long tons. The 1955 shipments to the Grants Pass purchasing depot from Oregon, California, and Alaska was 34,567 long tons.

Other Senate bills (many of which do not have companion bills from the House) introduced are:

S. 2876 - Would provide for a five-year extension of existing purchase programs for tungsten, manganese, chromite, mica, asbestos, beryl, and columbium-tantalum-bearing ores and concentrates.

S. 3379 - Tungsten. Would provide for continuation of existing purchase program to June 30, 1959.

S. 3496 - Antimony. Would provide for setting up a purchase program for antimony to continue to June 30, 1961.

The following bills would provide for continuation of existing purchase programs to June 30, 1961:

S. 3455 - Mica.
S. 3485 - Columbium-tantalum-bearing ores.
S. 3486 - Beryl.
S. 3499 - Asbestos.
S. 3523 - Manganese.

Essentially, all these bills but S. 3453 are the same as H.R. 6373, of the last session of Congress, which was vetoed by the President reportedly on the advice of ODM. Theoretically, ODM could continue all strategic mineral programs without benefit of new legislation but their actions of last year would indicate they have no desire to do so. Because of this S. 3453, which would not be under ODM and which carries its own authorization for an appropriation, would appear to offer the best chance of continuing a domestic strategic mineral industry.

As encouraging as this proposed legislation is, it still does not answer the need for a policy that would assure a long-range, healthy, domestic strategic-mining industry capable of expanding in times of extreme crisis. Such a policy was outlined by official delegates of the Governors of Western States and Alaska at a meeting in Sacramento, November 7-9, 1955, but the Government has yet to propose one. Until such a program is forthcoming it appears the miner and Congress must press for this "stop gap" legislation if a nucleus of a producing industry is to be kept alive.

H.M.D.

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PUBLICITY ON GOVERNMENT BUREAU ACTIONS REQUESTED

The Governing Board of the State of Oregon Department of Geology and Mineral Industries requested Regional Forester Herbert J. Stone of the U.S. Forest Service and State Supervisor Virgil T. Heath of the Bureau of Land Management to give widespread publicity to their agencies' actions in determining who is to manage the surface of mining claims, authority for which was granted under Public Law 167. The letter of request sent April 12, 1956, to the two Bureau heads in Oregon is given below:

Mr. Herbert J. Stone, Regional Forester
U.S. Forest Service
729 N.E. Oregon Street
Portland, Oregon

Mr. Virgil T. Heath, State Supervisor
U.S. Bureau of Land Management
1001 N.E. Lloyd Blvd.
Portland, Oregon

Dear (Mr. Stone):

The Governing Board of the State of Oregon Department of Geology and Mineral Industries has requested that I write you asking that this Department be kept informed of the (U.S. Forest Service) efforts in making determinations on surface rights of mining claims in Oregon as provided under Public Law 167.

Further the Board earnestly requests that the(U.S. Forest Service)make public announcements and give wide publicity to the progress of the determinations. In this manner our Governing Board feels that the best interest of the public can be served in that the miners and prospectors of the State would be aware of what the(Forest Service) is doing under Public Law 167, fewer misunderstandings would arise, and cooperation could be better established between the(Forest Service)and mining people.

Sincerely yours,

/ / [illegible] Director

PROSPECTING IN CENTRAL OREGON

The Redmond Spokesman of January 30, 1956, carried a story by Mr. Thomas Boeke, Redmond attorney, on an application of a Denver, Colorado, group to the Bureau of Land Management that would tie up for the group the sole prospecting rights on 127,300 acres of acquired land in Jefferson and Crook counties, Oregon. Following Mr. Boeke's article, conflicting stories appeared in the Portland daily papers quoting Bureau of Land Management officials on the applications, prospecting permits, and staking of claims in the central Oregon area. As it appears likely that central Oregon will receive considerable attention this summer from uranium prospectors due to the interesting finds on Bear Creek and Powell Butte (Crook County), Mr. Virgil T. Heath, State Supervisor of the Bureau of Land Management, was asked for help in clarifying the confusion concerning prospecting in central Oregon. Mr. Heath's reply is given below:

> Certain public lands situated in Jefferson County were withdrawn by Executive Order No. 7672, dated July 19, 1937, from settlement, location, sale or entry and reserved and set apart for use and development by the Department of Agriculture for soil erosion control and other land utilization activities in connection with Oregon Land Project LA-OR2.
>
> The withdrawal provided, however, that, "Nothing herein contained shall restrict prospecting, locating, developing, mining, entering, leasing, or patenting the mineral resources of the lands under the applicable laws."
>
> A list of the lands withdrawn by Executive Order No. 7672 was published in the Federal Register of July 22, 1937, at page 1263. The area withdrawn involves portions or all of the following townships:

Tps. 12 and 13 S., R. 11 E.	Willamette	meridian,	Oregon
Tps. 11, 12, and 13 S., R. 12 E.	"	"	"
Tps. 11, 12, and 13 S., R. 13 E.	"	"	"
Tps. 10, 11, 12, and 13 S., R. 14 E.	"	"	"
T. 10 S., R. 15 E.	"	"	"

> The area of public lands involved in the Executive Order is reported to be about 13,000 acres and the area of lands acquired within the project area is reported to be about 93,000 acres. There are also lands within the project area that have not been acquired and, as well, there are some power site lands and some other lands which may be included in a Bureau of Reclamation, First Form Withdrawal.
>
> The mineral rights on the lands included in the project may be acquired, if available, as follows:
>
> (a) The public lands in the project:
>
> The public lands withdrawn are open for prospecting, location, developing, mining, entering, leasing, or patenting under applicable mineral land laws.
>
> Mineral materials such as common varieties of sand, stone, gravel, pumice, pumicite, cinders, and clay described in Public Law 167, 84th Congress (69 Stat. 367) may be pur-

chased under the Materials Act from the agency having jurisdiction, in this case, the U.S. Forest Service.

Lands withdrawn for power site purposes were opened to location and patenting of mining claims and for mining, development, beneficiation, removal, and utilization of the mineral resources by Public Law 359, 84th Congress, August 11, 1955, (69 Stat. 687). Such locations, however, must be filed for recordation in the Land Office as set out in the Act.

The First Form Reclamation lands, if any, are not available for mineral location unless opened under the act of April 25, 1932, (47 Stat. 136; 43 U.S.C. 154),

(b) The acquired lands in the project:

Under present regulations, prospecting permits will be issued, upon application, to the first qualified applicant after permission is secured from the agency having jurisdiction, and provided the deeds for the acquired lands show the mineral rights were transferred to the Government. For procedure see Circular 1919.*

Mineral materials such as those enumerated in Public Law 167, supra, cannot be purchased under the Materials Act but must be secured by application for a prospecting permit and upon discovery, a preference lease may be secured as outlined above. (See also Circular 1919).

If any of the acquired lands were originally patented as Stockraising Homesteads, such lands are open for prospecting, location, development, leasing, or patenting under applicable laws.

A prospecting permit is for a period of two years and may be renewed for a period of two years. If a valuable mineral deposit is discovered by the permittee within his permit area, he is entitled to a preference right lease for any or all of the lands in his permit area for any period of five to ten years, upon advice of the agency having jurisdiction over the surface and the U.S. Geological Survey.

Sincerely yours,
/s/ Virgil T. Heath, State Supervisor

It would appear that anyone planning on prospecting in central Oregon would be wise to contact the Land Office of the Bureau of Land Management before going into a particular area in order to determine if prospecting permits are required or if the land can be staked according to the mining laws. If this precaution is not taken, there is always the possibility your "find" will be on acquired land, which requires a prospecting permit. If the "find" is made before a prospecting permit is obtained, the land must be put up for open, competitive bid with no priority or advantage given the discoverer.

The experience so far this year in central Oregon indicates that mineral leasing of government land is a dismal failure and certainly is not to be preferred to the tried and true method of staking claims.

H.M.D.

*"Mineral deposits in acquired lands and under rights-of-way," U.S. Bureau Land Management.

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TO ATTEND SENATE HEARING

Fay Bristol and Bill Robertson, members of the "Chromite Industry Advisory Committee" of the Office of Minerals Mobilization, and Hollis M. Dole, Director of the State of Oregon Department of Geology and Mineral Industries, will attend a hearing in Washington, D. C., April 19 and 20, on the Senate bills given on page 32 of this month's Ore.-Bin. The hearings are to be held by the Senate Subcommittee on Minerals, Materials, and Fuels of the Senate Committee on Interior and Insular Affairs, James E. Murray, Montana, Chairman.

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NEW PUBLICATION ON RADIOACTIVITY

The Department has received the Colorado School of Mines Quarterly, vol. 51, no. 1, which is devoted to the article "Instrumentation and methods for radioactivity detection in the mineral industry." The author of Part I is James O. Milmoe, Instrumentation Chemist, Colorado School of Mines Research Foundation, and of Part II is Stephen P. Kanizay, Instructor in Geology, Colorado School of Mines.

Part I deals with the theory, development, and applications of various radioactivity detection instruments. Some special uses devised by the Colorado School of Mines Research Foundation, are pointed out and explained. Instruments and methods of detection that are described include photography, cloud chambers, electroscopes, electrometers, ionization chambers, proportional counters, Geiger-Müller counters, scintillation counters, and crystal conduction counters. Radiometric assay methods for pitchblende, carnotite, and monazite-type ores are given, together with comparison curves for conversion of net counts per minute to percent thorium and uranium oxides. The importance of a petrographic examination for mineral identification is indicated.

Part II is an outline of current techniques in field exploration, based on characteristics of the instruments as developed in Part I. It outlines many considerations of radioactive prospecting and points out advantages and limitations of each method. The importance of correcting for variations in terrain level during airborne traversing is brought out. Geologic guides discussed emphasize the Colorado Plateau, but applications in other radioactive areas are mentioned. The author covers various types of drilling in current use with a comparison of costs. The methods of sampling and gamma-ray logging are shown in determining the ore grade and stratigraphy and in making a final evaluation of a deposit.

A copy of the Quarterly may be secured by sending $1.00 to the Colorado School of Mines, Golden, Colorado.

****

DO YOU STILL OWN SOME GOLD?

In general, persons are required by law to have a government license in order to possess or deal in gold. Exceptions are given below as contained in the Gold Reserve Act of 1934 as amended to July 15, 1954.

Natural gold may be held, bought, sold, and transported within the United States without the necessity of obtaining a government license. Natural gold is defined by the Treasury as gold recovered from natural sources which has not been melted, smelted, or refined or otherwise treated by heating or by a chemical or electrical process. Thus the only gold which would come under the Treasury definition and which may be bought and sold in this country without any strings attached is metallic gold obtained from a natural source by mechanical means only - that is by such methods as sorting, washing, sluicing, screening, and tabling. Gold amalgam is also considered as unprocessed gold, but it must not be heated or treated before sale.

Gold obtained in the form of sponge, which results from retorting gold amalgamated with mercury, may be held and transported without a license by the person retorting the amalgam, provided that the person shall hold at any one time an amount not in excess of 200 troy ounces of fine gold. The person holding such gold may dispose of it only to the United States Mint or to a person holding the proper government license.

Gold coin of value to coin collectors may be acquired, held, transported within the United States, or imported without the necessity of holding a license. However, such coin may not be exported without a license from the Director of the Mint. Gold coin made prior to April 5, 1933, is considered to be of recognized special value to collectors of rare and unusual coin (See January 1956 Ore.-Bin, page 8).

A person engaged in an industry, profession, or art which requires gold for the legitimate conduct of such activities may import unmelted scrap gold and may acquire, hold, melt, and treat gold in any form without a license provided the aggregate amount of such gold does not exceed at any time 50 troy ounces of fine gold. This gold must be used by the person possessing it in his actual business of fabricating or in his profession or art.

A person may hold at any one time not more than 50 troy ounces of fine gold in the form of unmelted scrap. He may furnish it only in such form to persons authorized by license or otherwise, to acquire unmelted scrap gold, or he may sell it in unmelted form to the United States. Such persons may acquire gold for these purposes only from:

(1) A person duly licensed by the government.
(2) A person authorized under the regulations to hold and dispose of gold without a license.
(3) A United States mint or assay office.

Persons as specified above may not sell or otherwise dispose of gold except as unmelted scrap gold, or fabricated gold, or in metals containing not more than 5 troy ounces per short ton, or gold in its natural state; provided that gold filings, clippings, and the like which result from the legitimate conduct of the work in which the person is engaged may be disposed of in the same form to licensed persons or to the United States.

No person may acquire, hold, transport, melt or treat, or import gold coin or gold derived by any person from gold coin or any gold which has been held in noncompliance with the Act of March 9, 1933, any executive orders or orders of the Secretary of the Treasury issued thereunder.

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LIGHTWEIGHT CONCRETE IN SWEDEN

A company in Sweden manufactures a lightweight concrete called Durox that can be drilled, sawed, and nailed like wood. The material was developed in 1923 after Nobel prize winner Gustaf Dalen, a native of Sweden, discovered that local deposits of alum shale and limestone could be successfully combined to form the lightweight concrete. Since that time certain other substances have been found to be suitable. The Durox weighs 31 to 44 pounds per cubic foot as compared with 75 to 100 pounds for ordinary bricks, and can therefore be made into fairly large units. The process is described in Compressed Air Magazine, November 1955, as follows:

> "The manufacturing process is somewhat similar to the baking of bread. The essential calcareous and silicious ingredients are ground into a flourlike powder, mixed, sprinkled with water and 'leavened' with aluminum powder. The mass is then worked like dough and poured into greased baking molds. These are transferred to a fermenting chamber where the mixture rises to twice its original height. After the cakes have been baked with steam they are cut with wire saws into blocks or slabs of desired sizes. The final step is hardening in cylinders containing high-pressure steam. This treatment is claimed to prevent the pieces from shrinking later on."

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EASTERN OREGON MINING NEWS

The first chromite shipments from the John Day region for the 1956 season were made by the Comstock Uranium-Tungsten Company, Inc., which is working the Haggard and New mine, Grant County. The Company has mined and milled enough chromite ore for three truck-trailer shipments of chrome concentrates. With continued good weather, access conditions will permit sustained full-scale resumption of operations. Mr. E.E.W. Kearly is in charge of operations.

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Al Dunn has started construction of a mill in Canyon City to treat ore from a leased chromite prospect situated on the William Gardner ranch about a mile northwest of the Haggard and New mine, Grant County. Development of the prospect was begun in 1955, and 16 tons of concentrates were produced and shipped from a test mill-run conducted late in the year.

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Underground exploration work is being continued by H. K. Riddle on the Jordan brothers' cinnabar claims on Bully Creek, Malheur County. Mr. S. P. Wilson is in charge.

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The Uranic and Strategic Minerals Company, Inc., of Boise, Idaho, Mr. William Schierding, Manager, is reportedly scheduled to start drilling at a cinnabar prospect located on Vale Butte, Malheur County. Access roads to the prospect have already been completed.

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DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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Field Offices

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Baker

239 S.E. "H" Street
Grants Pass

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to Lilly alias "the debris slide" from the "Soil Creep" Herb

LANDSLIDES

By
Herbert G. Schlicker*

Introduction - This past winter excessive slope failures in the Northwest have focused more than usual interest on landslides. Public interest has led to the preparation of this article designed to explain in a general way the causes, danger signs, and corrections for a few of the most common types of slides occurring in the Portland area.

Landslide damage - Landslides are far more common than is generally realized. Lack of information about them is probably due to their intermittent occurrence and the relatively small number of people directly affected. The following cost estimates of slide damage in Oregon are given to illustrate their importance and to call attention to the need for further slide study.

The winter of 1955-1956 cost the Multnomah County road department an estimated $125,000 for slide repair, four times the normal yearly cost. Slides in that county, which numbered 109, are exclusive of those on highways and streets maintained by city governments and the State Highway Department. The Portland city water department reported a slide damage this past winter to the main water supply system which will cost an estimated $100,000 to repair. According to the city engineer's office, repairs to Portland city streets and parks necessitated by recent slides will cost about $100,000.

The Oregon State Highway Department reports that slides have cost an average of more than $400,000 yearly for the 4-year period ending November 30, 1955. Since that date, damage has occurred which may greatly exceed this yearly average. Federal agencies concerned with relocation of the Willamette Highway in the vicinity of Lookout Point Dam reported that slides increased the cost of construction by at least $500,000, but that other similar Federal projects were less affected. In addition the cost of landslides to counties in Oregon other than Multnomah County, cities besides Portland, the Forest Service, logging companies, railroads, power and telephone companies, corporations, and individuals throughout the State makes the total for greater than may be realized.

Causes of landslides - Slopes remain standing only because they possess the internal strength to have withstood the most severe conditions to date. The fact that slides occur is evidence that either weather conditions affecting the soil have become more severe or other factors have made the slopes more susceptible to sliding.

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

A slide is precipitated when the shearing stress exceeds the shearing strength of the soil. Shearing stress in a soil mass is increased by external causes while a loss of shear strength of the soil is caused by internal changes.

External causes of landslides are due to the undercutting of the toe of a slope (over-steepening), addition of weight from embankment material or waste deposited along the upper edge of the slope, and from added weight of increased moisture content. Earthquakes or vibrations can be a cause and there is no doubt that vibrations from any source may "trigger" a slide.

Internal causes of landslides are due to water in the ground. The ground water produces both immediate and progressive decrease in shear strength of the soil. Immediate decrease of shear strength is generally caused by increase in pressure from water in the voids. This pressure is analogous to the forces exerted by a hydrostatic head. Seapage pressure is a force exerted by ground-water flow due to the viscosity of water moving through minute passages in the soil. Continued seepage through slopes expels the air and apparent cohesion between the soil particles is eliminated, further weakening the soil. Although this mainly concerns conditions of rapid drawdown in reservoirs and stream channels it is also true of saturated soils below the water table. Progressive decrease in shear strength results from removal of the soil binder and chemical decomposition of the mineral grains by ground-water action.

A deep frost greatly increases the susceptibility of a slope to fail. Frost heaving or the expansion of the soil by formation of ice crystals and the freezing of water pockets results in increase of void spaces in the soil. This increased moisture capacity of the soil is sometimes sufficient to start liquefaction* and slide action on fairly steep slopes. The deep frost early in the fall of 1955 is unquestionably a major factor in the large number of slope failures in the Portland area during the past winter.

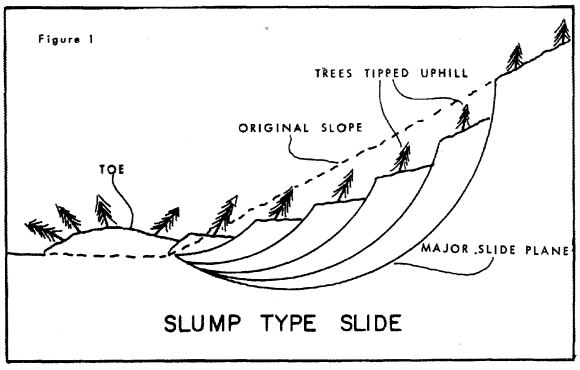
Slide development - As the shearing forces approach the shear strength of a soil mass, certain sections fail by rearrangement of the soil grains and the formation of hairline cracks. Excess water in the disturbed soil is forced into other sections of the soil and failure of the soil mass continues as if by chain reaction. When the shear strength along a possible slide plane is reduced sufficiently the entire mass becomes mobile and a slide occurs. At the moment a slide begins the shearing forces are but slightly greater than the shear strength of the soil, but sliding causes a reduction in strength of 20 to 90 percent depending on the sensitivity** of the soil (Terzaghi, 1950, p. 112). Movement of the slide rapidly increases as the soil loses its strength. As the slide progresses, the driving force is reduced through reduction in slope and mixing of the slide material with more stable foreign soil. When the resisting force again is equal to the shearing force of the soil the movement passes from sliding into slow creep. The surface of an old slide is particularly susceptible to the effects of excessive rainfall, since numerous deep fissures provide easy entrance for water and drainage is greatly disrupted.

Varieties of landslides - Landslides occur in so many types of material under such a wide variety of conditions that a classification could include dozens of categories. For the student of landslides, various classifications have been prepared (Ladd, Sharpe, Terzaghi, and others)

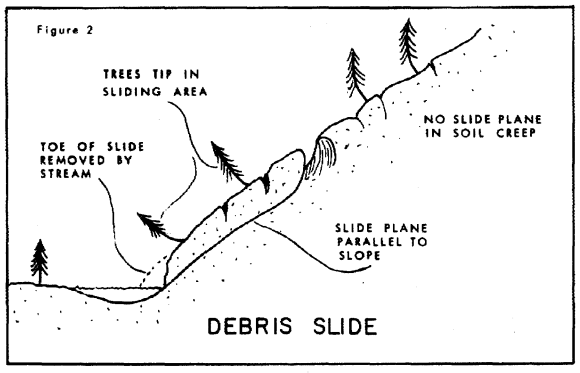
* Action of a saturated soil which becomes fluid when disturbed.

** Sensitivity refers to changes in soil strength under variations of moisture content.

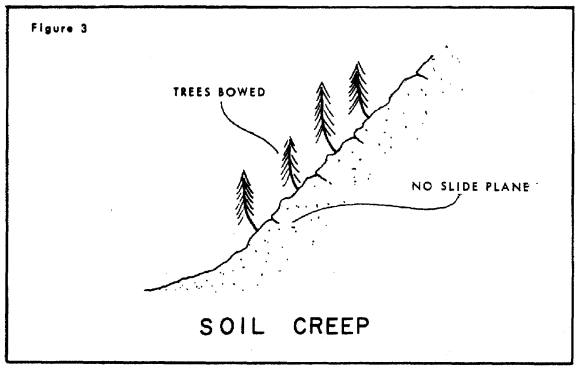
based on the appearance, the mechanics, the type of material, and the speed at which failure takes place. No attempt is made here to present a classification of landslides other than to name and describe the most general types occurring on earth slopes.



Slump: This term is used (Sharpe, 1938) for landslides having a curved slide plane occurring in relatively homogeneous material such as unbedded silts and clays. A slump-type slide is recognized by the exposed main slide plane at the head of the slide, a series of successive slump blocks resembling terraces having exposed sliding surfaces, and the bulged toe of the slide due to compression from the sliding mass. Trees standing on the individual blocks are nearly vertical at the top but near the base they lean upslope, due to rotation (see Fig. 1). On the toe, however, the trees lean downhill. When the toe of a slump occurs on steep slopes the slide may continue as a debris slide or mudflow depending on moisture conditions and sensitivity of the sliding material to minor moisture changes. As an example of high sensitivity, a silt soil, which is stable at a certain moisture content, loses its strength rapidly with slight increase of moisture.



Debris slide: Debris slides are characterized by a straight slide plane and generally occur in a weathered zone such as clay or silt resting on unweathered resistant beds. The sliding mass tears away from the soil upslope, forming deep irregular cracks normal to the direction of sliding. Trees tip downhill due to forward rotation of the soil mass by friction at the slide plane (see Fig. 2). If material accumulates at the toe of a debris slide a curved sliding plane will develop, producing a more stable condition (Baker, 1953, p. 10).



Soil creep: Creep is similar to a debris slide except that no slide plane is developed. The surface of a creep area consists of a series of humps or rolls; cracks are developed in an irregular pattern but do not outline the sliding area as in a debris slide. Trees and normally vertical objects tilt downslope. Creep often develops into slump or debris slides as continued movement produces a sliding surface (see Fig. 3).

Mudflow: Mudflows occur when the soil flows downslope as the result of oversaturation. Rearrangement of the soil grains in this type of material by shock or movement when the soil is saturated decreases the void space, which in effect creates an excess of water in the soil mass. The excess water gives buoyancy and mobility to the soil mass and can carry along material in its path ranging from soil to boulders. Mudflows are recognized by the jumbled mass of unsorted materials, generally fan shaped, at the toe.

Treatment and prevention - Both critical slopes and landslides offer serious problems and should be equally considered. In general both will require the same extensive treatment before stability is assured.

The corrective methods used depend on degree of slope, size of area, type of soil, and degree of safety required. All slides and unstable slopes have in common the force of gravity and shear strength of the soil. Both are appreciably affected by moisture. Any treatment to be successful must counteract the effective force of gravity or increase the shear strength of the soil.

Since even gentle slopes may be subject to sliding they should be examined for signs of failure. Old landslide scars are obvious signs of dangerous slopes. Although these may have affected only a small part of the area, the entire slope should be considered susceptible to failure. According to Terzaghi (1950, p. 110) all slides except those due to earthquake and spontaneous liquefaction will show signs of progressive failure prior to sliding. Indications of progressive slope failure are bent trees, vertical objects such as fence posts tipped downhill, and tension cracks along the upper edge of the unstable area.

Although some slopes have not failed, any steepening such as addition of material at the top or the removal of material at the toe, may change the conditions sufficiently to cause sliding. Failure, however, will probably not occur until there is a decrease of soil strength and addition of weight during a period of excessive moisture.

The treatment of slides and critical slopes depends upon acquiring a satisfactory degree of safety within economical limits. In the case of highway slides it is sometimes more economical to clean up a slide after it occurs rather than prevent it. Occasionally moderate expenditure will make a slope questionably safe; however, this type of treatment is impractical if a slide might result in excessive damage, possible injury, or loss of life. The magnitude of a slide that warrants being made absolutely safe depends on the value of the property involved. Slides affecting most dwellings must be made unquestionably safe, therefore only sliding on a small scale can be economically corrected. Generally stabilization can be effected by unloading the top of the slide and placing material on the toe and draining the slope by good surface drainage and by horizontal pipes placed to intersect subsurface water. All sources of surface and ground water leading into the slide area should be located and their effects lessened or eliminated. Control of long slopes is difficult, expensive, and often economically impossible, especially if the slide occurs part way up the slope.

Piling driven through the moving layer of soil into stable material may add stability but it should not be attempted without a study of the forces involved. Piling of proper strength must be driven sufficiently deep in firm, stable material to resist being pushed over or broken off by the force exerted by the unstable soil mass. The effects of piling or a retaining wall should not be expected to overcome the entire force of a large soil mass but should be used in conjunction with other procedures such as drainage or resloping.

Close spacing of homes on small hillside lots affected by a slide may prevent the most satisfactory correction such as diversion of surface water away from the slide and resloping. Proper treatment in this case can be accomplished only by cooperation on the part of all persons involved.

Landscaping of homes located on steep hillsides should take into consideration the possibility of creating or alleviating slides. Care should be taken when retaining walls are built on slopes below the level of the house and filled with soil to provide level or nearly level yards. This system if properly designed is satisfactory; however, most trouble lies in underdesigned retaining walls, poor foundations in which to anchor the wall, little or no drainage facilities for water pressure building up behind the wall, and, probably the greatest cause of failure, poorly compacted fill material composed of sensitive silt or clayey silt. Persons familiar with design of retaining walls should be given the responsibility. The problem of compaction and type of material is extremely important. The body of the fill should be made of a well-graded soil which when compacted will have a minimum of void space, thereby providing as little volume for moisture as possible. It should be placed at a computed moisture content and compacted to at least 90 percent maximum by hand or pneumatic tampers. The fill should be placed and compacted in layers not exceeding a depth of 6 inches to insure sufficient compaction.

Acknowledgments - Gratitude is extended to the persons and organizations that gave assistance in the preparation of this report. Mr. W. C. Hill, Soils Engineer for the Oregon State Highway Department, read the report and made helpful suggestions. Mr. H. F. Kerslake provided a map and list of slides occurring on Multnomah County roads. The State Highway Department, the Multnomah County Road Department, and the Street, Park, and Public Works departments of the City of Portland provided information on occurrences and costs of the numerous slides in the Portland area.

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LAND DETERMINATION AREAS IN OREGON

The U.S. Forest Service and Bureau of Land Management have notified the Department the following areas will be examined this summer for determination of surface rights under Public Law 167 (see The Ore.-Bin, April 1956 and August 1955).

U.S. Forest Service

1.-Deschutes National Forest (field examination started May 1956): Secs. 29 through 36, T. 25 S., R. 8 E.; secs. 24, 25, and 36, T. 26 S., R. 7 E.; secs. 1 through 36, T. 26 S., R. 8 E.; secs. 1 through 30, 34, 35, 36, and part of sec. 31, T. 27 S., R. 8 E.; secs. 1, 2, 3, 10, 11, 12, 13, 14, 24, 25, 35, and 36, T. 28 S., R. 8 E.; and sec. 1, T. 29 S., R. 8 E.

2.- Willamette National Forest (field examination to be started as soon as snow conditions permit): Little North Fork Santiam River area and Quartzville area.

3.- Siskiyou National Forest (to be examined this spring): Lawson Creek drainage of Curry County.

U.S. Bureau of Land Management

The letter from the Bureau of Land Management states:

> "We have selected T. 34 S., Rs. 5 and 6 W., as the first experimental or test area. This is an area of intermingled O&C and vacant public lands and known to contain a number of mining claim locations. We expect to examine and advertise the vacant public land under Public Law 167 within the next three months. It is also quite likely it will also be necessary to examine and advertise the O&C lands. The reason being that the O&C Mining Act of 1948 (62 Stat. 162) does not provide road rights of way across mining claims located either prior or subsequent to the act of August 28, 1937 (50 Stat. 874).
>
> "If any claims are found on O&C lands which were located prior to August 28, 1937, and which appear, upon examination, to be locations without a valid discovery, it is quite likely adverse proceedings will be brought under the old procedure with the object of cancelling such locations. The effect of such a procedure would be to save for the counties (75%) and the Government (25%) of the timber values now and hereafter growing on the area occupied by a claim or claims located prior to August 28, 1937, the same as if such locations were made subsequent to the act of April 8, 1948, supra."

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DRILLING PERMIT ISSUED

Permit No. 18 to drill an oil test well was issued April 30, 1956, to Riddle Gas and Oil Producers, Oreg., Ltd. The permit showed that the drilling was to be done 601 feet south of the north line and 34.9 feet west of the east line of sec. 28, T. 30 S., R. 6 W. The lessee was given as F. H. Wollenberg, Alameda, California, and the lessor as W. M. Parnell, Riddle, Oregon.

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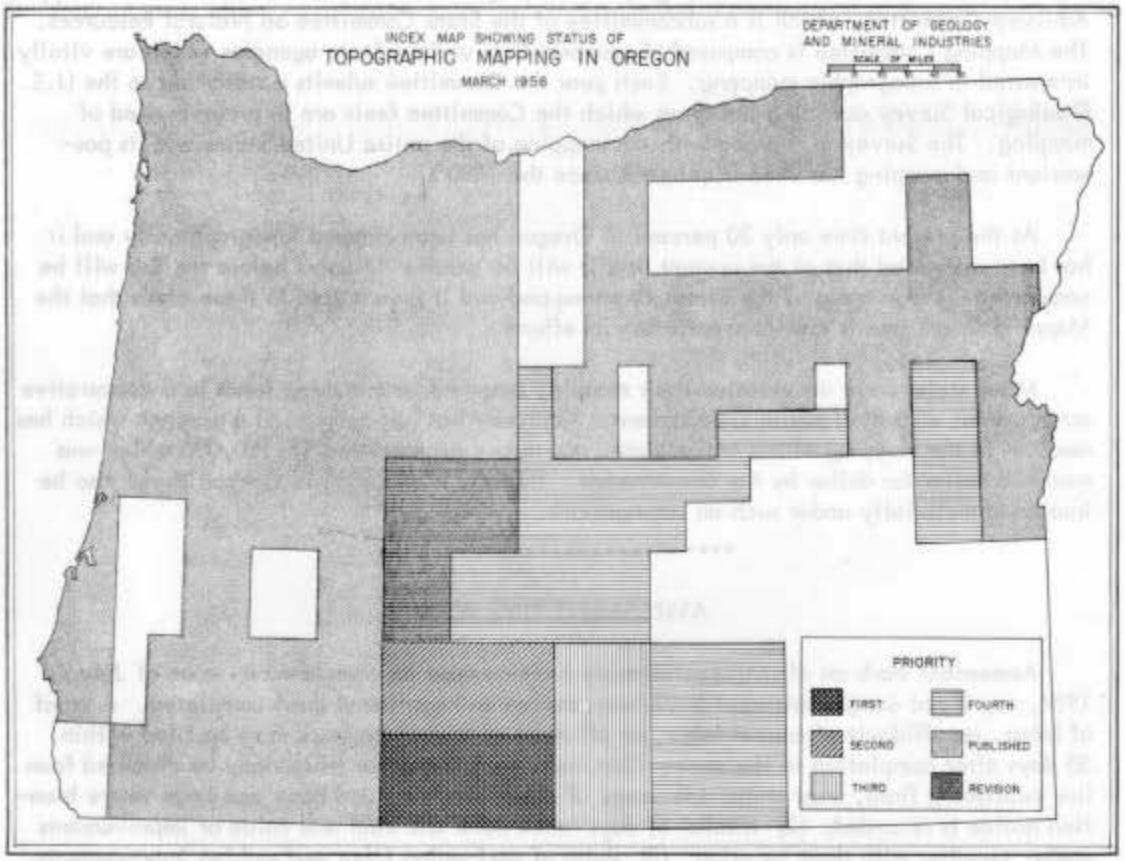
TOPOGRAPHIC MAPPING



One of the most useful tools of the geologist and engineer is the modern topographic map. A topographic map shows the location of rivers and streams, mountain peaks, valleys, and many other natural features. It shows trails, roads, highways, bridges, ditches, and dams. Cities, towns, and even individual buildings in rural areas are indicated. In addition to all these, a topographic map shows by means of a series of contour lines the elevation and configuration of the surface of the earth. These contour lines are drawn through points of equal elevation and are spaced at vertical intervals varying from 5 to 100 feet. Exact elevations of important topographic features such as mountain peaks are printed on the map. A topographic map in the hands of a person trained in reading it shows at a glance the relationship of one geographic point to another, both vertically and horizontally. The usefulness of such maps is not limited, however, to the professional, and increasing numbers are sold annually to vacationists and others interested in the out of doors who wish the most accurate information of the countryside available.

From an engineering standpoint, a topographic map is a "must" in the planning and execution of any project such as a pipeline, highway, transmission line, or dam. Oftentimes the feasibility of a proposed site can be determined readily from an examination of a topographic map. Geologists require topographic maps as a base on which to plot their findings. It is impractical to do any geologic mapping in areas not previously mapped topographically. The growing demand for water points up the need for topographic maps since adequate studies can not be made without them.

The accompanying map shows the status of topographic mapping in Oregon. Included on this map are the areas for which topographic coverage has been requested by the State Mapping Advisory Committee, which is a subcommittee of the State Committee on Natural Resources. The Mapping Committee is composed of members from various State agencies which are vitally interested in topographic mapppng. Each year the Committee submits a statement to the U.S. Geological Survey outlining the areas which the Committee feels are in greatest need of mapping. The Survey is charged with the mapping of the entire United States and its possessions and mapping has been in progress since the 1880's.

At the present time only 30 percent of Oregon has been mapped topographically and it has been estimated that at the present rate it will be another 17 years before the job will be completed. Large areas of the State are unmapped and it is in regard to these areas that the Mapping Committee is now concentrating its efforts.

Many states have accelerated their mapping programs by matching funds in a cooperative arrangement with the Federal Government. Kentucky has just completed a program which has resulted in the mapping of the entire state. Kentucky appropriated $3,180,000 which was matched dollar for dollar by the Government. The rate of mapping in Oregon could also be increased materially under such an arrangement.

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ASSESSMENT TIME AGAIN

Assessment work on all unpatented mining claims must be completed by noon of July 1, 1956, or, if not completed, must have been started and continued until completed. A proof of labor, an affidavit of annual labor, or affidavit of assessment work must be filed within 30 days after completion of the work. This instrument, forms for which may be obtained from law publishing firms, must state: (1) name of claim or claims and book and page where location notice is recorded; (2) number of days' work done and kind and value of improvements made, together with their location; (3) dates of performing labor and making improvements; (4) at whose instance or request work was done; and (5) amount paid for labor and improvements and by whom paid when same was not done by claim owner.

A total of $100 worth of work or improvements must be expended on each quartz, placer, or association placer claim each year. Some claim holders start their work just prior to the close of one assessment year and remain on the ground until after the start of the next assessment year, doing the work necessary for both years.

The Department has published a bulletin, Mining Laws of the State of Oregon, which contains the rules and regulations of the State of Oregon pertaining to location and assessment work on quartz and placer mining claims. Copies of this publication may be obtained from the Department office at Portland or from the Grants Pass and Baker field offices at a cost of 50 cents per copy.

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FLASH

It has been reported but not confirmed that the Office of Defense Mobilization will announce the extension of several strategic mineral programs in the near future. Chrome is one of the minerals reportedly included in the extensions.

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MAGNETIC DECLINATION IN OREGON

By
M. L. Steere*

Anyone who uses a compass for surveying or prospecting must take into account the effect of variations in the earth's magnetism on the compass needle. There are only a few places on the earth where the compass points truly north, and even there the direction is not constant for very long. In Oregon the compass points between 18° and 22° east of true north, with local variations of from 5° west to nearly 33° east. This deviation of the compass needle, or angle between magnetic north and true north, is known as magnetic declination.

Vagaries in the earth's magnetic field cause the declination to be constantly changing with time. Thus there is no fixed angle of declination anywhere on the surface of the earth and anyone using a compass for obtaining precise direction must either measure the declination at a particular location or refer to the latest magnetic observations of the U.S. Coast and Geodetic Survey.

Isogonic charts

One of the services of the U.S. Coast and Geodetic Survey is to provide information on magnetic declination in the United States (see bibliography). The Survey makes frequent observations at regular intervals and maintains magnetic charts (Figures 1 and 2, opposite page 49) which are revised and published every decade.

A chart of magnetic declination is known as an isogonic chart (isogonic meaning "equal angle"). It is a map, in this case of the United States, on which isogonic lines are drawn. Each isogonic line passes through places having approximately the value of declination specified. Because of natural local disturbance (anomaly), which is nearly everywhere present to some degree, the chart value is not usually the actual value of declination. Rather it is the average value for an area within a surrounding 10-mile radius. According to the Coast and Geodetic Survey, there is perhaps an even chance that the chart value will agree with the actual value within half a degree; occasionally it differs by many degrees, and in such places the compass is not very reliable.

The isogonic chart has an auxiliary set of lines showing equal annual change. These lines are called isopors and allow for applying a correction for secular change (gradual change in declination over a long period of time). Isopor lines should be used only if the desired value of declination is for a date within a few years before or after that of the chart.

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Figure 1. Magnetic Declination in Oregon in 1955 (Adapted from U.S. Coast and Geodetic Survey Isogonic Chart of the United States for 1955). Solid lines show equal magnetic declination. Dashed lines show equal annual change westward. Isolated numbers are abnormal observed values caused by local magnetic disturbances.

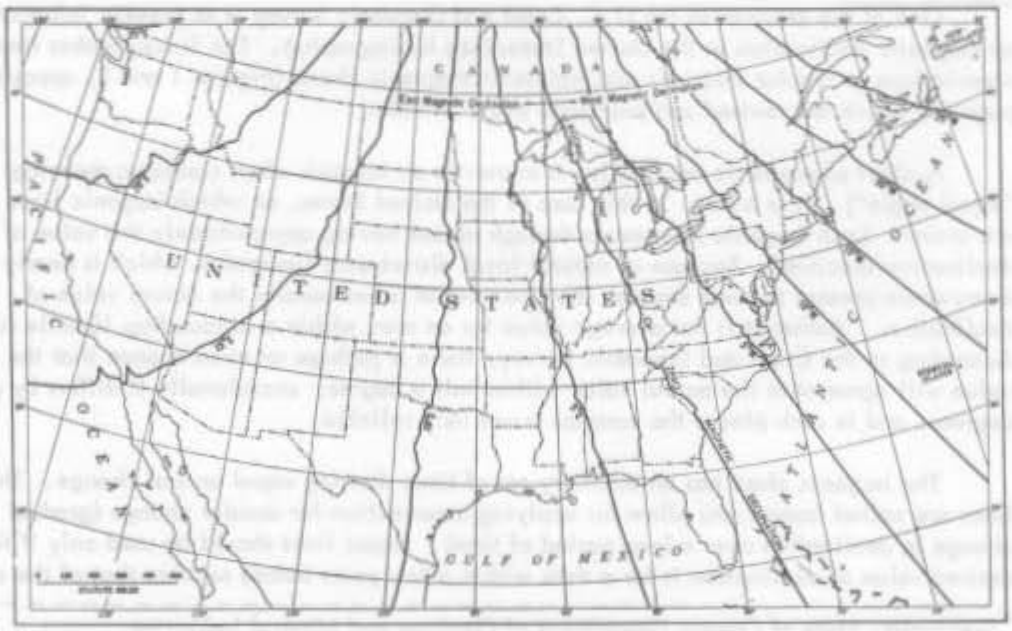

Figure 2. Isogonic Chart of the United States for 1945 (U.S. Coast and Geodetic Survey). Map shows lines of equal magnetic declination in 5-degree intervals.

The accompanying maps (Figures 1 and 2, on opposite page) were reproduced from Coast and Geodetic isogonic charts. By comparing the position of the 20° isogonic line on these two maps, one can see that its position has changed in the 10-year interval, 1945 to 1955. In Oregon the eastward declination has decreased nearly half a degree since 1945; and in the United States as a whole, the north end of the compass needle has been slowly moving westward with time.

History of geomagnetism*

The modern science of geomagnetism had its beginnings in ancient superstitions about the curious behavior of a variety of iron ore known as lodestone. The property of the lodestone to attract iron was explained by a Greek writer of the seventh century B.C. as "a certain appetite or desire of nutriment that makes the lodestone snatch the iron."

In the Middle Ages it was believed that there were fatal mountains of lodestone which broke up ships at sea by drawing the nails out of them. It is not known just when the directive property of the magnet was discovered or when this knowledge resulted in its use as an instrument, but literature of the 12th century tells of mariners using a crude floating compass as a last resort when all other means of finding direction failed.

Early charts of the Mediterranean coasts made in the 14th and 15th centuries were oriented by compass in total disregard of magnetic declination. Failure of the compass to point exactly north was believed at that time to be due to imperfections in the instrument. Gradually, however, makers and users of compasses became convinced that the needle did not point true north and that the angle of declination changed from place to place.

The prevailing opinion of the times was that the compass was being drawn toward a "point attractive" such as a magnetic mountain or island. In 1851 Robert Norman of London devised a type of compass needle that measured the dip or inclination. With this instrument he was able to show that the needle was not attracted but rather directed toward a point and that this point was not above the horizon but below it.

In 1600 Dr. William Gilbert of England published his famous work "De Magnete," in which he presented his important theory that the earth itself is a great magnet. He devised a spherical lodestone and showed how the dip of a compass needle on such a sphere would change from zero at the equator to 90° at either pole.

It had long been supposed that declination, although different from place to place, was fixed and invariable at any one place. But in 1634, Gellibrand, a mathematics professor at Gresham College, England, made the discovery that magnetic declination changes with time. By observing declination at places which had been measured 50 years earlier by previous mathematicians he was able to show that considerable change had occurred. His discovery of secular change was of great significance to the mariner and surveyor who could no longer feel confident in using the old values of declination observed by previous navigators or surveyors. Since Gellibrand's time, observations have shown that not only declination but also dip and intensity of the earth's magnetic field are changing with time.

Magnetic charts came into use around 1700. The earliest were for the Atlantic Ocean and showed lines of equal magnetic declination. The name "isogonic line" was adopted.

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* Condensed from Chapter 6, "Origins of geomagnetic science," U.S. Coast and Geodetic Survey Serial 663, 1945.

For a long period it was supposed that secular change was the only time change that occurred in declination. But eventually transient changes from day to day and from hour to hour were noted. This led to further investigation and the discovery of changes due to solar flares, cosmic rays, and magnetic storms.

In 1832 a German mathematician and physicist by the name of Gauss developed an instrument capable of measuring declination and intensity known as a magnetometer. With this instrument he was able to prove what had been earlier suspected, that the magnetic field originated inside the earth. His magnet was 3 feet long, weighed 25 pounds, and was suspended on a fiber 17 feet long. By way of contrast, the modern magnetometer has a magnet about half an inch long suspended on a filament less than 6 inches in length.

Gauss was responsible for stimulating interest in the field of magnetics among scientists in other countries. He succeeded in promoting international cooperation to the point where magnetic observatories were established at widely separated places to secure simultaneous data regarding variations of the earth's magnetism.

In 1843 the making of magnetic observations became one of the functions of the U.S. Coast and Geodetic Survey. These observations were at first confined to the coasts, but were later extended to the interior of the United States. Since 1947, the Survey has been charged with the responsibility of collecting results of magnetic observations from the entire world.

In recent years the study of the earth's magnetism has become one of the important fields of geophysical science. Besides the work of the Coast and Geodetic Survey, programs of research are carried on by the Carnegie Institution of Washington and the U.S. Geological Survey. Other organizations and certain universities are conducting laboratory and field investigations in some aspect of terrestrial magnetism. In spite of the abundance of research and the number of attractive theories advanced, however, no one has as yet been able to account satisfactorily for the existence of the earth's magnetism and its change with time.

Properties of the earth's magnetism

The earth can be thought of as a large magnet surrounded by a magnetic field. It is like the common bar magnet in that it has a north-seeking pole and a south-seeking pole. It is also similar to a spherical magnet in that at the magnetic poles the dip needle stands vertically and direction cannot be determined; as one goes away from the poles the dip increases until at the magnetic equator it is zero. Unlike the ordinary magnet, the earth has a magnetic field that is highly irregular and constantly changing.

Measuring the earth's magnetism at any one place consists of determining the direction and intensity of the field. By means of a dip needle and a compass needle the three magnetic elements - declination, dip, and horizontal intensity - can be measured and from these the total intensity and direction computed.

The axis of the earth's magnetic field is tilted in relation to the axis on which the earth rotates so that the magnetic north and south poles are many miles away from the geographic north and south poles. The magnetic poles, which, incidentally, are known to be moving, are by definition at the surface of the earth, but if a powerful bar magnet were placed within the earth so as to give an external field as nearly like the earth's actual field as possible,

this magnet would have to be quite short and near the center of the earth. Its terminations or poles would be thousands of miles from the magnetic poles as we interpret them. Thus the magnetic poles are only surface manifestations of the earth's magnetic field. A popular misconception about the magnetic poles is that they control the action of the compass. The Coast and Geodetic Survey emphasizes that the compass points only in the general direction of the magnetic poles.

Observations have shown that the magnetic pole is not a point but a rather large area in which the compass direction cannot be determined because the dip of the needle is vertical. According to the latest estimate by the Coast and Geodetic Survey, the position of the north magnetic polar region is latitude 74° N., longitude 101° W.; and the position of the south magnetic polar region is latitude 68° S., longitude 144° E.

Variations and anomalies in the earth's magnetism

1. Secular change. The causes of secular change (change over a long period of time) are obscure but are believed to lie deep within the earth. Although no one has been able to account for the earth's magnetism or its change with time, a number of theories have been advanced to explain it. W.M. Elsasser, physicist, in 1939 was the first to suggest how movements in a liquid core might explain the changing field. It is now generally assumed by physicists (Inglis, 1955) that the earth's core consists of fluid metal which surrounds a solid inner core. Heat within the core is sufficient to establish convection currents. Theories to account for the complicated flow pattern in the earth's interior that would induce the magnetic field observable at the surface are admitted by physicists to be based largely on conjecture.

It is believed that the magnetic pattern of the earth is shifting slowly westward, continually changing in form but drifting as a whole (Runcorn, 1955-b). This change seems to be regional in that the rate is much greater in some parts of the world than in others.

2. Annual change. The amount of secular change in one year is known as annual change. In Oregon at the present time the annual change averages about $2\frac{1}{2}$ minutes westward per year. That is, the north end of the compass needle is gradually shifting westward by that amount. At Salem, Oregon, for example, the declination is about 21 degrees E. and the annual change westward is 2.5 minutes (Figure 1, opposite page 49); in 10 years the angle of declination will have decreased about 25 minutes so that in 1966 the declination at Salem will presumably be about $20\frac{1}{2}$ degrees E. But since the future course of secular change is unknown, annual change cannot be predicted very far in the future.

3. Daily change. Declination varies significantly during the day time, but there is little change during the night. Daily change in the earth's magnetism is believed to be due to a system of electric currents in the upper atmosphere or ionosphere.* The current system remains more or less fixed with respect to the position of the earth and sun, while the earth rotates beneath it.

In the northern latitudes there is an easterly motion of the north end of the compass needle until 8 to 9 a.m. (local time); this is followed by a westerly motion of the needle

* A regular and pronounced diurnal variation in the low-frequency range of electromagnetic activity was studied by Philip A. Goldberg of the Physics Department of the University of Oregon and students at an isolated location in Lake County during the summer of 1955. Variations were believed due largely to world-wide thunderstorm activity.

until 1 or 2 p.m.; and finally an easterly motion. From dusk until early morning there is little change. Daily variation is significant when using a compass, as the north end of the needle points about 10 minutes more to the west at 1 p.m. than it does at 8 a.m.

4. Magnetic storms. Magnetic storms are associated with sun spots and characterized by auroral displays and pronounced disturbances to radio wave transmission. A magnetic storm may last many hours or even several weeks, and the most severe affect the whole earth. During a magnetic storm a stream of electrical charges is sent from the sun into the upper atmosphere of the earth. The change in declination during a magnetic storm may be as much as 4° in the United States.

5. Local magnetic anomalies. In most places the change in declination is gradual enough so that a surveyor can use the same declination throughout a small area. In some regions, however, there are large differences within a small area - sometimes as much as several degrees in a hundred feet. These effects are due to local disturbances or anomalies. If caused by works of man they are artificial; otherwise they are natural.

Artificial: Artificial magnetic disturbances affecting the compass needle can be caused by iron in buildings, fences, buried pipes, power lines supported by steel towers, and electric railways with grounded rails. Objects on the observer's clothing such as knives, belt buckles, and zippers also affect the compass needle. Some brass contains iron and is magnetic.

Natural: Minor natural irregularities in declination are normal, and almost everywhere the declination at two points 100 feet apart can differ by a few minutes. Natural anomaly thus limits the value of a compass as a surveying instrument.

Natural anomalies of several degrees are usually due to the presence of iron ore or magnetite, but other ores and certain geologic formations also cause irregularities in the magnetic field. It is known that sedimentary rocks do not usually contain enough magnetic minerals to produce noticeable distortion in the earth's field. In fact the sedimentary rocks tend to have a blanketing effect. According to the Coast and Geodetic Survey (correspondence), if it were not for the depth of sedimentary rock that covers the basement structure in most regions of the United States, it is likely that severe anomaly in the magnetic field would be quite commonplace.

Volcanic rocks, on the other hand, particularly basaltic lavas, contain considerable amounts of magnetite and are known to cause marked distortion in the earth's field when exposed at or near the surface. In Oregon, lava flows, volcanic plugs, dikes, sills, and certain basaltic intrusions are possible causes of local irregularities in the magnetic field.

A group of abnormal observed values in declination is shown in southeastern Oregon in the vicinity of Steens Mountain (Figure 1, opposite page 49). A variation in this region of from 5.7° W. to 32.4° E. has been recorded by the Coast and Geodetic Survey. A compass would not be reliable in this area. So far as is known, no one has attempted to interpret these magnetic anomalies, but they are presumably associated with the basic Tertiary lavas of the region.

The Isogonic Chart of the United States for 1955 shows only two closures of isogonic lines, and both closures occur in Oregon (see the 20° and 21° lines in Figure 1). These

closures reflect the natural anomalies of the area. It is probable that if the number of magnetic stations were increased in Oregon a great many more anomalies would be observed.

Natural magnetic anomalies play an important part in the location of ore bodies and in the mapping of geologic structures. In magnetic prospecting, knowledge of the vertical intensity of the earth's field is more useful than knowledge of declination. Exploration is done with a magnetometer which detects the intensity of the magnetic field. Iron, nickel, cobalt, chromite, and ferruginous bauxite, as well as oil structures are sometimes located in this manner.

The airborne magnetometer, developed as a submarine detector during World War II, has come into wide use in geophysical exploration for minerals (Knoerr, 1946). Aeromagnetic surveys are being conducted by the U.S. Geological Survey in search of iron ores in various parts of the country. The aerial survey is generally followed by ground surveys of the most promising anomalies.

Magnetic determinations

U.S. Coast and Geodetic Survey. Observations of magnetic declination by the Coast and Geodetic Survey are available for about 7000 places in the United States, 236 of which are in Oregon. The place where the observations are made is called a magnetic station and it is marked by a stone or concrete post with a bronze disk set in the top (as figured). In general, the stations are placed in or near county seats where they are readily accessible to local surveyors and engineers, and the locations are generally selected where natural or artificial disturbances are at a minimum.

Declination is measured by determining the true and magnetic meridians. The true meridian is obtained by observations with a theodolite on the sun or the stars. The magnetic meridian is determined by a magnet free to turn in a horizontal plane, and since accurate readings are desired a magnetometer is used. Horizontal intensity is determined with a magnetometer by means of timing the oscillations of the magnet as it swings. Dip is generally measured by means of an earth inductor. The method involved in making its determinations is described in U.S. Coast and Geodetic Survey Serial 618. Values of the magnetic elements determined at each station are given in Serial 667.

Observations are repeated about every 5 years by the Coast and Geodetic Survey at selected stations. At five observatories (Cheltenham, Maryland; Tucson, Arizona; San Juan, Puerto Rico; Sitka, Alaska; and Honolulu, Hawaii) continuous photographic records are maintained to show fluctuations in direction and intensity of the earth's magnetic field at those places.

Compass determinations. Declination may be determined also by compass if the instrument is in good adjustment and the observer free of iron and steel objects. If the true meridian is not known, it may be determined by making observations on Polaris with either the surveyor's transit or with a plumb and peep sight. (Methods for obtaining the azimuth of Polaris are described in U.S. Coast and Geodetic Serial 664.) Declination can then be measured with a compass. Observations should cover half an hour or more with readings at intervals of 5 or 10 minutes and should be made over several days, between 5 and 6 o'clock when declination is near the mean value and nearly stationary.

Paleomagnetic declination

Certain igneous, sedimentary, and metamorphic rocks have remanent magnetization that was caused by the earth's magnetic field at the time they were formed. Rocks having magnetization contain grains of magnetic iron in the form of iron oxide minerals such as hematite and magnetite. The magnetized grains act like tiny compass needles and record the declination and to a certain extent the inclination or dip of the magnetic field existing when the rock formed. In strongly magnetized rock such as basic lavas, remanent magnetization can be determined with a compass, but for weakly magnetic rocks a more sensitive instrument such as an astatic magnetometer is required (Runcorn, 1955-a). Hydrothermal alteration and weathering tend to destroy remanent magnetization.

Magnetization of lava is believed to occur when hot molten magma cools below the Curie point, above which it is nonmagnetic. Below the Curie point it becomes magnetized by the local geomagnetic field and its magnetism is not thereafter affected by changes in the field. Sedimentary deposits acquire a remanent magnetization if the already magnetized grains of iron oxide minerals orient themselves in the direction of the earth's field as they settle. Currents and eddies may affect the direction taken by these particles. The origin of remanent magnetization in metamorphic rocks is much more complicated.

It has been observed in recent years that certain rocks are reversely magnetized. The explanation of this condition has given rise to two opposing theories among students of geomagnetism: one that the earth's magnetic field reversed itself every so often (Runcorn, 1955-a); and the other that the iron oxide grains in the rock reversed their magnetic directions during the process of cooling, independently of the earth's field (Balsley and Buddington, 1956). Both theories have their staunch supporters.

Reversed magnetism is rare in sedimentary rocks but common in lava flows, particularly those of Tertiary age. Columbia River basalts in Oregon and Washington have been studied by Campbell and Runcorn (Runcorn, 1955-a) and found to have alternating zones of normal and reversed magnetizations. Further results of their work await publication.

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Magnetic poles and the compass: Serial 726, 1949

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ODM ANNOUNCES STAND ON STRATEGIC MINERALS

Late last month Office of Defense Mobilization Director Flemming presented to the Senate Interior Subcommittee on Minerals, Materials, and Fuels ODM's stand on strategic minerals procurement. Continuance of the domestic purchase programs by General Services Administration was indicated for metallurgical chromite, block and film muscovite mica, beryl, metallurgical manganese, metallurgical fluorspar, and antimony, and a recommendation was made that legislation be passed to assist the producers of chrysotile asbestos, acid-grade fluorspar, and tungsten. A review is to be made on mercury to ascertain whether there is any need for extension or intensification of the present program.

In discussing metallurgical chromite, Flemming stated "From the standpoint of stockpile objectives, it is clear that this program could be continued for a long period beyond June 30, 1957 (termination date of chrome purchase program). The question . . . is whether the program, if continued, would utlimately provide us with a mobilization base that would justify the expenditure. . . . The Interior Department has been requested to explore the matter further and submit an early report on the question of whether a meaningful mobilization base might be supported in the light of domestic reserves of metallurgical chrome and the feasible production from such reserves in time of emergency. ODM feels that if there is a reasonable doubt as to whether or not the program would ultimately provide us with a meaningful mobilization base, the doubt should be resolved in favor of a continuation of the program."

If ODM honestly wants to continue the metallurgical chrome-mining industry in the United States, they had better get on the ball and make a definite announcement rather than indulge in double-talk. As it is now, the only chrome mining is where ore has already been developed. Exploration work necessary to keep the program alive just isn't being done. If ODM waits until next year to announce the continuation of the purchase program, they will find the present mines closed down, the miners in other branches of industry, and the operators with little taste to once again reopen their mines in response to a government agency that doesn't seem to understand or care about the difficulties of operating a mine.

In his testimony, Flemming stated ODM's position in regard to the strategic minerals program as follows: Ample authority exists to procure materials for the national defense; procurement authority should be kept "flexible" to permit immediate action to support a vigorous defense program; measures which are primarily for economic relief should not be handled as part of the defense program; bills that would give specific guarantees for individual materials have not been supported. This statement of policy has long been awaited by the domestic mining industry and the Senate Subcommittee, for reportedly it was on advice from ODM that the bill to increase purchase goals passed by the first session of the 84th Congress was vetoed. Until ODM had stated its position, the future of the present bills on extension of the minerals programs was unknown. Quite obviously only the minerals recommended as needing legislation by ODM now stand a chance of being favorably reported out of the Senate Subcommittee. This means that S. 3504, which would have provided for continuation of the existing chromite purchase program, is in all likelihood dead.

H.M.D.

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EASTERN OREGON ENGINEER DIES

John Arthur, Sumpter, Oregon, mining engineer, died June 13, 1956. Mr. Arthur, who was on the Lindgren survey of the Blue Mountains in 1900, has long been identified with mining in eastern Oregon. His formal schooling in engineering was obtained at the Colorado School of Mines and the Massachusetts Institute of Technology. He was a registered professional engineer. Mr. Arthur was born May 8, 1872, in Illinois.

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NEW URANIUM PURCHASE PLAN ANNOUNCED

The U.S. Atomic Energy Commission announced May 24 establishment of a new domestic uranium procurement program for the period from April 1, 1962, through December 31, 1966, and an extension of the initial production bonus for uranium ore from February 28, 1957, its present expiration date, through March 31, 1960.

The new domestic procurement program provides a guaranteed market for all uranium concentrates produced by domestic mills from domestic ores. The price established is $8.00 per pound of U_3O_8 contained in normal mill concentrates or precipitates. The initial production bonus, which has been in effect since 1951, is paid on the first 10,000 pounds of uranium oxide in ore delivered from an eligible mining property to an authorized buying station or mill. The bonus ranges from $1.50 per pound of uranium oxide in ore assaying 0.10 percent uranium oxide to $3.50 per pound of uranium oxide in ore assaying 0.20 percent uranium oxide and above.

Concerning the off-Plateau procurement program, Mr. Elton A. Youngberg, Acting Assistant Manager of AEC's Grand Junction Operations office wrote the Department:

> ". . . This program has been under study for several months and, at this time, we are not issuing contracts of this type. An announcement will be made when a decision has been reached.
>
> "This does not mean that producers in Oregon do not have a market. We will purchase their amenable ores under our regular procurement contracts and pay haulage at 6 cents a ton mile up to 100 miles. You should also realize that the initial production for the first 10,000 pounds of contained U_3O_8 is eligible for a bonus equivalent to the base price. With the assistance of the haulage allowance and the bonus, I believe you will find that producers that have ores of minable grade can ship their production to Salt Lake City and realize a profit."

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PURCHASE PROGRAM BILLS

Legislation to extend the purchase programs of strategic minerals not taken care of by ODM was passed by the Senate Interior Committee in mid-June. The bill, S.3982, calls for the following quota limits and purchase prices: Tungsten, 1¼-million ton units at $55, and small producers - 1,000 units per year and less - will get a bonus rate of $63 per unit; asbestos, 2,000 tons of No. 1 and 2, and 2,000 additional tons of No. 3 if delivered along with No. 1 and 2, at the market price; acid-grade fluorspar, 250,000 tons at about $52.50; and columbium-tantalum - this provision was thrown in to give producers added assurance but no additional Government purchases are expected since the defense stockpile goal for this mineral has been reached.

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LAND DETERMINATION AREAS IN OREGON

The U.S. Bureau of Land Management and Forest Service notified the Department this month that the following areas will be examined this summer for determination of surface rights under Public Law 167. These areas are in addition to the ones noted in the May 1956 Ore.-Bin.

U.S. Bureau of Land Management - T. 37, 38, and 39 S., Rs. 5 and 6 W. All public domain land including O&C lands will be examined. The O&C lands will be examined under provisions of the law that have been in effect prior to passage of Public Law 167.

U.S. Forest Service - Quartzville area, most of the southern part of T. 11 S., Rs. 4, 5, and 6 E., and most of the northern part of T. 12 S., Rs. 4, 5, and 6 E.

Little North Fork area of the Santiam River, most of T. 8 S., Rs. 4 and 5 E., and secs. 3, 4, and 7 of T. 9 S., R. 6 E.

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STRATIGRAPHIC IMPLICATIONS OF SOME CENOZOIC FORAMINIFERA FROM WESTERN OREGON*

By
R. E. Stewart**

OLIGOCENE

"Blakeley (?) zone" (upper Oligocene ?): Reference has been made to an exposure of beds containing foraminifera of possible Blakeley age east of Astoria, Oregon (15, p. 74). The strata and fauna referred to are best developed in southwestern Washington and appear to be upper Oligocene in age and correlative with the Twin River beds farther north in Clallam County, Washington, and the type Blakeley formation of Bainbridge Island near Seattle.

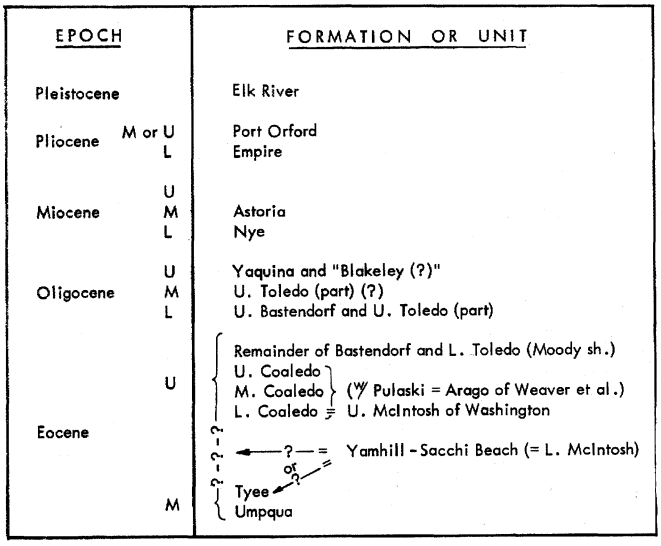

Figure 1. Generalized Stratigraphic Column on Some Western Oregon Marine Tertiary Formations. (Redrawn from Ore.-Bin, January 1956.)

Rau (14, pp. 426-427) gives a thorough discussion of Blakeley (?) strata in the Willapa River Valley, Pacific County, Washington. He points out that the transitional nature of its foraminiferal fauna between that of the Astoria formation and the Lincoln formation and the stratigraphic position of the type Blakeley in relation to the Lincoln formation in other regions suggest a correlation of these transitional beds with the type Blakeley, but so few typical Blakeley foraminifera have been found that the true relationship cannot be established definitely at this time. He, therefore, calls this stratigraphic interval the Blakeley (?) zone.

Kleinpell (5, pp. 77, 111, 161, 163, fig. 14) has correlated foraminiferal faunules from the Blakeley formation of Washington with his California Zemorian Stage of lower Miocene age.

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* Continued from The Ore.-Bin, vol. 18, no. 1, January 1956.

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Rau (14, p. 424) has charted the following species, all of which are figured in his paper, as restricted to this Blakeley (?) zone in his Willapa River section: Anomalina sp., Bulimina sp., Dentalina sp., Elphidium minutum (Reuss), Robulus cf. calcar (Linne), Sigmoilina tenuis (Czjzek).

The following species, according to Rau's range chart, have lower limits of their ranges in the Willapa Valley Blakeley (?) zone: Bolivina floridana Cushman, B. marginata adelaidana Cushman and Kleinpell, Bulimina cf. ovata d'Orbigny, Buliminella subfusiformis Cushman, Cassidulina pulchella d'Orbigny, Cibicides aff. perlucida Nuttall, Eponides mansfieldi oregonensis Cushman, Stewart and Stewart, Globigerina bulloides d'Orbigny, Nonion costiferum (Cushman), Nonionella miocenica Cushman, Planulina astoriensis Cushman, Stewart and Stewart, Pseudoparrella parva (Cushman and Laiming), Robulus nikobarensis (Schwager), Uvigerinella californica ornata Cushman, U. obesa impolita Cushman and Laiming, Valvulineria araucana (d'Orbigny), V. menloensis Rau.

According to the same chart the following species have their upper range limits in the Blakeley (?) zone: Cassidulina galvinensis Cushman and Frizzell, Cibicides elmaensis Rau, Eponides umbonatus Reuss, Gaudryina alazanensis Cushman, Guttulina frankei Cushman and Ozawa, Gyroidina orbicularis planata Cushman, Karreriella washingtonensis Rau, Nodosaria grandis Reuss, Nonion ? cf. planatum Cushman and Thomas, Plectofrondicularia packardi multilineata Cushman and Simonson, Pseudoglandulina inflata (Bornemann), Pyrgo lupheri Rau, Quinqueloculina weaveri Rau, Sigmomorphina pseudoschenki Cushman and Ozawa, Spiroloculina texana Cushman and Ellisor, Uvigerina gallowayi Cushman.

Martinottiella communis (d'Orbigny), not mentioned by Rau, is quite characteristic of the Blakeley (?) zone, although its range extends upward into the lowermost Astoria formation and appears to go downward into the top of the Lincoln formation.

Yaquina formation (upper Oligocene ?): The Yaquina formation at its type locality east of Newport is sandstone. It contains a megafauna, but, to the best of the writer's knowledge, no foraminifera. About 15 miles to the south, however, in a highway cut approximately half a mile southwest of Waldport, foraminiferal shales occur in association with sandstones which Vokes, Norbisrath, and Snavely (22 b) have mapped as Yaquina sandstone of upper Oligocene ("Blakeley" equivalent) age. Among the megafossils reported from this Waldport locality is Durham's (7b, p. 111, fig. 7) upper Oligocene (lower Blakeley) gastropod marker, Echinophoria rex (Tegland). The foraminiferal assemblage is essentially the same as one recorded by Heacock (16, pp. 13-43) from the upper 2325 feet of the Nye formation at Newport, and has several species in common with the Astoria formation. A partial list of the foraminifera from the Waldport locality is as follows: Anomolina glabrata Cushman, Bolivina advena Cushman, B. marginata Cushman, var. adelaidana Cushman and Kleinpell, Bulimina cf. ovata d'Orbigny, B. cf. pyrula d'Orbigny, Buliminella bassendorfensis Cushman and Parker, B. subfusiformis Cushman, Cassidulina laevigata d'Orbigny, var. carinata Cushman, C. margareta Karrer, Cibicides floridanus (Cushman), Chilostomella cf. oolina Schwager, Cyclammina sp., Dentalina cf. isidroensis Cushman and Renz, Glandulina cf. laevigata (d'Orbigny) var. ovata Cushman and Applin, Globigerina cf. bulloides d'Orbigny, Globobulimina cf. pacifica Cushman, var. oregonensis Cushman, Stewart and Stewart, Gyroidina scalata Garrett, G. soldanii d'Orbigny, Lagena (Oolina) striatula (Egger), L. aff. strumosa Reuss, L. substrata Williamson, Nodogenerina advena Cushman and Laiming, N. (Nodosaria) lapidula (Schwager), Nodosaria parexilis Cushman and K. C. Stewart, Nonion costiferum (Cushman), Nonionella miocenica Cushman, Plectofrondicularia miocenica Cushman, P. cf. vaughani Cushman, Pseudoglandulina (Glandulina) inflata (Bornemann), Quinqueloculina sp., Robulus inornatus (d'Orbigny), R. cf. mayi Cushman and Parker, R. cf. nikobarensis

(Schwager), Textularia sp., Uvigerina subperegrina Cushman and Kleinpell, Virgulina cf. californiensis Cushman. The identifications for this list are based primarily upon comparison with available published figures. It is believed that comparison with type specimens will eliminate the need for using "cf." in most cases.

The mapping of the Yaquina-Waldport area by Vokes, Norbisrath, and Snavely (22b) is tentatively followed in assuming an upper Oligocene age for the Yaquina sandstone, although some discrepancy between their field and megafaunal evidence and the implications of the microfauna is indicated by the apparent Miocene affinities of the foraminiferal assemblage listed in the preceding paragraph.

Toledo formation (middle (?) and lower Oligocene and upper Eocene): Below the Yaquina formation in the Newport-Toledo area is the Toledo formation, whose lower member, the Moody shale, contains upper Eocene foraminifera (11, pp. 125-145). The portion of the Toledo formation which lies between the Yaquina formation and the Moody shale is here tentatively considered to be middle and lower Oligocene in age pending further study of the upper Toledo foraminifera.

Bastendorf formation (lower Oligocene and upper Eocene): At Bastendorf Beach between Tunnel Point and Yokam Point about 4 miles northeast of Cape Arago in Coos County, the Bastendorf formation has a thickness of approximately 3000 feet. The upper 2000± feet are well exposed in high sea cliffs, but the lower portion has been eroded almost to beach level and is not exposed.

The foraminifera of the Bastendorf shale appear to be related both upward toward the Oligocene and downward toward the Eocene.

The upper 700± feet of the Bastendorf Beach Bastendorf section and much of the Sunset Tunnel Keasey section contain the fauna used by Laiming to characterize his lower Oligocene zone "R" (Refugian stage).

The dominant affinities of the foraminifera of the exposed middle portion of the Bastendorf Beach section appear to be with the upper Eocene Coaledo fauna.

In other words, the Bastendorf foraminifera indicate lower Oligocene age for the upper 700± feet of the section and uppermost Eocene age for the remaining lower portion.

Upper Bastendorf beds (lower Oligocene): In designating his zone "R," Laiming states (6, p. 194):

> "The uppermost zone here described and designated zone 'R' is characterized by the group of foraminifera figured by Cushman and Schenck (3, pls. 42-45) from the Bassendorf shale of Oregon, typical of the Refugian stage of the California Tertiary.
>
> "Most characteristic for this zone are the occurrences of Uvigerina cocoaensis, 'Planulina' haydoni, Plectofrondicularia packardi and Bulimina sculptilis, the first two being confined to this zone."

The following foraminifera were figured from the "Bassendorf shale" in the Cushman and Schenck paper (3, pls. 42-45) cited by Laiming: Anomalina coalingensis Cushman and G.D. Hanna, Bulimina sculptilis Cushman, Cibicides hodgei Cushman and Schenck, Cyclammina

clarki ? (Hanna), Dentalina adolphina d'Orbigny, D. communis (?) d'Orbigny, D. consobrina d'Orbigny, Glandulina laevigata d'Orbigny, Guttulina byramensis (Cushman), G. problema d'Orbigny, Gyroidina soldanii d'Orbigny, var. octocamerata Cushman and G. D. Hanna, Nodosaria pyrula d'Orbigny, Planulina haydoni Cushman and Schenck, Plectofrondicularia packardi Cushman and Schenck, Robulus inornata (d'Orbigny), Uvigerina cocoaensis Cushman.

Detling (9, pp. 350-360) records and figures the following species from her uppermost Bastendorf stations 46 to 49 which appear to represent Laiming's zone "R" (asterisks mark species which on her range chart appear to be restricted to this part of the section): Bulimina cuneata (Cushman), Cassidulina globosa Hantken, Cibicides hodgei Cushman and Schenck , C. pseudowuellerstorfi Cole, Dentalina communis d'Orbigny, Eponides condoni Cushman and Schenck, Globigerina triloculinoides Plummer, *Guttulina byramensis (Cushman), *G. problema d'Orbigny, Nodogenerina bradyi Cushman, Nodosaria consobrina (d'Orbigny), *Nonion umbilicatulus (Montagu), Planulina haydoni Cushman and Schenck, Plectofrondicularia packardi Cushman and Schenck, Pseudoglandulina turbinata Detling, Robulus inornatus (d'Orbigny), Trochammina ? sp., *Uvigerina atwilli Cushman and Simonson, U. cocoaensis Cushman, U. sp.

A list of additional species which the writer has observed in samples from this zone "R" portion of the Bastendorf formation includes: Bathysiphon eocenica Cushman and G. D. Hanna, Bulimina schencki Beck, B. sculptilis Cushman, var. laciniata Cushman and Parker, Ellipsonodosaria cf. cocoaensis (Cushman), Eponides condoni Cushman and Schenck, E. duprei Cushman and Schenck, E. kleinpelli Cushman and Frizzell, Lenticulina cf. crassa (d'Orbigny), Nodosaria grandis Reuss, Plectofrondicularia garzaensis Cushman and Siegfus, Robertina cf. angusta Cushman, Robulus chehalisensis Rau.

Essentially the same zone "R" fauna occurs in the Keasey formation of Columbia and Washington counties as in the upper Bastendorf beds at Bastendorf Beach. Cushman and Schenck (3, pp. 305-324, pls. 42-45) recorded both Keasey and Bastendorf assemblages in the paper cited by Laiming, but there appears to be some question as to whether their Keasey assemblage represents lower Oligocene or upper Eocene age. However, a typical lower Oligocene zone "R" fauna occurs in Keasey sediments which have been exposed in road cuts along Wolf Creek Highway east and west of Sunset Tunnel in northwestern Washington County.

EOCENE

Upper Eocene

As has been pointed out in the preceding discussion of Oligocene formations, both the Toledo and the Bastendorf formations are here considered to be partly Oligocene and partly Eocene in age.

An upper Eocene foraminiferal assemblage from the lower (Moody shale) member of the Toledo formation in Toledo, Lincoln County (11, pt. 6, pp. 125-145), and a very similar assemblage from beds at Helmick Hill in southeastern Polk County (10, pt. 5, pp. 93-111) have been recorded and figured by Cushman, Stewart and Stewart.

Detling (9, pp. 348-361) has recorded, figured, and indicated ranges for upper Eocene foraminifera from the portion of the Bastendorf formation which is exposed below the lower Oligocene zone "R" beds at Bastendorf Beach, and also from the underlying Coaledo formation which is exposed westward and southward along the coast to Point Arago.

Lincoln and Polk counties area

Moody shale (upper Eocene): The upper Eocene foraminiferal assemblage recorded and figured from the Moody shale in Toledo (11, pt. 6, pp. 125-145) is comprised of the following species: Bolivina basisenta Cushman and Stone, B. basisenta Cushman and Stone var. oregonensis Cushman, Stewart and Stewart, Cassidulina globosa Hantken, Cibicides howei Cushman and Todd, C. warreni Cushman, Stewart and Stewart, Dentalina cf. samanicus (W. Berry), Ellipsonodosaria sp. A, E. sp. B, Eponides minimus Cushman, Globobulimina pacifica Cushman var. oregonensis Cushman, Stewart and Stewart, Gyroidina scalata Garrett, Haplophragmoides sp., Lagena cf. costata (Williamson), Marginulina subbullata Hantken, Nodosaria chirana Cushman and Stone, Nonion florinense Cole, Planulina tolmani Cushman and Simonson, Plectofrondicularia searsi Cushman, Stewart and Stewart, P. vokesi Cushman, Stewart and Stewart, Robulus chiranus Cushman and Stone, R. inornatus (d'Orbigny), R. welchi Church, Saracenaria sp., Textularia ? sp., Uvigerina garzaensis Cushman and Siegfus, Valvulineria chirana Cushman and Stone.

The very similar assemblage recorded and figured by Cushman, Stewart and Stewart from upper Eocene beds at Helmick Hill (10, pt. 5, pp. 99-111) is comprised of the following species: Angulogerina hannai Beck, Bathysiphon eocenica Cushman and G. D. Hanna, Bolivina basisenta Cushman and Stone, Bulimina schencki Beck, Cassidulina globosa Hantken, Cibicides warreni Cushman, Stewart and Stewart, Cyclammina cf. acutidorsata (Hantken), Dentalina communis d'Orbigny, Ellipsonodosaria sp., Eponides minimus Cushman, Glandulina laevigata (d'Orbigny) var. ovata Cushman and Applin, Globobulimina pacifica Cushman var. oregonensis Cushman, Stewart and Stewart, Gyroidina cf. planulata Cushman and Renz, Lagena cf. acuticosta Reuss, L. cf. costata (Williamson), Marginulina cf. subbullata Hantken, Nodosaria cf. longiscata d'Orbigny, Nonion applini Howe and Wallace, N. florinense Cole, Nonionella jacksonensis Cushman, Plectofrondicularia oregonensis Cushman, Stewart and Stewart, P. packardi Cushman and Schenck, Robulus chiranus Cushman and Stone, R. inornatus (d'Orbigny), R. welchi Church, Sigmomorphina semitecta Reuss, Virgulina cf. zetina Cole.

Coos County coastal area

In the coastal section westward and southward from Tunnel Point to Cape Arago, upper Eocene sedimentation is represented, in descending stratigraphic order, by the middle and lower portions of the Bastendorf shale and the upper, middle, and lower members of the Coaledo formation.

Middle and lower Bastendorf formation (upper Eocene): The only appreciable thickness of unexposed strata in this upper Eocene coastal section is at the western end of Bastendorf Beach, where the lower 1000± feet of the Bastendorf shale has been eroded to beach level and is obscured by the valley fill of Miner Creek. Due to their apparent stratigraphic position between upper Eocene Bastendorf and Coaledo beds these unexposed lower Bastendorf strata are presumed also to be upper Eocene in age.

The 1300± feet of exposed middle Bastendorf strata are represented by Detling's stations 30 to 45 (9, fig. 1). From this stratigraphic interval she has recorded the following species of foraminifera (asterisk indicates a species which, on her range chart, is restricted to the Eocene portion of the Bastendorf formation): Bolivina cf. jacksonensis Cushman and Applin, Bulimina cuneata (Cushman), B. sp. B, Cibicides hodgei Cushman and Schenck, Cyclammina pacifica Beck, C. sp., Globigerina triloculinoides Plummer, Nodogenerina bradyi Cushman, Nodosaria

consobrina (d'Orbigny), N. cf. pyrula d'Orbigny, Nonion inflatum (Cushman and Ellisor), Plectofrondicularia packardi Cushman and Schenck, P. packardi multilineata Cushman and Simonson, P. sp. A, P. sp. B, Pseudoglandulina turbinata Detling, Pseudopolymorphina ? sp., Robulus inornatus (d'Orbigny), *Spiroloculina wilcoxensis Cushman and Garrett, Trochammina ? sp., Uvigerina garzaensis Cushman and Siegfus, Valvulineria tumeyensis Cushman and Simonson.

Among other species which the writer has observed in this middle Bastendorf association are: Bathysiphon cf. eocenica Cushman and G. D. Hanna, Bolivina cf. basisenta Cushman and Stone, Bulimina sculptilis Cushman, var. laciniata Cushman and Parker, Cassidulina globosa Hantken, Dentalina cf. communis d'Orbigny, Epistomina eocenica Cushman and M. A. Hanna, Globigerina cf. bulloides d'Orbigny, Gyroidina condoni (Cushman and Schenck), var. rotundiformis Cushman and Simonson, Plectofrondicularia garzaensis Cushman and Siegfus, Pseudoglandulina cf. inflata (Bornemann), Valvulineria cf. thomasi Cushman and Simonson.

Upper member of Coaledo formation (upper Eocene): The upper member of the Coaledo formation in its coastal exposure at Yokam Point west of Bastendorf Beach is predominantly coarse to fine-grained tuffaceous sandstone, with minor occurrences of sandy shale, carbonaceous sandstone and shale, and coal. Deposition appears to have been at relatively shallow depths in littoral and estuarine marine, brackish and fresh water. Foraminifera have been reported from only three restricted horizons in more than 1300 feet of these upper Coaledo sediments, and they are small and appear to have lived under very unfavorable environmental conditions.

Detling (9, pp. 348-361) records, figures, and indicates ranges for the following species of upper Coaledo foraminifera from her stations 28 and 29: Cibicides aff. baileyi Beck, *C. fenestratus Detling, Cyclammina pacifica Beck, Nonion inflatum (Cushman and Ellisor), Pseudopolymorphina ? sp., Quinqueloculina sp., Robulus inornatus (d'Orbigny), *Saracenaria hantkeni (Cushman), *Triloculina gibboei Beck, Uvigerina cocoaensis Cushman, *Virgulina cf. hobsoni Beck.

The following species were recorded and figured by Cushman, Stewart and Stewart (10, pt. 3) from what appears to be the same upper Coaledo locality as Detling's station 29: Ammobaculites cf. hockleyensis Cushman and Applin, Angulogerina cf. hannai Beck, Bolivina basisenta Cushman and Stone, B. cf. kleinpelli Beck, Cibicides cf. cooperensis Cushman, Dentalina (?) sp., Eponides cf. minimus Cushman, Globobulimina pacifica Cushman, var. oregonensis Cushman, Stewart and Stewart, Gyroidina cf. planulata Cushman and Renz, G. sp., Nonion applini Howe and Wallace, N. cf. inexcavatum (Cushman and Applin), N. sp., Nonionella jacksonensis Cushman, Plectofrondicularia cf. searsi Cushman, Stewart and Stewart, Quinqueloculina cf. minuta Beck, Robulus inornatus (d'Orbigny).

Middle member of the Coaledo formation (upper Eocene): The middle member of the Coaledo formation, as exposed westward along the coast from the promontory of Yokam Point to that of Gregory Point (Arago Lighthouse), is predominantly tuffaceous shale with a few sandy lenses.

Detling (9, pp. 348-361) records, figures, and indicates ranges for the following foraminifera from her middle Coaledo stations 6 to 27: Bulimina cuneata Cushman, *B. sp. A, B. sp. B, Cassidulina globosa Hantken, Cibicides aff. baileyi Beck, C. pseudowuellerstorfi Cole, Cyclammina pacifica Beck, Dentalina communis (d'orbigny), Discorbis ornatissima Cushman, Eponides condoni Cushman and Schenck, *E. sp., Globigerina triculinoides Plummer, Gyroidina cf. soldanii d'Orbigny, Nodogenerina bradyi Cushman, Nodosaria consobrina (d'Orbigny), N. cf. pyrula

d'Orbigny, Nonion inflatum (Cushman and Ellisor), *Plectofrondicularia jenkinsi Church, P. packardi Cushman and Schenck, P. packardi Cushman and Schenck, var. multilineata Cushman and Simonson, Pseudopolymorphina ? sp., *Quinqueloculina minuta, Beck, Q. sp., *Robulus coaledoensis Detling, R. inornatus (d'Orbigny), *R. welchi Church, Trochammina ? sp., Uvigerina garzaensis Cushman and Siegfus, Valvulineria tumeyensis Cushman and Simonson.

Lower member of Coaledo formation (upper Eocene): The foraminiferal fauna of the lower member of the Coaledo formation is essentially the same as that of the upper part of the McIntosh formation of southwestern Washington. In the Coaledo section exposed along the Oregon coast southward from Gregory Point (Arago Lighthouse) to Cape Arago and Five-mile creek, this fauna extends upward about 375 or 400 feet into the middle Coaledo as defined by Allen and Baldwin (7a, pp. 21-23, pl. 5).

Detling (9, figs. 1, 2, and text) has recorded, figured, and given ranges for the following species from the lower Coaledo: Bolivina cf. jacksonensis Cushman and Applin, Bulimina sp. B, Cyclammina pacifica Beck, C. sp., Discorbis ornatissima Cushman, *Gyroidina cf. soldanii d'Orbigny, Nodogenerina bradyi Cushman, Nonion inflatum (Cushman and Ellisor), Plectofrondicularia packardi Cushman and Schenck, P. packardi multilineata Cushman and Simonson.

The following species have been recorded and figured from the lower Coaledo by Cushman, Stewart and Stewart (10, pt. 4): Angulogerina cooperensis Cushman, Cassidulina globosa Hantken, Cibicides natlandi Beck, var. olequaensis Beck, Cyclammina pacifica Beck, Dentalina cf. approximata Reuss, D. dusenburyi Beck, D. communis d'Orbigney, Ellipsonodosaria sp., Eponides ellisorae Garrett, Gaudryina sp. A, Gaudryina sp. B, Glandulina laevigata (d'Orbigny) var. ovata Cushman and Applin, Globobulimina pacifica Cushman var. oregonensis Cushman, Stewart and Stewart, Gyroidina cf. soldanii d'Orbigny, Lenticulina cf. theta Cole, Marginulina cf. subbullata Hantken, Nonion applini Howe and Wallace, Nonion danvillense Howe and Wallace, Planulina cf. haydoni Cushman and Schenck, Plectofrondicularia oregonense Cushman, Stewart and Stewart, P. searsi Cushman, Stewart and Stewart, Quinqueloculina imperialis Hanna and Hanna, Robulus inornatus (d'Orbigny), R. articulatus (Reuss) var. texanus (Cushman and Applin).

This series of articles will be concluded in a forthcoming issue of the Ore.-Bin by a discussion of the foraminifera of the Yamhill formation, the Saachi Beach beds, and the Tyee and Umpqua formations.

Anyone interested in obtaining a copy of the bibliography for these articles may do so by addressing a written request to the State of Oregon Department of Geology and Mineral Industries, 1069 State Office Building, Portland 1, Oregon.

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LAND DETERMINATION AREAS IN OREGON

The U.S. Forest Service notified the Department this month that one new area is to be examined for determination of surface rights under Public Law 167. The area, centering around Dooley Mountain, Baker County, is in addition to the ones noted in the May and June 1956 Ore.-Bin. The land to be examined is located in the National Forest in Tps. 11 and 12 S., Rs. 39, 40, and 41 E. The U.S. Bureau of Land Management states that no new areas are to be examined by them this month.

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CHROME STOCKPILE PURCHASES EXTENDED

Office of Defense Mobilization Director Flemming has announced that the present chrome purchase program will be extended to June 30, 1959. Continuation of the program, originally scheduled to terminate at the end of June 1957, offers some assurance to the chrome miners of Oregon and California that they can continue to mine until such time as a workable long-range federal domestic minerals policy takes over. The need for continuing the program is apparent for it encourages further exploration by the present chrome producers and helps keep the prospectors in the hills. Both of these are necessary if the nation expects to maintain a domestic metallurgical grade chrome mining industry.

In making the announcement, Flemming noted that 101,000 long tons of chrome out of a goal of 200,000 long tons had been stockpiled since the purchase depot was established in August 1951. He stated that the purchase price (based on $115 per ton of 48-percent Cr_2O_3 lump ore with a 3:1 chrome-iron ratio) and location of the purchase depot at Grants Pass would remain the same.

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MINING NEWS

The Oregon Chrome mine in Josephine County, operated by W. S. Robertson of Grants Pass, is currently shipping about 50 tons of chrome ore per day from the ore body opened up last fall. The ore is being trucked to the GSA buying station at Grants Pass.

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A promising low-grade, large-tonnage mercury prospect is being developed by John and Weyland Roush of Lakeview. The claims, named the Digmore claims, are located up Salt Creek in sec. 12, T. 38 S., R. 20 E., Lake County. The Roush brothers are part-owners of the White King uranium mine, Oregon's first uranium producer.

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The Opalite quicksilver mining district in southwestern Malheur County has again become active. Present work is concentrated in the vicinity of the old Bretz cinnabar mine which produced more than 10,000 flasks of mercury before it was abandoned in the early 1940's. The claims, originally staked by John Ruiz, were taken over last May by the Shawano Development Corporation. Comstock Uranium Company is building a furnace at the mine. Mining is to be done by Shawano Development Corporation and S. S. Arentz, operator. The cinnabar is disseminated through clayey tuffaceous lake sediments beneath an overburden averaging 20 to 30 feet thick.

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A DMEA loan has been granted for prospect exploration of cinnabar showings in Hope Butte in the Bully Creek area of Malheur County. Current plans call for a drilling program to be conducted on the north and northwest sides of the Butte. The property is owned by the Jordan brothers of Vale and has been under prospect exploration by H. K. Riddle, lessee, since last fall.

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The Great Lakes Carbon Company has returned to the Otis Basin area of Harney County and is engaged in exploration of diatomite-bearing terrain in an area to the east of that tested last year. Large-diameter holes are being drilled as a means of exposing the diatomite for examination and sampling.

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GEOLOGIST ADDED TO STAFF

The Department has added a second geologist to its staff at the Baker field office. The position, authorized by the last session of the Legislature, became necessary due to the great increase in exploration for uranium, oil and gas, and work on the State Geologic Map in eastern Oregon.

The new geologist, Howard C. Brooks, graduated from Idaho State College, Pocatello, Idaho, in 1953 and has just received a Master of Science degree from the Mackay School of Mines, Reno, Nevada. His masters thesis was concerned with a Nevada uranium prospect now under lease and being explored by the Homestake Mining Company. While in Nevada, Mr. Brooks was an assistant in the analytical laboratory of the State of Nevada Bureau of Mines. Previous to attending the Mackay School of Mines, Mr. Brooks was a geologist with Westvaco Chemical Company.

The Baker field office of the Department, located at 2033 First Street, was established shortly after the Department was founded in 1937 and has been in charge of Mr. N.S. Wagner since 1942.

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DEPARTMENT FIELD ACTIVITIES

Dr. Wallace D. Lowry, Professor of Geology at Virginia Polytechnic Institute and former Department staff member, is geologically mapping the Ironside Mountain quadrangle of east-central Oregon. Dr. Lowry was retained by the Department for the summer to prepare a geologic map of the area for publication and to do reconnaissance work in central Oregon for the State Geologic Map.

Mr. R. E. Corcoran has been mapping in the Mitchell Butte quadrangle of southeastern Oregon. During July and August he will be working in the Northern Cascades and will return to southeastern Oregon in the fall.

Mr. Herbert G. Schlicker is doing State Geologic Map work in the Central Cascades near Eugene.

Mr. Max Schafer is continuing his studies on uranium occurrences in the State. Several properties in central and southeastern Oregon have been visited and geologic mapping is being done near the White King uranium mine northwest of Lakeview.

Mr. Len Ramp is completing his studies on the occurrence of chrome in southwestern Oregon. This is the fourth year of this study and a bulletin on his findings is to be issued.

Messrs. N. S. Wagner and Howard Brooks of the Baker field office are doing reconnaissance mapping in eastern Oregon for the State Geologic Map.

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TRIMBLE COMPLETES FIELD WORK

Mr. Donald E. Trimble, geologist with the U.S. Geological Survey, reports that the project of the Engineering Geology Branch in the Portland industrial area begun in 1948 was completed this June. The project area comprised the Camas, Portland, Hillsboro, Oregon City, and Boring 15-minute quadrangles. All field work was done by Mr. Trimble. It included mapping of both bedrock and surficial units, the results of which will be published as composite maps. Publication plans include a Survey bulletin on the entire project area and a Geologic Quadrangle Map series publication on the Portland quadrangle. Mr. Trimble reports that it is not likely the bulletin will be published for several years but the map series publication on the Portland quadrangle is now in draft form and may be ready for distribution within a year.

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SURVEY GEOLOGISTS IN OREGON

The U.S. Geological Survey has several field parties in Oregon this summer making geological investigations for the State Geologic Map, a cooperative project with the State of Oregon Department of Geology and Mineral Industries. Dr. Francis G. Wells, who is in charge of the Survey's program on the map, is in southwestern Oregon accompanied by Mr. David Brooks. Dallas Peck is continuing his field work started last summer in the Western Cascades. Professor Aaron Waters of Johns Hopkins University, on temporary duty with the Survey, is completing his work in the Columbia Gorge and will work in the Mt. Hood area. Dr. Roland Brown, assisted by Jack Wolfe, is making paleobotanical collections to assist the field geologists in their mapping. Dr. Ralph Imlay, Survey authority on the Mesozoic formations, will do field work in Curry County and in central Oregon. Present plans for the State Geologic Map are to complete the field mapping in Oregon west of 121° longitude this summer. A black and white preliminary geologic map of western Oregon should be available the middle of 1957.

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NEW OCCURRENCE OF BAUXITE NEAR PORTLAND

An interesting new occurrence of ferruginous bauxite was examined recently by the Department in the vicinity of Garden Home, a suburb of Portland. Location of the occurrence is NE¼ NW¼ sec. 25, T. 1 S., R. 1 W., where the exposure is in an old railroad cut. The material is the reddish-brown pisolitic variety typical of that found in the deposits in Washington and Columbia counties several miles to the north and northwest. A chemical assay of the bauxite by the Department gave the following results: Al_2O_3, 40.13 percent; SiO_2, 4.12 percent; Fe_2O_3, 25.78 percent; TiO_2, 4.32 percent; loss on ignition, 25.65 percent. The road cut has weathered considerably and no fresh rock is exposed beneath the bauxite. The bauxite zone appears to be at least 3 to 4 feet thick and drilling may show a much greater actual thickness.

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GEOLOGY OF URANIUM AND THORIUM PUBLISHED BY U.S.G.S.

A comprehensive volume on the geology of uranium and thorium and methods of prospecting for radioactive ores has been published by the U.S. Geological Survey as Professional Paper 300. The volume is an outcome of the joint program carried on since 1944 by the Atomic Energy Commission and the Geological Survey to study atomic energy resources of the United States. This program has been successful in finding reserves of fissionable materials far beyond early expectations and in adding a large volume of valuable data to the sum of geologic knowledge.

Professional Paper 300 is a compilation of 89 reports by 133 scientists. It is entitled "Contributions to the geology of uranium and thorium by the United States Geological Survey and Atomic Energy Commission for the United Nations International Conference on Peaceful Uses of Atomic Energy, Geneva, Switzerland, 1955." There are 739 pages, 235 illustrations, and an extensive subject index. Copies may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C. Price is $6.00.

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PURCHASE PROGRAM BILL

Senate Bill 3982, to allow for the purchase of 1¼ million units of tungsten at $55 per unit, 250,000 tons of fluorspar at $53 per ton, and 250,000 pounds of columbium-tantalum-bearing ores at previously established prices, is awaiting the President's signature.

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EDEN RIDGE COAL TO BE INVESTIGATED

By
Ralph S. Mason*

To Mrs. O. whose ability to make a dull article look interesting is broadly appreciated TSM

A new and important development in Oregon's mineral industry was announced this month by Pacific Power & Light Company, Portland, when it made public its plans to start immediate exploration of the Eden Ridge coal, southern Coos County, for possible use in an on-the-spot 100,000-kilowatt steam-electric generating plant. A companion investigation to the coal exploration is the possibility of developing additional power through a hydro plant utilizing a drop of 1600 feet in the South Fork of the Coquille River as it flows around Eden Ridge. Although largely unexplored, the Eden Ridge coal seams, which have been known for more than half a century, may contain a reserve of subbituminous grade coal running into many millions of tons.

Ed.

The Eden Ridge coal field is located in Tps. 32 and 33 S., R. 11 W., in southern Coos County, 11 miles south of Powers and 24 miles north of Agness (see map on page 68). The South Fork of the Coquille River cuts through the south end of Eden Ridge, a prominent physiographic feature east of Powers, to expose the coal beds. Access to the area is by good forest road from Powers that follows, in general, the Coquille River to Eden Valley at the drainage divide between the Coquille and the South Umpqua River.

The Eden Ridge coal seams have been investigated by geologists from time to time since 1912 when Lesher** first reported on the area. Other reports, principally by Campbell and Clark, 1916, and Daniels, 1920, have also been published. The coal lies in a series of gently dipping sandstones of middle Eocene age. Insufficient exploration has been done to date to determine the extent of the several seams which crop out at numerous places but Pacific Power & Light Company states that 50,000,000 tons of coal are indicated. Although Lesher reported that the coal had coking characteristics, samples taken earlier this year by the Department and analyzed by the U.S. Bureau of Mines, Division of Solid Fuels Technology at Seattle, were not of coking grade. The coal may have an average as high as 11,000 B.t.u.'s. It does not slack readily and samples mined years ago have been found in good condition on some of

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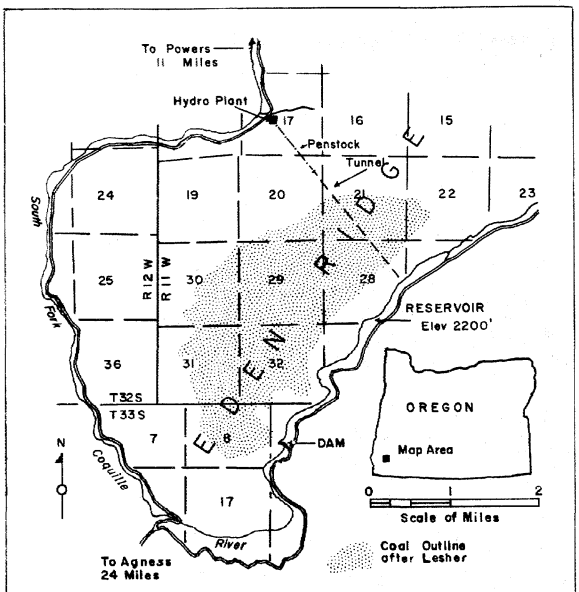
* Mining Engineer, State of Oregon Department of Geology and Mineral Industries.

** See references at end of report.

the early mine dumps. The seams range in thicknesses from 4 to 8 feet. Outcrops of the various seams indicate a probable relationship as follows: The Peacock or Lockhart seam 6 feet thick is 50 feet above the 4- to 8-foot thick Carter seam, which is 400 feet above the 6-foot Anderson seam. There is a probability that there may be more seams below the Anderson but this is not certain.



INDEX MAP OF EDEN RIDGE
Coos County Oregon

Due to its relative inaccessibility the Eden Ridge coal has received little attention even though it is of higher rank than the Coos Bay coal. The decision to use Eden Ridge coal at the mine, rather than transporting it, overcomes the principal difficulty of its remote location.

Coal, unlike metallic minerals, may not be located under the federal mining laws but must be leased from the government. As reported in the November 1955 Ore.-Bin, Roy Rannells, Jim Carrol, and A. A. Robins initiated a small exploration program at Eden Ridge during the summer of 1955. Their permit was taken over by G. D. Rannells, Aurora, who asked the Department of Geology to examine the property. Several samples were taken by the Department in February and an examination of additional outcrops was made in April. Pacific has an agreement with the Rannells for prospecting and development under this permit, and under Pacific's permits, on approximately 5000 acres of land in the Siskiyou National Forest.

The hydroelectric phase of the proposed project involves the construction of a dam at the head of a series of rapids on the South Fork of the Coquille to create a long, narrow reservoir. Water from the reservoir would be diverted through a tunnel more than 2 miles in length to penstocks leading down to a power house located at the mouth of McCurdy Creek on the South Fork at a point 1650 feet lower in elevation and 12 miles downstream from the dam. The accompanying map shows the general relationship of the Eden Ridge coal beds to the proposed dam and the hydroelectric plant. Exact location of the steam-fired plant has not been settled and will depend on the results of the exploration and method to be used in mining. If the combined projects prove feasible Pacific estimates the cost of the coal and hydro plants might run between 30 and 50 million dollars and employ 2000 men at the height of the construction phase. When completed, the combined operation would be staffed with about 100 permanent employees.

The combination of steam and hydro generation is favorable in that base load power will be supplied by steam while the hydro plant, with a projected capacity of 67,500 kilowatts, will be used to carry the peak loads. The consideration of Eden Ridge coal by Pacific

points up a growing demand for electric energy, coupled with a steady decrease in suitable sources of hydroelectric power. Improvements in coal technology have brought coal back into the energy picture in areas noted for their cheap hydro power. The following which appeared in Trends, March 1, 1956, sums up the situation:

> "Back in 1939, it took 1.38 pounds of coal to generate one kilowatt hour of electricity. Since then the technology of generating electricity in steam plants has undergone a revolution. By 1946, the quantity of coal needed to produce 1 kilowatt hour was down to 1.29 pounds. Last year came further improvements, and the amount of coal per kwh dropped to 0.96 pound."

In addition to the 400,000 or more tons of coal which it is anticipated would be required annually by the steam plant, there is a good possibility that additional coal could be produced to bolster sagging fuel supplies in the area. Large-scale modern mining methods could conceivably place coal in a competitive position with either oil or natural gas. Another outlet for Eden Ridge coal might be in offshore shipments to Japan and other fuel-shy countries bordering the Pacific. A total of 20,157 tons of coal originating in the inter-mountain states was shipped from Portland and nearby ports during the past 12 months. Eden Ridge coal should be able, due to freight differentials, to enter this market since it compares closely in heating value and other physical and chemical characteristics with coal now being shipped overseas. Still another possibility in this development is the obtaining of by-products from the coal.

The investigations which Pacific Power & Light Company will make in the coming months will be followed with a great deal of interest by the people of Oregon for if the project proves feasible, a healthy new mineral industry will be established and a new source of electrical energy will be assured.

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LAKEVIEW URANIUM NEWS

The Lakeview Mining Company shipped 400 tons of uranium ore from the Lucky Lass mine August 10 to Vitro Chemical Company of Salt Lake City. This is the second shipment of ore from Lake County. A test shipment of three carloads was sent to Vitro last fall from the Lucky Lass and White King properties.

Drilling is continuing at the Lucky Lass, and some mineralization has been found below the mine. The Company is continuing to find more ore in the vicinity of the White King mine. Three core drilling rigs have been working double shifts on exploration, and last month's drilling totaled more than 20,000 feet.

According to the Lake County Examiner, the Lakeview Mining Company is conducting an aerial survey program to locate areas of radioactivity, and is making this information available to prospectors and claim holders. By announcing the anomalous radioactive areas to the public, the Company hopes to spur localized ground exploration for uranium in southern Lake County. The location of the anomalies detected by airborne equipment is shown on maps which are posted each Friday morning about 9 o'clock in the Company's office window in the Marius Theater Building in Lakeview, Oregon. Information released has no bearing on land ownership or whether the ground is staked. It is pointed out that the presence of an anomalous radioactive area on the map shows where the instrument reacted more strongly and does not necessarily mean that ore-grade uranium will be found there.

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STRATIGRAPHIC HOLES TO BE DRILLED

Sunray Mid-Continent Oil Company, Los Angeles, has applied for a permit to drill five stratigraphic core holes near Scappoose, Columbia County, Oregon. Locations are as follows:

Core hole No. 1 - SW¼ sec. 12, T. 2 N., R. 2 W. Lessee is B. Cole, Portland, Oregon.
Core hole No. 2 - NW¼ sec. 12, T. 2 N., R. 2 W.
Core hole No. 3 - NW¼ sec. 12, T. 2 N., R. 2 W.
Core hole No. 4 - SE¼ sec. 2, T. 2 N., R. 2 W.
Core hole No. 5 - NE¼ sec. 11, T. 2 N., R. 2 W.
Holes 2 through 5 have Ralph Kapper, Mulino, Oregon, as the lessee.
Core hole No. 6 - SW¼ sec. 12, T. 2 N., R. 2 W. Lessee is C. M. Austin, Portland, Oregon.
Core hole No. 7 - SW¼ sec. 12, T. 2 N., R. 2 W. Lessee is B. Cole.
Core hole No. 8 - SE¼ sec. 11, T. 2 N., R. 2 W. C. M. Austin, lessee.

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THREE GEOLOGIC MAPS OF CENTRAL OREGON PUBLISHED

Preliminary geologic maps of the Aldrich Mountain, Mt. Vernon, and John Day quadrangles, Grant County, have been published by the U.S. Geological Survey as part of the Mineral Field Investigations Series. They show the geology of a 40-mile strip along the John Day River valley including the Aldrich and Strawberry mountains to the south. The maps are in black and white with the formations shown by letter symbols and the chromite-bearing rocks by shading. Author of the three maps is Thomas P. Thayer. The titles are as follows:

MF-49, "Preliminary geologic map of the Aldrich Mountain quadrangle, Oregon."
MF-50, "Preliminary geologic map of the Mt. Vernon quadrangle, Oregon."
MF-51, "Preliminary geologic map of the John Day quadrangle, Oregon."

These maps may be purchased for 50 cents each from the U.S. Geological Survey, Denver Federal Center, Denver, Colorado.

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VALUE OF OREGON'S MINERAL PRODUCTION FOR 1955

Oregon's mineral production for 1955 as given in an advance summary just released by the U.S. Bureau of Mines is valued at $31,895,335. The 1955 total value shows a decrease of about 7 percent as compared to 1954 rather than an increase as anticipated.

Nonmetallic minerals, used primarily for construction, comprised about 92 percent of the total value. Mercury and nickel production increased, but most other metals declined in 1955. Output of chromite decreased nearly 20 percent, but value of production declined only about 13 percent due to higher grade material received at the depot. Josephine County was top chromite producer while Curry County assumed second place.

Value of mineral production in Oregon in 1954 and 1955 by mineral commodities is tabulated below. A breakdown by counties is given on the following page.

Mineral Production in Oregon, 1954-1955 [1]

Mineral	1954		1955	
	Short tons (unless otherwise stated)	Value	Short tons (unless otherwise stated)	Value
Chromite, gross weight	6,655	$ 535,609	5,341	$ 463,514
Clays	334,413	377,201	250,608	275,916
Copper	5	2,950	4	2,984
Gold, fine ounces	6,520	228,200	1,708	59,780
Iron ore (limonite)	---	---	2,000	2/
Lead	5	1,370	3	894
Mercury, 76-pound flask	489	129,287	1,056	306,610
Nickel ore, nickel content	1,993	2/	4,181	2/
Pumice and pumicite	67,852	177,515	2/	2/
Sand and gravel, short tons	13,157,239	14,149,380	12,148,593	11,985,164
Silver, fine ounces	14,335	12,974	8,815	7,978
Stone	5,841,880	8,436,284	7,739,963	9,420,471
Tungsten, 60 percent WO_3 basis	2/	2/	1	2/
Undistributed: Carbon dioxide, cement, coal, diatomite, gem stones, and minerals whose value must be concealed for particular years (indicated in appropriate column by footnote reference 2)	---	9,444,218	---	10,504,356
Total		3/ 32,271,513		3/ 31,895,335

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Included with "Undistributed."
3/ Total has been adjusted to eliminate duplication in the value of clays and stone.

Value of mineral production in Oregon by counties, 1954-1955

County	1954	1955	Minerals produced in 1955, in order of value
Baker	1/	1/	Cement, stone, sand and gravel, clay, gold, copper, silver
Benton	$209,176	$169,034	Sand and gravel, stone, clay
Clackamas	5,312,221	5,485,348	Cement, sand and gravel, stone, clay, coal
Clatsop	124,464	138,233	Stone, sand and gravel
Columbia	200,996	324,333	Sand and gravel, stone, iron ore (limonite)
Coos	240,848	661,200	Stone, sand and gravel, coal
Crook	124,448	331,561	Stone, sand and gravel, mercury
Curry	1/	132,674	Chromite, stone, sand and gravel
Deschutes	907,049	980,180	Diatomite, pumice, sand and gravel, stone
Douglas	2,088,283	2,823,527	Nickel, sand and gravel, mercury, stone, chromite, gold, silver
Gilliam	-	1/	Stone
Grant	260,129	164,032	Chromite, sand and gravel, gold, silver, copper, lead
Harney	22,655	48,730	Sand and gravel, pumice, stone
Hood River	44,700	43,500	Stone, sand and gravel
Jackson	2,958,186	3,220,052	Cement, stone, sand and gravel, clay, carbon dioxide, gold, tungsten, chromite, silver
Jefferson	1/	183,867	Mercury, stone, sand and gravel
Josephine	609,059	890,216	Sand and gravel, stone, chromite, gold, clay, silver
Klamath	166,303	504,100	Stone, sand and gravel, clay
Lake	115,104	76,620	Sand and gravel, stone
Lane	2,302,427	2,710,655	Sand and gravel, stone
Lincoln	371,204	608,840	Stone, sand and gravel
Linn	526,434	583,445	Sand and gravel, stone, clay
Malheur	1/	1,041,027	Stone, sand and gravel, mercury, clay
Marion	540,083	526,116	Sand and gravel, stone, clay
Marrow	1/	139,137	Stone, sand and gravel
Multnomah	2,503,456	2,884,972	Sand and gravel, stone, clay
Polk	465,782	385,783	Stone, sand and gravel, clay
Sherman	80,235	1,276,500	Sand and gravel, stone
Tillamook	204,838	180,606	Stone, sand and gravel, clay
Umatilla	550,737	622,948	Stone, sand and gravel
Union	178,115	335,801	Sand and gravel, stone, clay
Wallowa	189,031	258,028	Stone, sand and gravel
Wasco	505,634	314,945	do
Washington	753,033	1,369,757	Stone, sand and gravel, clay
Wheeler	1/	21,106	Sand and gravel, gold, silver
Yamhill	289,123	200,247	Sand and gravel, stone, clay
Undistributed 2/	10,651,235	3,390,557	
Totals	3/ 32,271,593	3/ 31,895,335	

1/ Included with "Undistributed" to avoid disclosure of individual output.
2/ Includes value of sand and gravel, stone, gem stones, and chromite production that cannot be assigned to specific counties.
3/ The total has been adjusted to eliminate duplication in value of clays and stone.

LAND DETERMINATIONS ANNOUNCED

The U.S. Forest Service has notified the Department that it is examining two areas in Baker County for determination of surface rights under Public Law 167. One area which includes most of T. 11 S., Rs. 36 and 37 E., lies in the northwestern part of the county. The other embraces land lying in Tps. 6 S. and 7 S., Rs. 45, 46, 47 E., and a small portion of T. 6 S., R. 48 E., in northeastern Baker County.

The Bureau of Land Management is continuing its examination of Tps. 38 and 39 S., Rs. 5 and 6 W., in Josephine County. Determination of rights in the Deadman Creek area of Douglas County, Tps. 29 and 30 S., R. 2 W., may be started within 30 days.

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CHROME MINING NEWS

George Tulare and Jack Binder and Sons of Gold Hill are leasing the Shady Cove mine and the Sordy Group on Chrome Ridge, Josephine County. At present they are mining a body of high-grade chrome ore at the Shady Cove in sec. 11, T. 36 S., R. 9 W. Other claims in the Sordy Group are located in secs. 2, 11, and 14 of the same township. According to Tulare, plans are being made for a drilling program.

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GROUND-WATER GEOLOGY OF TUALATIN VALLEY DESCRIBED

"Preliminary report on the ground-water resources of the Tualatin Valley, Oregon," by D. H. Hart and R. C. Newcomb has been prepared by the Geological Survey in cooperation with the Oregon State Engineer. The report shows the relation of ground water to the presence or absence of certain rock formations, and presents data on more than 1000 wells and springs in the area. It also includes a geologic map showing formations and structure of the Tualatin Valley. The report is on file at the Ground Water Branch of the Geological Survey in the Lloyd Building, Portland, and at the office of the State Engineer in Salem.

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RESULTS OF COPPER INVESTIGATION IN JOSEPHINE COUNTY PUBLISHED

"Preliminary investigation of the Takilma-Waldo copper district, Josephine County, Oregon," by R. J. Hundhausen has been published by the Bureau of Mines as Report of Investigations 5187. The studies were made between 1950 and 1954 through funds provided on a cooperative basis by the Bureau of Mines and the California-Oregon Power Company, Medford, Oregon. The geology of the district was previously described in other reports (U.S. Geol. Survey Bull. 846-B, 1933, and Oregon Dept. Geol. and Min. Industries Bull. 40, 1949).

The Takilma-Waldo copper deposits were mined principally during periods of high metal prices. Total production up to 1933 is estimated to be about $1,700,000. Since 1933 the mines have been largely inactive and most were found to be caved and inaccessible. Because it was not economically feasible to reopen the mines, surface sampling was done according to a grid system in which 3,600 holes 3 feet deep and 6 inches in diameter were drilled. Samples showing more than 0.1 percent copper in spectrographic analysis were assayed by chemical methods. Results when plotted on a map revealed seven anomalies having relatively distinct boundaries. Four were over mine workings and three in unexplored areas.

The largest anomaly was found above the Queen of Bronze mine workings, and this area was explored by diamond drilling to test the value of the surface sampling technique. Five of the six drill holes were barren and one penetrated 78.5 feet of copper-bearing rock averaging 0.77 percent copper. The results indicated that weathering and ground water have probably concentrated the copper near the surface and that caution must be used in interpreting the results of surface sampling.

Report of Investigations 5187 is available free of charge from Publications Distribution Section, U.S. Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pennsylvania.

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URANIUM MILL ASSURED IN SPOKANE AREA

Dawn Mining Company, operating subsidiary of Newmont Mining Corporation at the Midnight uranium mine on the Spokane Indian Reservation, concluded a contract with the Atomic Energy Commission for construction and operation of a uranium processing plant at Ford, Washington, on the eastern border of the reservation about 40 miles northwest of Spokane. Announcement of the contract was made by the AEC's Grand Junction operations office. Preliminary work on the 400-ton mill is already underway, with completion scheduled in about 12 months. Uranium concentrate products will be sold to the AEC under terms of the contract.

The Midnight deposit, found in the fall of 1954, and the original commercial discovery on the Reservation is now estimated to have reserves of as much as 700,000 tons of ore worth more than $20,000,000. Northwest Uranium Mines, Inc., also has indicated reserves of approximately 400,000 tons averaging 0.15 percent uranium oxide on its holdings a few miles south of the Midnight property. Daybreak Uranium and Big Smoke Uranium have reserves of undisclosed size in the same general area in the southern part of the reservation.

(The Wallace Miner, August 16, 1956.)

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SELENIUM ADDED TO DMEA ASSISTANCE LIST

The Defense Minerals Exploration Administration announces that selenium has been made eligible for financial assistance in exploration projects, with Government participation set at 75 percent of the authorized costs of a project. The addition of selenium brings to 34 the number of minerals on the eligible list for financial aid. The major use of selenium is in power rectifiers and rectifiers for radio and television receivers. It has a number of specialized applications in military end use items.

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PURCHASE PROGRAM BILL APPROVED

Senate Bill 3982, allowing Government purchase of domestic tungsten, asbestos, fluorspar, and columbium-tantalum, was approved by the President July 19, 1956, and became Public Law 733, 84th Congress. American Mining Congress reports that General Services Administration has been authorized to accept July offerings of tungsten from domestic producers. Regulations governing the purchase programs for tungsten and the other minerals are under preparation by GSA and are expected to be announced shortly.

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HISTORICAL NOTES ON THE STANDARD MINE, GRANT COUNTY, OREGON

By
N. S. Wagner*

It is believed that few persons are aware Oregon once produced and exported cobalt ore. The Standard Mine of Grant County was the producing property, and the ore was shipped to Europe at the turn of the century. In view of present-day demand for cobalt, these historical notes on the Standard Mine are of special interest.

Cobalt is a relatively rare element in the earth's crust, making up only about 0.001 percent. It is nearly always associated with other metals such as iron, copper, nickel, and gold. As cobalt minerals are seldom found in sufficient quantity to be mined for cobalt alone, production is chiefly a by-product of other metals, mainly copper. Only a small portion of the nation's requirements come from domestic sources, and at the present time the Blackbird district of Idaho is the only United States producer.

Before World War I, cobalt was used chiefly for pigment by the ceramics industry. Recent years have seen a spectacular increase in demand for cobalt for high-temperature alloys, magnets, high-speed steels, and many other uses. At the same time, much progress has been made in metallurgical research on extractive methods for cobalt. The net result is that world production has taken a sharp upward trend.

Ed.

The Standard Mine of Grant County is known as one of the prominent early-day eastern Oregon producers. It is also generally regarded today as a copper-gold property from which interesting specimens of cobalt minerals can be obtained. A fact not commonly known is that the Standard achieved international fame at the turn of the century for its shipments of cobalt ore to Germany. This is documented in the file of mine news clippings presented to the Department by Mrs. H. E. Hendryx (The Ore.-Bin, vol. 17, no. 2, 1955) and it is from these clippings and the Blue Mountain American volumes in the archives of the Oregon Historical Society, Portland, that the following account has been compiled.

The Standard's early history is described in a clipping from the Mining Investor, May 11, 1903, as follows:

". . . it (the Standard Mine) was located back in the 60's by Juneau, a Frenchman, who afterwards explored the coast of Alaska and after whom the town

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

of Juneau is named. The Standard was worked from the surface in those early days at a profit. Juneau and associates erected a small smelter and produced a matte which they packed on mules to The Dalles, Oregon, and from there shipped to France by steamer. Juneau and associates sold the property for $10,000; since that time successive owners have worked it periodically but the difficulties to be overcome in transportation have been too great to afford much profit."

A similar account in a clipping from the Blue Mountain American, March 7, 1903, fails to mention Juneau's smelter, but does state that the material shipped to France was "cobalt."

The first reference to the cobalt production made at the turn of the century appears in a clipping from the Blue Mountain American, October 5, 1901, which states: "Several shipments of cobalt ore have been made to Germany, with very good results, and it is believed that this property is the only cobalt mine in the United States."

Another article from the same paper dated October 25, 1902, reports:

"Another shipment of cobalt ore is being prepared by the Standard management for the German people who received the last batch. The foreigners were so well pleased with the ore carrying the cobalt that they are eager to get all possible, and will take it as rapidly as it can be mined and shipped. Before shipment, the cobalt matrix is separated largely as possible from the copper and gold, although much gold goes with the cobalt."

Continued cobalt production is indicated in another Blue Mountain American clipping dated January 17, 1903, in which the Standard is stressed as the "No. 1" property of the Quartzburg district and mention is made that the management has been using the five-stamp mill recently purchased by the Equity Company for concentrating the cobalt ore shipment intended for Germany. A follow-up article in the same paper, January 31, 1903, contains the statement that this "shipment of cobalt concentrates was made on time for the German interests."

The first clue to the value of cobalt at this time appears in a Blue Mountain American article dated March 7, 1903. The article states:

"It was estimated in the basis for the (merger) that there was above $500,000 of ore reasonably in sight in the three properties (Standard, Copper Ridge, and Willie Boy) and an offer of $1.00 a pound f.o.b. the cars at Baker has been made for the cobalt in a 7% concentrate."

This same article also contains the statement, "The cobalt ore from the mine took first prize where ever exhibited in international expositions, and it was at Buffalo that the German syndicate became aware of the Standard's rare metal."

At this point the Hendryx records are incomplete due to partial loss in the Sumpter Fire and recourse was made to the Oregon Historical Society archives. Several additional references to the cobalt phase of the Standard's production were found there and selected items are summarized in the following paragraphs.

Blue Mountain American, August 22, 1903. A full-page ad for the Killen, Warner, Stewart Company re Standard Mine investment recounts the early history and describes two cobalt-gold shipments to Germany as follows:

"High grade cobalt-gold ores were shipped to Germany with the following results:

Koenigliches Blaufarben Werk, Germany
No. 1-Gold, 8 oz; silver, 10 oz; copper, 25.7%; cobalt, 4.87%;
Total value per ton---$334.50

No. 2-Gold, 4.5 oz.; copper, 3%; nickel, 0.5%; cobalt, 11%;
Total value per ton---$43.90."

The value listed in the No. 2 shipment is undoubtedly a misprint as the values are described as "representative of the shipping high-grade copper and cobalt ores."

Blue Mountain American, December 31, 1904. This article mentions a logging contract let by the company and the installation of a sawmill for timber for a proposed reduction plant. It also reports underground development progress and describes a car of ore for mill test purposes as "about ready" for shipment. Of interest, with respect to cobalt, is a statement that (1) the Lewis and Clark Expedition was considering a special cobalt ore exhibit, and (2) the following quotation credited to Manager H. H. Nicholson:

> "From the three shoots that have been opened on the lower level of the Standard, and with a concentrating plant such as we expect to install in due time, I could produce for a considerable period from three to five tons of a high-grade cobalt concentrate a day. The magnitude of the product amazes the German dealers in cobalt. They do not believe such a body of cobalt has ever been found. When they come to consider one to five tons of cobalt each day for several months, they are bewildered. Hence, I have been compelled to proceed along original lines of work in marketing the cobalt product of our mine."

Blue Mountain American, December 9, 1905. Under the headline "Standard Mill Will Be Installed At Once" is the information that the property had been visited by J. F. Traylor, "one of Denver's best known millwrights"; that the plant is to be of 50-ton capacity, but so constructed as to be enlarged to 150 tons; that concentration in "simplest form" is to be employed with the flow sheet including an "ore breaker," Elspass mill, four Wilfley tables, and two slimers. The gold-copper concentrate production is described as scheduled for shipment to the Sumpter Smelter and the cobalt concentrate to either a New York or German firm.

Blue Mountain American, August 4, 1906. Thomas A. Edison is named as the holder of what is described as "a long term contract" for cobalt output according to an announcement by the Standard Company president, D. M. Campbell.

Blue Mountain American, December 15, 1906. Mill capacity is described as increased to 100 tons daily by addition of three Allison-Chalmers rollers, and Campbell is again quoted on the subject of the Edison contract as follows:

> "While I was east recently, I had a long conversation with Thomas A. Edison. . . . He owns two cobalt mines. . . , one in Canada and another in Tennessee, but he told me that the separation was much more difficult than from our mine. He is . . . anxious to get at every available supply. I have contracted to deliver him thirty tons a month after the first of the year."

Press articles on various other aspects of the Standard Mine's activity continue to appear until February 1908 at which time the manager is reported to have been seriously hurt by a fall into the water wheel. These later articles contain no additional reference to the mine's cobalt production, however, although it is a matter of record that many shipments of copper-gold concentrates were made to the Sumpter Smelter through the year 1907.

How much cobalt was delivered on the Edison contract during this period is not known, but a statement in the Standard Mine report in U.S. Geological Survey Bulletin 846A indicates that at least some cobalt was delivered to the Edison Laboratories during that time. In any event it is evident from the records just cited that shipments of the Standard's cobalt ores and concentrates were made to foreign outlets on several different occasions during the property's early history, with possible later shipments to the Edison Laboratory in this country.

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STRATIGRAPHIC DRILLING PROGRAM
SUNRAY MID-CONTINENT OIL COMPANY
Multnomah County, Oregon, August-September 1956

Permit No.	Lease	Core hole No.	S. T. R.	Location	Elevation	Lessee
S 1	Lee	1	SW¼ 12, 2 N., 2 W.	3176.52' S., 584.76' E. NW cor. sec. 12	255.0'	H. H. Lee NW St. Helens Road Burlington, Oregon
S 2	Kappler	1	NW¼ 12, 2 N., 2 W.	1716.52' S., 949.16' E. NW cor. sec. 12	196.8'	Ralph & Helen Kappler Mulino, Oregon
S 3	Kappler	2	NW¼ 12, 2 N., 2 W.	1844.84' S., 114.76' E. NW cor. sec. 12	257.1'	Ralph & Helen Kappler Mulino, Oregon
S 4	Kappler	4	SE¼ 2, 2 N., 2 W.	36.11' N., 220.57'W. NW cor. sec. 12	277.3'	Ralph & Helen Kappler Mulino, Oregon
S 5	Kappler	3	NE¼ 11, 2 N., 2 W.	2137.90' S., 671.58' W. NW cor. sec. 12	393.4'	Ralph & Helen Kappler Mulino, Oregon
S 6	Gardner (not drilled)	1	SW¼ 12, 2 N., 2 W.	3989.47' S., 1995.20' E. NW cor. sec. 12	91.0'	Carl W. Gardner 8016 N. Lombard St. Portland, Oregon
S 7	Gault	1	SW¼ 12, 2 N., 2 W.	4468.21' S., 1218.02' E. NW cor. sec. 12	129.9'	John Gault 6925 N.E. Garfield Ave Portland, Oregon
S 8	Austin	1	SE¼ 11, 2 N., 2 W.	4399.83' S., 185.69' W. NW cor. sec. 12	268.6'	C. M. Austin Route 1, Box 191 Portland 1, Oregon
S 9	Kappler	5	NW¼ 12, 2 N., 2 W.	629.92' S., 580.34' E. NW cor. sec. 12	184.5'	Ralph & Helen Kappler Mulino, Oregon
S 10	Austin	2	SE¼ 11, 2 N., 2 W.	477.25' S., 1251.08' W. NW cor. sec. 12	357.7'	C. M. Austin Route 1, Box 191 Portland 1, Oregon

Amended and official copy.

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U.S. BUREAU OF MINES REPORTS ON JOHN DAY CHROME ORE

A recent Bureau of Mines report shows that low-grade chrome ore from the John Day area of Grant County, Oregon, can be smelted to yield ferrochrome-silicon, used as an alloying metal in steel making or blended with magnesite to produce refractory brick. Besides giving the results of its research, the report describes three deposits in the area - the Iron King, Chambers, and Dry Camp - where several years ago the Bureau outlined an estimated 208,000 tons of ore averaging 22 percent chromic oxide. Less than 1000 tons have been mined, as the two largest deposits are submarginal under the present-day domestic price and consequently offer no incentive to develop. While demonstrating the technical feasibility of two processes for using the John Day ore, the report notes that the economics are yet to be determined.

Results of the research are published in Report of Investigations 5238, "Exploration and Utilization Studies of John Day Chromites, Oregon," by R. J. Hundhausen and others. The publication may be obtained free of charge from the U.S. Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pennsylvania.

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PORTLAND AREA WATER-RESOURCES REPORT AVAILABLE

The U.S. Geological Survey has just issued as Circular 372, "Water Resources of the Portland, Oregon, and Vancouver, Washington, Area." The report is one of a series concerning the water resources and present water utilization of selected industrial areas of national importance. It may be obtained free of charge from the U.S. Geological Survey, Washington 25, D.C.

The area considered in the report includes nearly all of Multnomah and Washington counties and parts of Clackamas, Columbia, and Yamhill counties in Oregon, and all of Clark County and part of Cowlitz County in Washington. The report presents streamflow data, including information on magnitude and frequency of floods, quantity and quality of ground-water supplies, and chemical quality and other data on public water supplies. A brief review of the geology of the area is also given. A geologic map accompanies the report. The map is a compilation of existing geologic maps supplemented by recent field investigations by the Survey.

According to the report, the water supply available to the Portland-Vancouver area exceeds requirements for any foreseeable industrial expansion. Both surface-water and ground-water sources yield, with few exceptions, water of satisfactory quality for most uses. Water from the Columbia River contains sufficient dissolved solids to be moderately hard, whereas water from tributary streams is very soft. Ground-water supplies are generally of good quality, but tend to be harder and more mineralized than the surface water. A study of the water-bearing properties of the geologic formations in the area reveals that formations older than Columbia River basalt are generally nonpermeable (Eocene volcanic rocks) or yield saline water (Tertiary marine sediments). Columbia River basalt, Troutdale gravels, and Pleistocene and Recent alluvium are the most important sources of ground water in the area. A map of the major ground-water areas is also included.

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DOMESTIC METAL PRICES

From E&MJ Metal and Mineral Markets, September 20, 1956

Copper - 39.510 cents per pound, refinery (domestic average).
Lead - 16 cents per pound New York.
Zinc - 13½ cents per pound East St. Louis.
Quicksilver - $255-257 per 76-pound flask New York.
Silver - (foreign) 90 3/4 cents per ounce New York; (domestic) 90 1/2 cents government price.
Aluminum - per pound f.o.b. shipping point (freight allowed) 30-pound ingot 99+ percent, 27.1 cents per pound; in pigs, 25 cents.
Antimony - 99½ percent grade, domestic, bulk, Laredo, 33 cents per pound.
Bismuth - $2.25 per pound in ton lots.
Cadmium - delivered, $1.70 per pound.
Cobalt - per pound in 500- to 600-pound containers, $2.60.
Cobalt ore - per pound of cobalt contained f.o.b. Cobalt, Ontario, 9 percent grade, $1.30; 12 percent, $1.60.
Gallium - per gram in 1000-gram lots, $3.00.
Germanium - per gram, 1000 gram lots, 1st reduction 48½ cents.
Iridium - per ounce troy $100-110.
Lithium - per pound 98 percent $11-14.
Nickel - per pound electrolytic cathodes f.o.b. Port Colborne, Ontario, 64½ cents duty included.
Osmium - per ounce troy $80-100.

Palladium - per ounce troy $23-24.
Platinum - per ounce troy $103-108.
Selenium - per pound, commercial grade, $13.50 (producer's price).
Titanium - per pound, grade A-1, 99.3+ percent, maximum .3 percent iron, $3.00.
Titanium ore - per gross ton, ilmenite 59.5 percent TiO_2 f.o.b. Atlantic Seaboard $26.25; rutile per pound, minimum 94 percent, concentrate 10-15 cents.
Tungsten - per pound 98.8 percent, minimum 1,000-pound lots, $4.50.
Zirconium - per pound, sponge, $10.

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OREGON MINING NEWS

The Sunshine Mining Company, Kellogg, Idaho, has leased the Columbia, Tabor Fraction, E & E, North Pole, and Villiard mines in the old mining camp of Bourne, Grant County, Oregon. These are quartz-gold properties of early-date note and their consolidation into a group affords control over an important section of the lode which traverses all properties. Although several attempts have been made to reactivate various of these properties during the past four decades, little development work of significance has been accomplished, nor have the old workings ever been fully reopened for examination. As a result, the task of appraising the present consolidation will entail an extensive amount of rehabilitation work before new exploratory development can be made. Sunshine has had the properties under preliminary examination for several months and the job of reopening certain portions of the old workings is now under way. Mr. Harry Bowyer is foreman and 8 men are currently employed.

The discovery of lode gold in the vicinity of Bourne followed the discovery of placer gold in 1861 at Griffin Gulch, a tributary of Powder River a few miles southwest of Baker City. Early in 1862 the rich Auburn placers were discovered. From Auburn, which within a year contained 5,000 inhabitants, exploring parties discovered the placers of Sumpter, Mormon Basin, and Rye Valley in Oregon and the Boise Basin and Owyhee mines in Idaho. By 1864 practically all the mining districts of eastern Oregon were known. In 1889 lode mining came to the fore in eastern Oregon and several of the Bourne area mines were major operations.

The North Pole - Columbia lode, along which the Columbia, Golconda, Tabor Fraction, E & E, North Pole, South Pole, and Villiard mines are located, can be traced for nearly 6 miles and is probably the most extensive gold lode in northeastern Oregon. During the early period of operation and up until 1916 when the Columbia ceased operations, most all properties now held in the present consolidation were operated independently, each with a separate capitalization, management, and mill. Mining practices and efficiencies of operation varried between properties. Little was done during this period in the way of preparing systematic assay maps or mill statistics, and many of the records that were kept have since been lost. It is impossible to present a comprehensive account of these operations today, but an informative report prepared by Swartley (The Mineral Resources of Oregon, Vol. 2, No. 4, December 1916) and based on the then available records, credits the entire lode with a production of "somewhat in excess of $8,000,000, estimated to January 1st, 1915." This same report further states that tailings losses for the entire lode were around $4,000,000 (based on a 90-percent recovery) due to the inefficiencies of the primitive mills and milling practices then in use. The combined milling efficiences of the existing mills "from beginning to end" is given as "not exceeding 67 percent."

The Arentz-Comstock Mining Venture, 807 First Security Building, Salt Lake City, Utah, is now completing construction of a 100-ton mill on the Bretz cinnabar mine in southern Malheur County. Important reserves of new ore were developed by drilling on the Bretz during the past two years, first by the U.S. Mercury Company and later by the Shawano Corporation. The present plant is being built on an operational agreement between the Arentz-Comstock Company and the Shawano Company. John Ruiz, McDermitt, Nevada, is owner of many of the claims. The Bretz was a notable producer during World War II. The flow sheet calls for flotation of the ore followed by batch retorting of the float concentrates in two "D" retorts. Most of the basic machinery is now in place and several of the buildings are erected. Final completion of the plant is scheduled for mid-October. Mining will be done by open-pit methods and a large stockpile of ore has already been recovered during the course of digging the initial pit excavations. Access road from McDermitt to the property is now being gravelled on a cooperative basis by the company and Malheur County. Mr. Roy Hickman is acting superintendent of operations for the company and Mr. Paul M. Sorensen is engineering representative for the Comstock interests.

Mr. A. C. Van Galder, president of the Oregon Drilling and Mining Company, Inc., of Jacksonville, Oregon, reports that his company has leased or optioned several quicksilver prospects in the Fields - Steens Mountain area of Harney County. Some drilling has already been done and more is scheduled for this season and possibly next spring.

Messrs. Chester and E. W. Kubli, Jacksonville, have recently acquired the Steamboat Cinnabar No. 1 property located in sec. 18, T. 40 S., R. 4 W., Jackson County. The upper claims have been reopened and work is progressing on two lower tunnels. Plans are to put in a small furnace. The Steamboat Cinnabar, formerly known as the Curl prospect, includes three claims and had minor production during World War I.

The Chemical Lime Company, Baker, is engaged in development of its high purity limestone which is situated at the head of Marble Creek, Baker County. Preliminary quarry benching is already well advanced and plant construction is underway. The operation should be ready for production in the forepart of 1957. Mr. Robert G. Veraeke is in charge and a construction crew of about 15 men is currently employed.

O.K. Coster and Carl Wikstrom have constructed a small mill at their Rock Creek chrome mine in the SW$\frac{1}{4}$ NE$\frac{1}{4}$ sec. 33, T. 33 S., R. 12 W., in the extreme southwest corner of Coos County. The mill consists of a 5-ton Gibson elliptic roll gold mill, a 12 by 18 Denver duplex jig, and a 12-ton Gibson table. The mill is powered by two small gasoline engines. It has a capacity of 3/4 to 1 ton of concentrates in 8 hours. A zone 1 to 2$\frac{1}{2}$ feet wide of crushed chromite from a landslide area is being mined.

Shipments of chrome ore are reported to have been made by Mr. Gardner from the Ward mine and Mr. R. C. Beggs from the Red Hill mine. Both properties are situated in Grant County east of John Day. Shipments are understood to be continuing with regularity from the Haggard & New mine, also in the John Day country.

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GOVERNOR APPOINTS REPRESENTATIVES

Elmo Smith, Governor of the State of Oregon, has appointed the following as his representatives to the Western Governors Mining Advisory Council meeting to be held in Los Angeles October 1 in conjunction with the American Mining Congress meeting:

Fay I. Bristol, President, Oregon Mining Association, and President, Bristol Silica Company, Rogue River, Oregon.
Hollis M. Dole, Director, State of Oregon Department of Geology and Mineral Industries, Portland, Oregon.
Austin Dunn, Member of Governing Board of State of Oregon Department of Geology and Mineral Industries, Baker, Oregon.
Fay W. Libbey, Consulting Mining Engineer, Portland, Oregon.
Earl Mollard, Superintendent, Hanna Nickel Smelting Company, Riddle, Oregon.

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LAND DETERMINATION AREAS ANNOUNCED

The U.S. Forest Service has notified the Department that it has begun examination of an area in southern Union County southwest of La Grande for determination of surface rights under Public Law 167. The district, termed the Woodley area, is at the headwaters of the Grande Ronde River and includes parts or all of T. 6 S., Rs. 35 and 36 E.

The Bureau of Land Management states that it will begin examination of O and C and public domain lands in Tps. 29 and 30 S., R. 2 W. The O and C lands will be examined under provisions of the law that have been in effect prior to passage of Public Law 167. The Bureau is completing their examinations in Tps. 37, 38, and 39 S., Rs. 5 and 6 W. Examinations in T. 34 S., Rs. 5 and 6 W. have been completed and advertising in the local newspapers will begin shortly.

A summary of all land determination areas by the U.S. Forest Service and the Bureau of Land Management, together with their status, will be printed in the October issue of The Ore.-Bin.

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DEPARTMENT GOVERNING BOARD MEETS

The Governing Board of the State of Oregon Department of Geology and Mineral Industries held meetings August 17-18 and September 24. The August meeting was held in Baker and was called principally to develop the Department's budget for the 1957-1959 biennium. The September 24 meeting was held in Portland for the purpose of discussing land withdrawals and routine business. Members of the Governing Board are: Mason L. Bingham, Chairman, Portland; Niel R. Allen, Grants Pass; and Austin Dunn, Baker.

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NEW DRILLING PERMIT

State Drilling Permit No. 19 was issued to Oroco Oil and Gas Company, Payette, Idaho, September 27, 1956, for a test drilling in the NE¼ SE¼ sec. 19, T. 16 S., R. 46 E., Malheur County, Oregon. The lessor is Floyd L. McBride, Jamieson, Oregon, and the test is to be called the McBride No. 1.

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STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
Head Office: 1069 State Office Bldg., Portland 1, Oregon
Telephone: CApitol 6-2161, Ext. 488

Field Offices

2033 First Street
Baker

239 S.E. "H" Street
Grants Pass

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THE MULTIPLE-USE MINING LAW - SUCCESS OR FAILURE

On July 23, 1955, the President signed H.R. 5891, thus establishing Public Law 167, commonly referred to as the Multiple-Use Mining Law (see Ore.-Bin, August 1955). The law, which had the support of the American Mining Congress, the American Forestry Association, and the U.S. departments of Agriculture and Interior, was designed to curb abuses of the mining laws without disturbing their basic principle. Its purpose, according to the U.S. Forest Service, was "to bring the greatest good from our natural resources to the greatest number of people in the long run." The law was designed to do this by restricting the use of a mining claim, located after passage of the law, to activities related only to mining, authorizing the government to manage the surface rights including timber cutting, forage, and access, and allowing the mining claimant to use only that part of the surface of the claim required in mining operations. Also, it set up a procedure whereby the government bureaus could examine existing claims to determine their validity and, if proved invalid, to manage the surface resources (see Ore.-Bin, August 1955). In other words, Public Law 167 stopped mining claimants from withdrawing land exclusively for their own use and allowed a reappraisal of land withdrawn as mining claims before passage of the law.

Areas of examination and status of government bureau activities in Oregon in reappraising lands held by mining claims are given on following pages where it will be noted that more than 400,000 acres of U.S. Forest Service land has been examined or is in the process of examination and, in addition, a total of nearly 700,000 acres has been approved for examination. The Forest Service anticipates completion of examination of all its lands by 1965. Acreage examined to date by the U.S. Bureau of Land Management is not as great but is appreciable. In the coming months the examined land will be advertised and hearings will be held. The manner in which the government bureaus and the mining men approach the hearings and conduct themselves might well determine whether or not the Multiple-Use Mining Law will be a success and whether "the greatest good to the greatest number of people" will accrue.

It is believed that Public Law 167 is a good law and that it is in the public interest. It is hoped that all parties will accept the spirit of the legislation that legitimate mining is to be encouraged and that varied interests in the use of the land are compatible.

Since correction of the mining laws which allowed tying up of public land for a claimant's exclusive use, other special uses of public land distinctly stand out. Withdrawal of public land through various legal procedures seems contrary to the purpose of the Multiple-Use Mining Law, as such withdrawals limit use of the land to special interests. New discovery and development of mineral deposits, whether of minerals long known to industry or whether of the new "wonder" minerals such as uranium, zirconium, titanium, and the so-called rare earths, depend upon land being open to search. The greater the amount of land open to prospecting, the greater the chance of finding the minerals urgently needed for national security and for our modern "way of life." From the mineral industry standpoint, withdrawals undermine the basic principle behind the new law and could jeopardize the region's economy and national security.

If the Multiple-Use Mining Law is to serve its purpose, all parties concerned must realize now that public land use is for all interests. Special interests, even government bureaus, could seriously weaken this law before it has ever had a chance to be tried by insisting that withdrawals made for their purposes are in the public's interest while all other withdrawals are not.

H.M.D.

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U.S. FOREST SERVICE LAND DETERMINATION AREAS

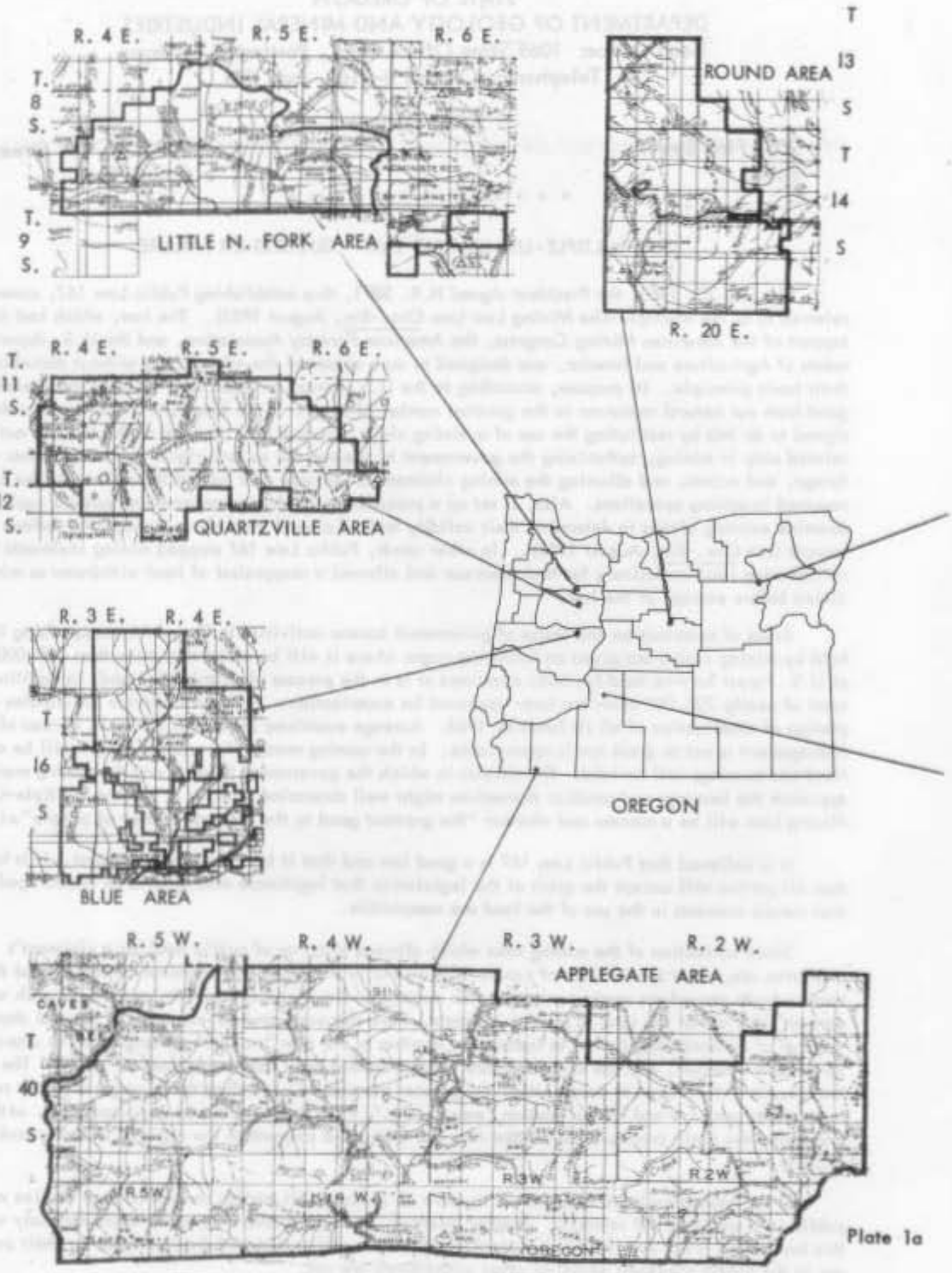
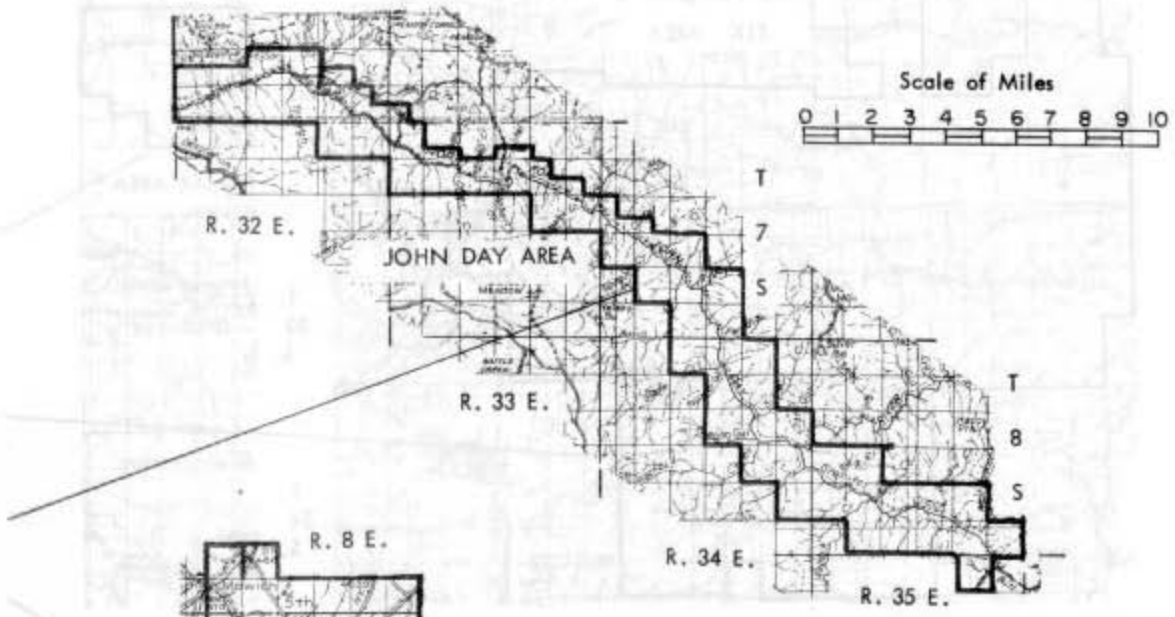
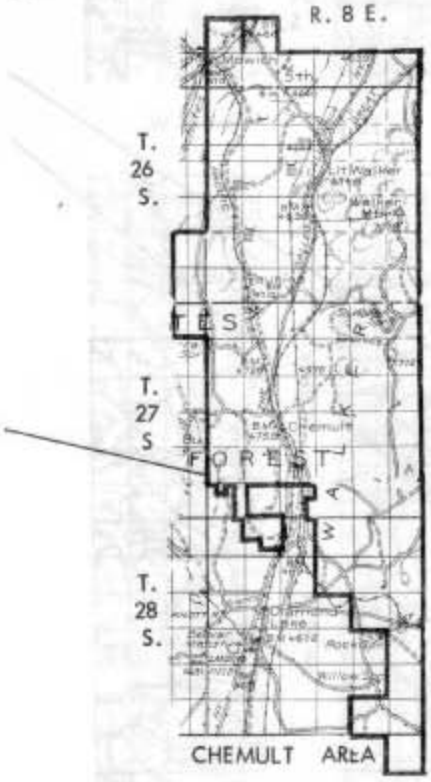


Plate 1a

U.S. FOREST SERVICE LAND DETERMINATION AREAS



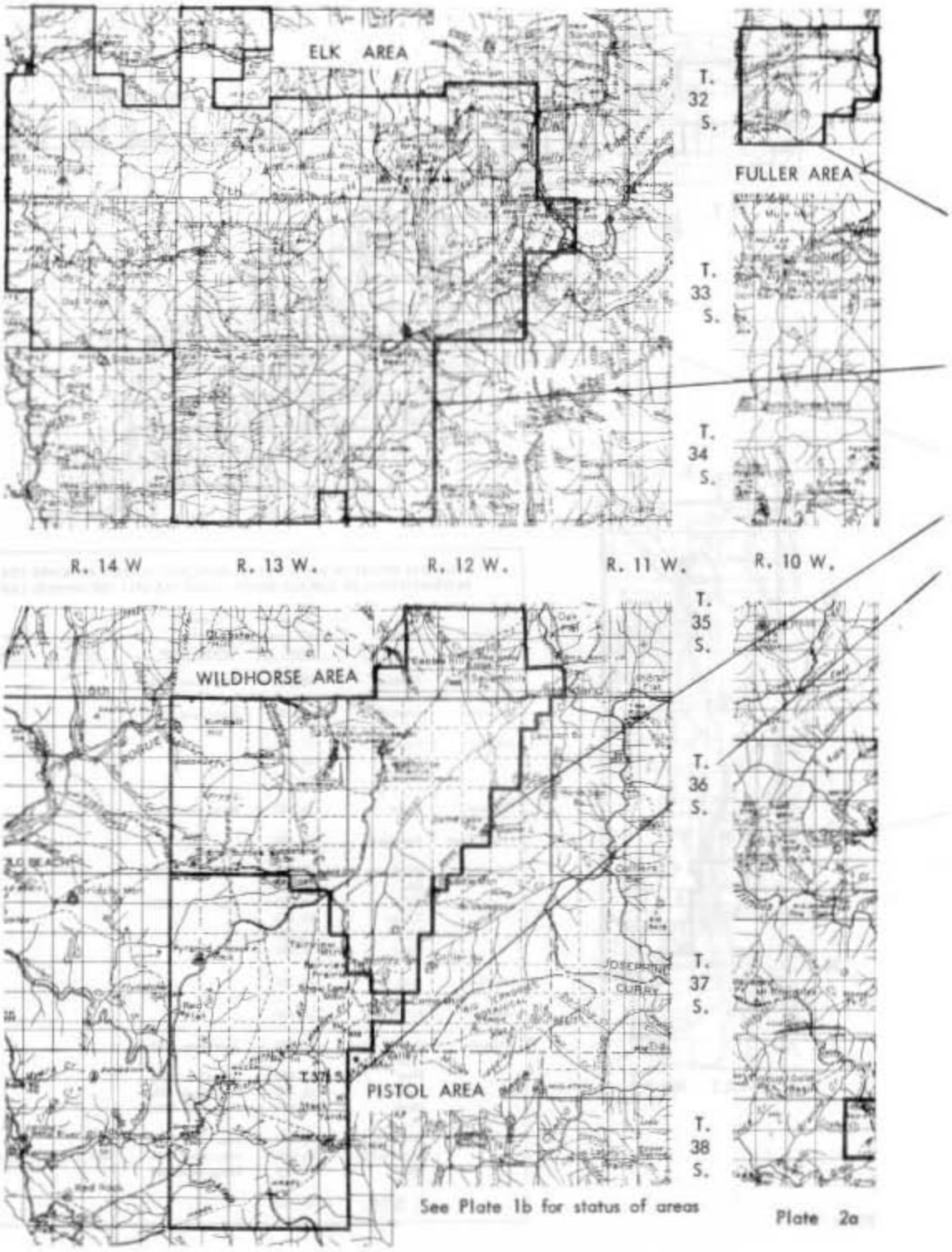


PROGRESS REPORT OF AREAS IN U.S. NATIONAL FORESTS APPROVED FOR DETERMINATION OF SURFACE RIGHTS UNDER MULTIPLE-USE MINING LAW

National Forest	Name of area	Acres Nat'l. Forest Land	Date of Field Examination	Case to BLM	Date of First Publication
Deschutes	Chemult	45,500	May-June 1956		
Fremont	Chemult	8,500	May-June 1956		
Malheur	Twin	55,200			
	Dixie	36,070			
	Baldy	47,830			
Ochoco	Round	24,450	Being examined		
Rogue River	Applegate	113,250			
Siskiyou	Wildhorse	53,000	July-Sept. 1956		
	Elk	138,220			
	Fuller	8,200	Sept.-Oct. 1956		
	Taylor	34,230			
	Illinois	45,350			
	Pistol	39,950			
Umatilla	John Day	29,165			
Umpqua	Bohemia	157,460			
Whitman	Dooley Mt.-Buffalo	44,000	June-Aug. 1956		
	Pine	82,230	July-Oct. 1956		
	Woodley	35,250	Aug.-Sept. 1956		
	Unity	37,500	Aug.-Oct. 1956		
Willamette	Little N. Fork	22,600	May-June 1956		
	Quartzville	28,000	May-June 1956	Sept. 1956	About Oct. 31
	Blue	17,600	Being examined		
	TOTAL	1,103,555			

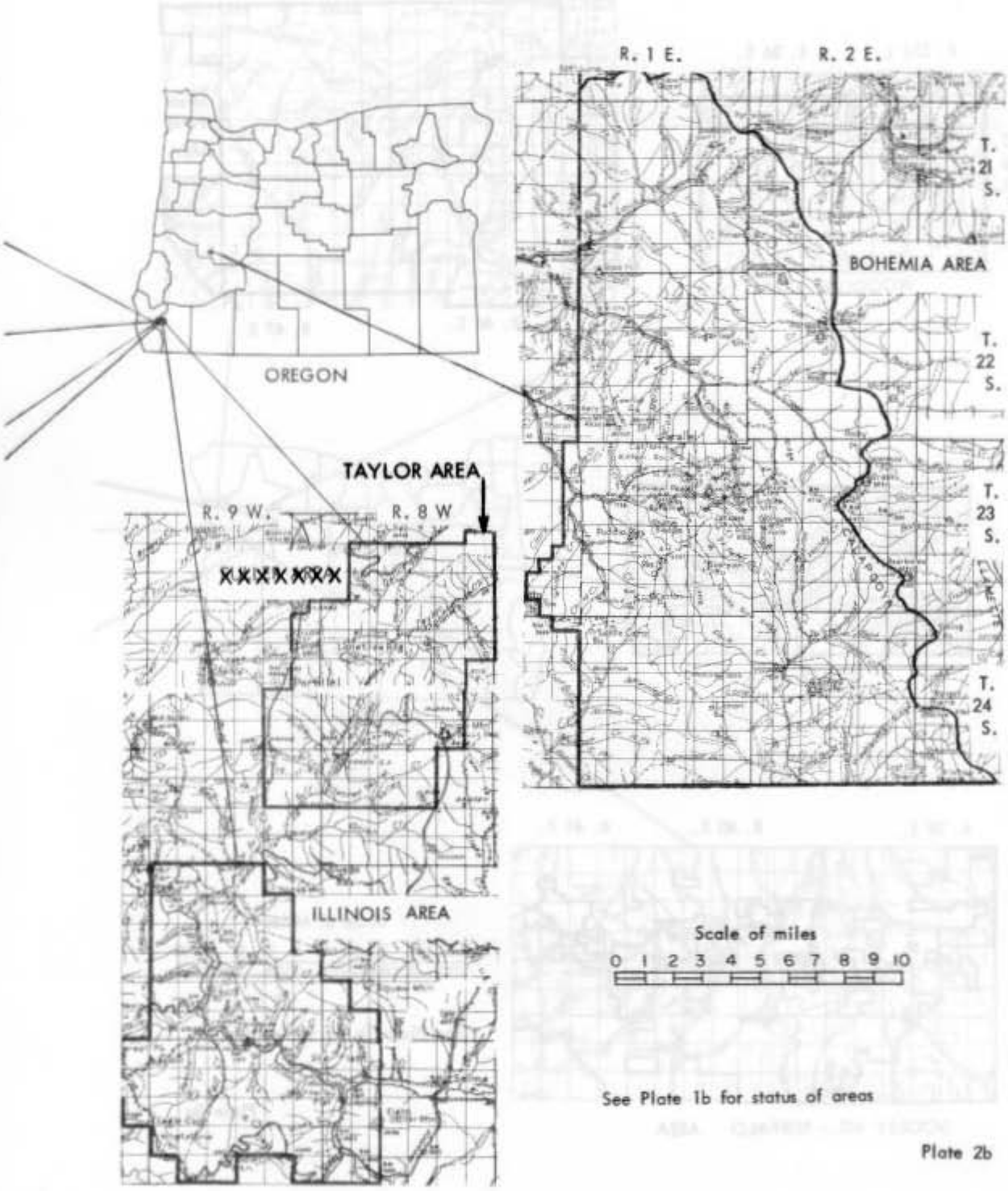
Plate 1b

U.S. FOREST SERVICE LAND DETERMINATION AREAS



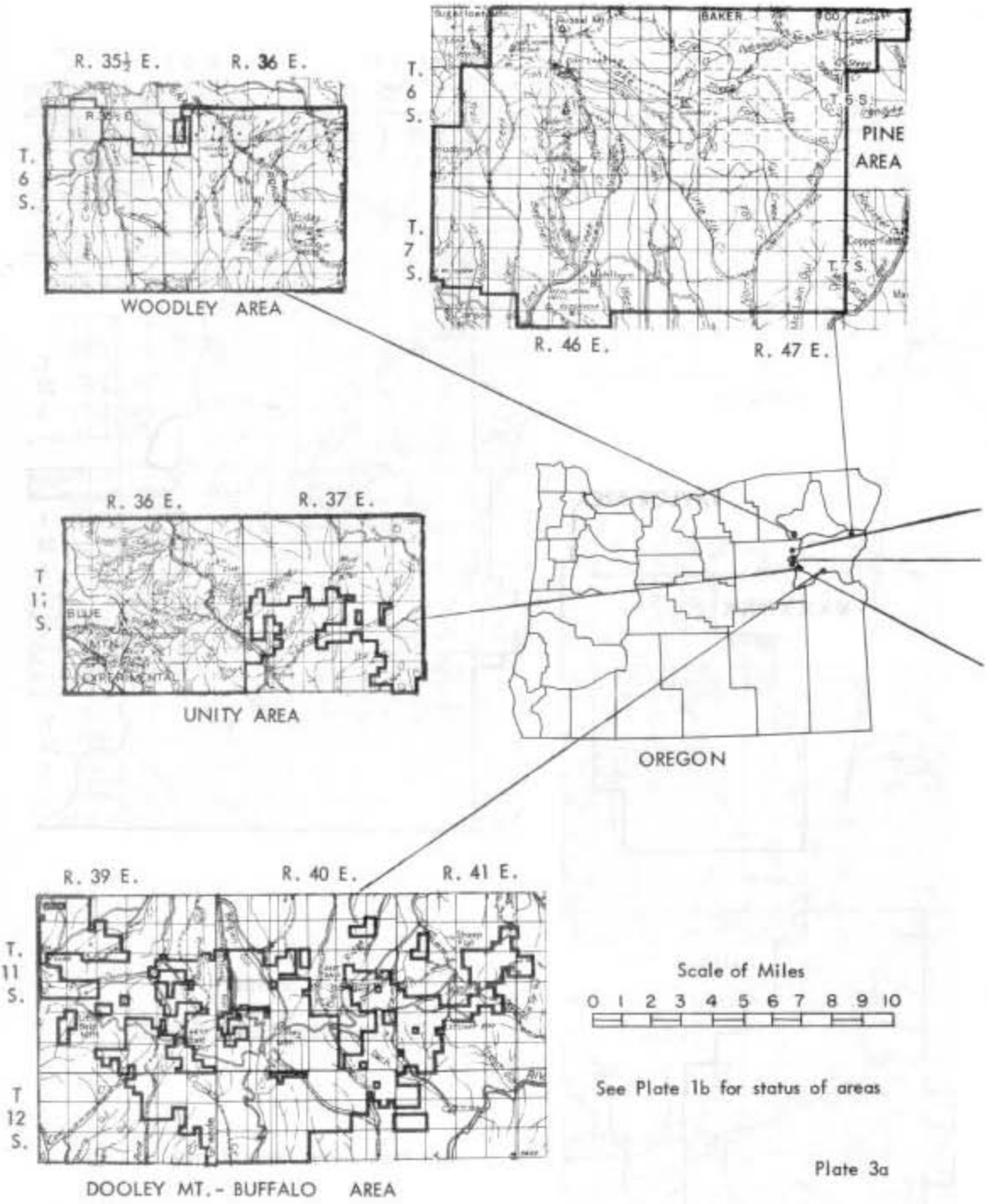
See Plate 1b for status of areas

U.S. FOREST SERVICE LAND DETERMINATION AREAS



See Plate 1b for status of areas

U.S. FOREST SERVICE LAND DETERMINATION AREAS



See Plate 1b for status of areas

Plate 3a

U.S. FOREST SERVICE LAND DETERMINATION AREAS

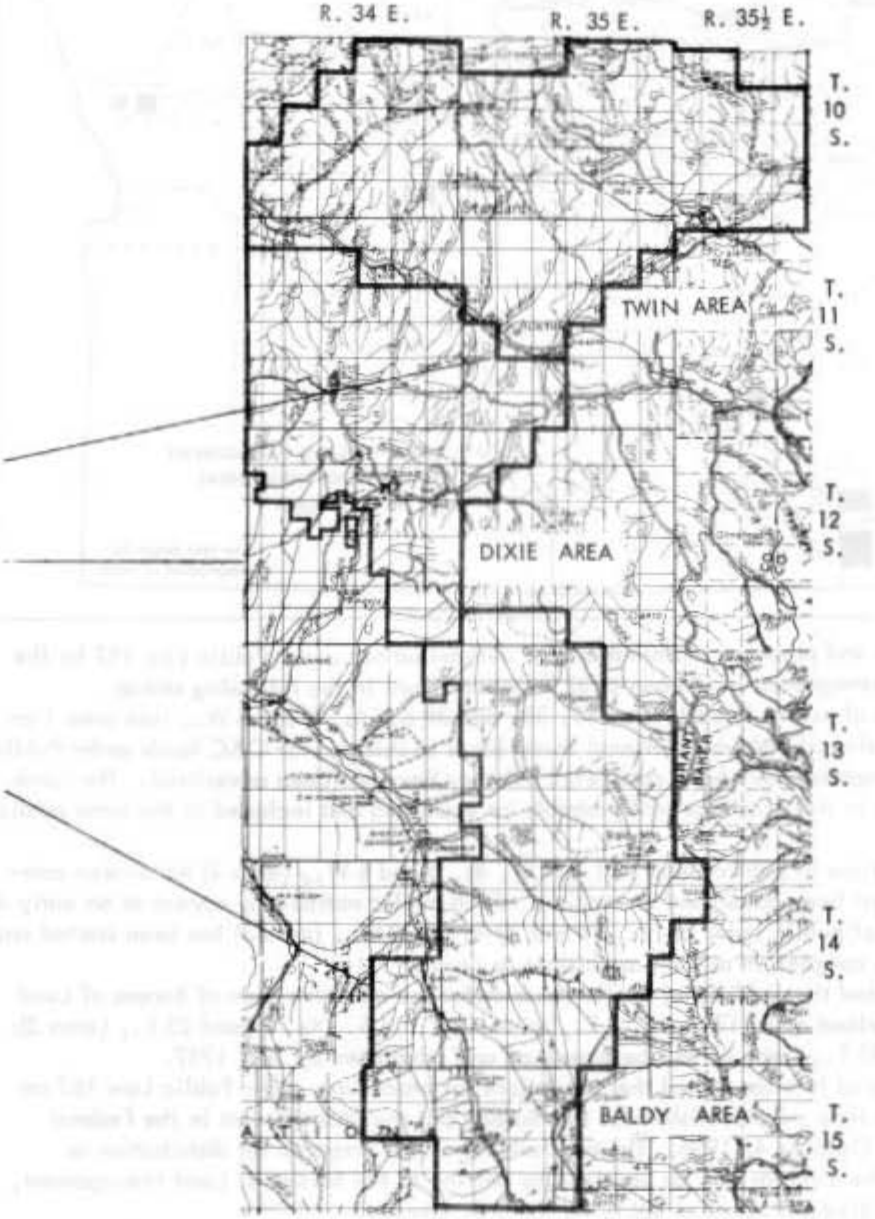
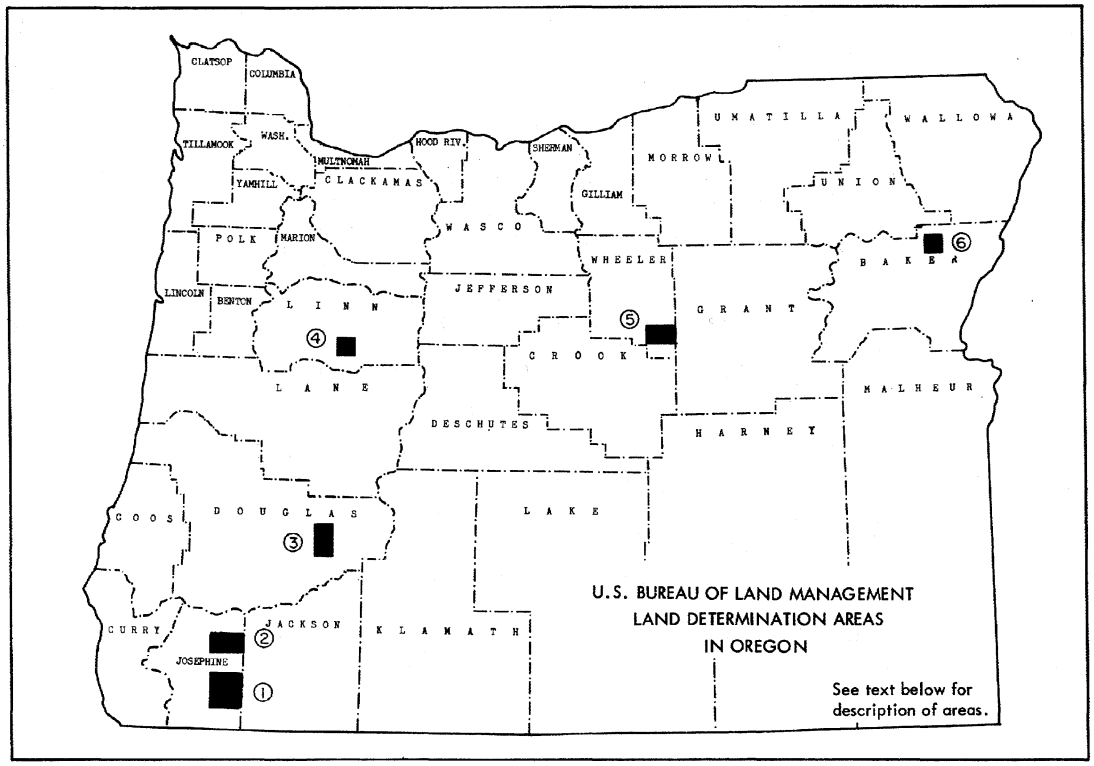


Plate 3b



Examinations and proposed examinations for determinations under Public Law 167 by the Bureau of Land Management in Oregon as of October 19 are in the following status:

Examinations of public lands in Tps. 37, 38, and 39 S., Rs. 5 and 6 W., (see area 1 on map above) exclusive of Siskiyou National forest lands exchanged for O&C lands under Public Law 426, 83d Congress, have been completed but they have not been advertised. The lands received by O&C in the exchange will probably be examined and included in the same public notice.

The examinations of public lands in T. 34 S., Rs. 5 and 6 W., (area 2) have been completed but have not been advertised as required. Such public notice may appear at an early date.

Examination of public lands in Tps. 29 and 30 S., R. 2 W., (area 3) has been started and will be carried to completion as soon as possible to do so.

It is anticipated that additional public lands under the administration of Bureau of Land Management described as T. 12 S., R. 3 E., (area 4); T. 13 S., Rs. 24 and 25 E., (area 5); and T. 7 S., R. 43 E., (area 6) will be examined and advertised by July 1957.

The Secretary of Interior signed the regulations for procedures under Public Law 167 on September 28 and they were published for the Bureau of Land Management in the Federal Register, issue of October 4, 1956. The regulations will be prepared for distribution as Circular 1961. The circular may be obtained by writing to the Bureau of Land Management, 1001 N.E. Lloyd Blvd., P.O. Box 3861, Portland 8, Oregon.

An explanation of Public Law 167, the Multiple-Use Mining Law, was given in the August 1955 issue of the Ore.-Bin. The procedures under which the U.S. Forest Service is conducting land determinations and the rights of claim holders were discussed in the April 1956 Ore.-Bin. Persons desiring copies of these Ore.-Bins may obtain them at no charge by writing to the Department of Geology and Mineral Industries, 1069 State Office Building, Portland 1, Oregon.

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ROGUE RIVER WITHDRAWAL HEARING ANNOUNCED

The State Office of the Bureau of Land Management has announced Tuesday, November 20, 1956, as the hearing date on the proposed withdrawal from prospecting and mining of 23,358 acres of public land along the Rogue River (see Ore.-Bin, pp. 7-8, January 1956, for map and description). The hearing will be held in the Circuit Court Room, Josephine County Courthouse in Grants Pass and will begin at 9:00 a.m.

The announcement on the hearing for the proposed withdrawals states: "The proposals would withdraw national forest lands from appropriation under the general mining laws and the remaining public lands from all forms of appropriation under the public land laws, including the general mining laws, except designated areas which may be classified for lease under the Small Tract Act and, if authorized, lease and sale under the Recreational Act of 1926, as amended."

The hearing will be open to all interested persons who desire to be heard. Those who desire to be heard in person at the hearing and those who desire to submit written statements should file notice not later than November 13, 1956, with the State Supervisor, Bureau of Land Management, 1001 N.E. Lloyd Blvd., P.O. Box 3861, Portland 8, Oregon.

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NEW DRILLING PERMIT

State Drilling Permit No. 20 was issued to Oroco Oil and Gas Company, Payette, Idaho, October 15, 1956, for a test drilling in Lot 1, sec. 18, T. 24 S., R. 33 E., Harney County, Oregon. The lessor is the Portland Company, 6455 S.W. Scholls Ferry Road, Portland, Oregon, and the test is to be called the Portland Co. No. 1.

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BRITISH GEOLOGISTS VISIT LATERITE DEPOSITS OF WESTERN OREGON

Dr. Victor A. Eyles, who retired last year from the Geological Survey of Great Britain, and his wife, who is also a geologist, were recent visitors to Oregon to examine the nickeliferous and aluminous laterite deposits of the western part of the State. Dr. and Mrs. Eyles were official delegates to the International Geological Congress at Mexico City in September and came to this country at the conclusion of the meeting.

During their visit to Oregon, members of the Department showed the Eyles the nickel laterite deposits on Nickel Mountain, currently being mined by the Hanna Coal and Ore Corporation, and the ferruginous bauxite deposits in Washington and Columbia counties and in the Salem Hills, Marion County. Dr. Eyles noted that the ferruginous bauxites of northwestern Oregon are very similar geologically and in composition to the Antrim deposits of Ireland and said that it had been his wish for many years to come to this country to examine these deposits first hand. During World War II, when imports of aluminum from South America were curtailed, Dr. Eyles made a detailed study of the Antrim laterites for the British Geological Survey. Following his investigation, more than 500,000 tons of bauxite ore were mined from the Irish deposits until the end of the war.

Dr. and Mrs. Eyles left Oregon to visit in Vancouver, B.C. From there they will go to the University of Illinois where Dr. Eyles will lecture on laterites of the world, after which they will travel to Jamaica, B.W.I., to study bauxite deposits on that Island.

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NEW MEDFORD QUADRANGLE MAP PUBLISHED

"Geologic map of the Medford quadrangle, Oregon-California," by Francis G. Wells and others, has just been published by the U.S. Geological Survey. A preliminary issue of the map was published in 1939 in cooperation with the Oregon Department of Geology and Mineral Industries. The new edition includes a number of minor changes and additional details. Several new formational names have been introduced for Cretaceous and Tertiary units. A revised text and bibliography are included.

The map, designated as GQ 89, is one of the Geologic Quadrangle Map series and is for sale only by the U.S. Geological Survey, Denver Federal Center, Denver, Colorado. Price has not been announced.

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ALBANY, OREGON - THE NATION'S NEWEST METAL-PRODUCING CENTER

Members of the Oregon Section of the American Institute of Mining and Metallurgical Engineers who met in Albany, Oregon, October 19, had the opportunity to visit Oregon's two new metallurgical plants operated by the Wah Chang Corporation and the Oregon Metallurgical Corporation for production of zirconium and titanium.

The Wah Chang Corporation is operating the Bureau of Mines zirconium plant and is under a contract with AEC to produce about 300,000 pounds of high-purity sponge annually for at least two years. Demand for zirconium has increased to the extent that Wah Chang is already beginning construction of a larger plant of its own in the Albany area.

The newly formed Oregon Metallurgical Corporation has just completed its plant for the production of titanium and zirconium ingots and castings from sponge. General manager is Stephen M. Shelton, former Bureau of Mines Regional Chief, under whose direction the Kroll process for the reduction and working of the two metals was perfected by the Bureau. The new plant recently began commercial production and may eventually produce ingots and castings of such metals as hafnium, tantalum, and columbium.

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NEW OUTLOOK FOR NORTHWEST ALUMINA CLAY

According to The Wallace Miner (October 11), Anaconda has announced that it will build a $1,000,000 pilot plant in Latah County, Idaho, to test a new process developed by its research department for the recovery of alumina from clays.

The Pacific Northwest has vast deposits of alumina clay. Idaho deposits in the Moscow-Troy-Deary area of Latah County are estimated to contain as much as 500,000,000 tons averaging 20 to 24 percent alumina. Oregon has clay deposits of considerable tonnage near Molalla in Clackamas County and sizeable deposits in Lane and Douglas counties averaging 27 percent alumina.

Anaconda has long been interested in alumina clay deposits, but early experiments in upgrading the clay failed because processes were too costly. The Company's new process coupled with the recent piping of natural gas into the region has greatly improved the outlook for commercial utilization of Northwest clays. The Anaconda Company has an aluminum reduction plant at Columbia Falls, Montana, and an aluminum fabricating plant at Great Falls, Montana.

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WORLD'S DEEPEST OIL WELL

The world's deepest oil well, located in southern Louisiana, has broken two world records: it is the deepest well, with a total depth of 22,570 feet, and the deepest producing well, producing from a depth of 17,306 feet. In spite of the enormous depth of this well, the bottom of the hole is in Miocene rocks.

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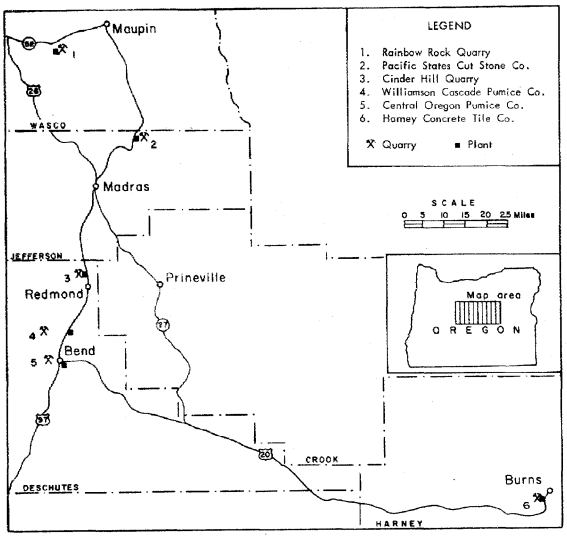
NEW PRODUCTS FROM OLD VOLCANOES

By
Ralph S. Mason*

Introduction

Central Oregon has been the scene of countless volcanic eruptions. Some were violent, with the emission of vast quantities of dust, ash, and pumice which showered down upon the countryside while others erupted more quietly, with streams of liquid lava flowing out to bury the lowlands and dam the streams. Still others spewed forth masses of sticky lava which hardened rapidly to form gingerbreadlike lumps of porous lava. The most spectacular by far, however, were the glowing clouds of ash and pumice which raced down the slopes of volcanoes at express train speeds. When the fiery masses came to rest their heat was sufficient to weld them together. Formidable as these eruptions sound, their products are used today to make our living more comfortable and enjoyable. Pumice, cinders, and volcanic tuff are the raw materials for two industries which have sprung up since World War II (see accompanying map).



Pumice and cinders

Pumice covers large areas in central Oregon. It is used today for lightweight aggregate and a variety of other purposes. The cellular structure of the pumice makes it a good insulator for heat, cold, and sound which, together with its light weight, makes it a valuable aggregate for concrete blocks. Cinders are denser than pumice and usually have a dark red color. Their occurrence is restricted to cones. The porous nature of cinders is similar to that of pumice but cinder blocks have lower shrinkage and greater crushing strength than pumice. The "red roads" of central Oregon owe their color to volcanic cinders used as an aggregate. Some cinder cones produce pieces the right size for block and road aggregate, while others have larger masses which can be used for rock gardens and retaining walls.

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

Immediately after World War II the demand for housing resulted in the opening up of about half a dozen pumice pits near Bend. Concrete block manufacturers were clamoring for lightweight aggregate and pumice was ideally suited for the purpose. Some of the early operators merely scraped off overburden and shipped raw pumice without further treatment. The block manufacturer was often as equally inexperienced as the pumice producer, consequently the results were almost disastrous to the pumice aggregate industry. Pumice blocks failed in every conceivable way. They cracked, shrank, spalled, and some just simply came apart. Builders, architects, and building inspectors took one look and had nothing more to do with pumice blocks. Today, after considerable research, pumice producers have succeeded in furnishing the block manufacturer and other users with a carefully tailored and controlled material which furnishes a sound product. Pumice and pumice blended with volcanic cinders have some definite advantages as an aggregate over all other types when used in certain applications. Pumice blocks have excellent acoustical and thermal insulation qualities and they make the lightest of all concrete blocks.

Although pumice was first shipped from the Chemult area in 1939, there is no activity in that area at the present time. The Chemult pumice is extensive, but considerable difficulty was experienced by producers because of the moisture content of their finished material. The pumice lies exposed on the surface where heavy snows cover it in winter, making operations very difficult. The moisture from the melting snow soaks into the pumice during the spring and no economical drying methods have been found successful. In the Bend area the pumice is normally covered by overburden which protects it from much of the surface moisture. Year-around operation is possible and the pits are located close to town where labor and supplies are easily available.

At the present time there are three pumice producers in the central Oregon area: Williamson Cascade Pumice Company and Central Oregon Pumice Company near Bend, and Harney Concrete Tile Company near Burns. The two operations near Bend also produce cinders from nearby deposits and cinders are produced from a deposit near Redmond.

The Williamson Cascade Pumice Company operates a plant 7 miles north of Bend on the Great Northern Railroad at Deschutes siding. Raw pumice is obtained from a pit near Tumalo. After some unsuccessful attempts at artificially drying the pumice to reduce its moisture content, the company now air dries it in a pit approximately three acres in extent where a spring tooth harrow is used to stir up the surface. At the plant the pumice is crushed with 12-inch rolls and vibrating screens provide various fractions. Extensive use is made of rubber conveyor belts in transporting the pumice within the plant and from the plant to cars on the siding. Blends of cinders and pumice are shipped as well as straight pumice and straight cinders. The cinders are obtained from Laidlaw Butte northwest of Tumalo.

In addition to aggregate for concrete block manufacturers, a nursery starter or bedding material ranging in size from 1/8 inch to 20 mesh, a floor sweeping compound consisting of 1/8 inch to dust, and plaster sand packed in 80-pound bags are produced.

Williamson also ships abrasive grade pumice from a quarry located in Newberry Crater. Due to the short season in the Crater, Williamson trucks out considerable quantities of lumps during the summer and stores them at Bend for shipment as required.

Central Oregon Pumice Company is currently producing pumice from numerous small pits located immediately west of Bend. More than a dozen pits are in use, although actual

production is restricted to one or two at any one time. The thickness of the overburden and the pumice vary considerably over short distances.

Air drying of the pumice is attempted whenever possible as artificial means of drying have not proved effective due to the high insulation quality of the material. Pumice exposed in idle pits loses a considerable amount of moisture. Bulldozers strip the overburden and a power shovel equipped with a 3/4-yard bucket loads a 40-cubic yard dump truck. The truck is unique, not only for its huge capacity, but for the mechanism used to elevate the box at the plant. The dumping operation is entirely mechanical and is achieved by setting the brakes on the rear wheels, unlocking the box which forms the frame connecting the rear wheels with the tractor unit, and then slowly backing the tractor. This motion forces a boom connected to the tractor and to the underside of the box to rise, elevating the forward end of the box. After discharging the load the truck moves forward, the box is lowered and locked into position, and the rear gate closes automatically. At the plant, which is located in the railroad district of Bend on Great Northern trackage, pumice passes through a grizzly and storage bin to a belt conveyor feeding onto 30-inch smooth rolls. Crushed material passes over a series of vibrating screens which may be changed to suit the requirements of the customer. Sized fractions are stored in bins from which loading can be into either open gondola cars on the spur or directly into trucks. The plant offers a self-service feature for trucks during hours when the plant is closed. At such times truckers open the bin gates, load their trucks, and leave a note showing the amount taken. The management reports that they have had little, if any, difficulty with keeping track of such movements.

The company also sells cinders which have passed over a 3-inch steel rail grizzly for base coarse road rock. The city of Bend has used this material with great success in its current "blacktop" paving program. The cinder pit is located about a mile west of Bend and is of considerable extent. The cinders in this pit are reddish-brown in color and grade in size from lumps weighing 20 or 30 pounds down to fines.

A second cinder pit operated by Central Oregon Pumice Company is located 4½ miles south of Bend and is the source of block aggregate which is sold extensively in the State of Washington and other areas. The cinders, which are sold under the trade name of "Shalex," are dug, crushed, and screened by a contractor who periodically sets up portable equipment at the pit and prepares several thousands of yards of various sizes. The sized fractions consist of 3/8-inch minus, 5/8 to 3/8 inch, and 3/4 to 1/2 inch. Material from the stockpiles is delivered to the plant as needed, where it is crushed and screened to customer specifications. A blend of pumice and cinders is also available, the particle size of the fractions and the proportion of the two materials being altered for the purpose for which it is to be used. Straight "Shalex," sized from 1/2 to 1/4 inch, is also being sold as a Bermuda-type roofing material which is packaged in 60-pound multi-wall paper bags.

The Harney Concrete Tile Company has been producing pumice near Burns in Harney County since 1948. Five separate occurrences of pumice are known in the area but production has come from only two of them. The pumice occurs in lumps ranging in size from 10 inches in diameter on down to fines. The lumps are hard, fresh looking, and almost pure white. One pit has some off-white material but it is otherwise similar in composition to the other deposits. Insufficient prospecting and exploration work has been done to determine accurately the extent of any of the occurrences. Judging from the exposures made in the course of quarrying and preliminary prospecting it seems fairly certain that a large tonnage exists at each of the five locations.

The chief product from these pits is an aggregate which is shipped to block manufacturers in eastern Oregon and western Idaho. Substantial amounts of pumice, particularly the off-white material, are sold as aggregate for logging roads. Logging operators have found that the pumice makes an excellent surface when it is kept moist and packed.

Dark red cinders for road aggregate are produced by Leroy Grote from Tetherow Butte 2 miles north of Redmond and just west of Highway 97. Locally this Butte is known as Cinder Hill. The cinders are dug with a Hough loader and dumped into trucks which haul the bank-run material a short distance to a portable crushing and screening plant.

Large quantities of the cinders have been used in highway construction locally and by the county for roads. In addition to road aggregate, Grote also supplies a Bermuda-type roofing, aggregate for concrete blocks, and a specialty item used on cinder tracks at high schools throughout the State.

Volcanic tuffs

Volcanic ash, blown high in the air at the time of eruption floated slowly to the ground where much of it was washed by streams into nearby lakes formed during the volcanic activity. Here the ash settled to the bottom, became compacted, and eventually cemented into a solid form. Such rock is known as tuff. Not all of the tuffs of central Oregon were formed by deposition in water. Some volcanoes emitted incandescent masses which fused into solid rock. Tuffs formed in this manner are usually denser and harder than the water-laid type. The color of the rock ranges from buff through red to brown and purple. Some deposits have colored bands, while others have solid colors. An interesting feature of volcanic tuffs is that they increase in hardness upon exposure to the air.

Volcanic tuffs are worked at two quarries in central Oregon, the Rainbow Rock and the Pacific States Cut Stone Company quarries. Several other deposits which contain suitable material may very possibly be worked in the future.

The Rainbow Rock quarry is located approximately 5 miles south of the town of Pine Grove on State Highway 52 in Wasco County. The stone is light pink to red in color with striking dark bands running through it. When quarried the stone is easily worked and when dry quite light in weight. Stripping back from the quarry face has exposed a considerable quantity of tuff and additional stone is available below the present floor of the quarry. The present operators, Madden and Burk, slab the quarry face with a two-wire reverse-twist cable wire saw. Local river sand is used as an abrasive for the wire. The slabs are then drilled with a series of horizontal holes, and plugs and feathers are used to split them for transportation with a lift truck to the re-saw. The re-saw consists of 13 circular blades 5 feet in diameter similar to those used in sawmills but equipped with carbide inserts. The blocks are placed on a heavy carriage running on rails which is drawn under the blades with a power feed. Slabs 2 inches, 4½ inches, and 7 inches thick are produced and then split to about 3-3/4 inches wide in a 40-inch guillotine. Finished pieces are strapped on to pallets and shipped out by truck. Re-sawing and splitting and sorting operations are performed under a shed measuring approximately 80 by 100 feet. All of the equipment is electrically powered.

Fracturing and other imperfections in portions of the quarry make it necessary to discard some material, but the quantity of stone appears to be adequate for an operation of the present size for many years. Approximately 15 men are employed during peak production periods. Ship-

ments of stone have been made to Spokane and Seattle, Washington, Pendleton and Portland, Oregon, and as far south as Los Angeles, California.

The Pacific States Cut Stone Company quarry is located 2.6 miles south of Willowdale on U.S. Highway 97 in northern Jefferson County. The quarry is operating under the management of Mr. E. L. Keater, Box 473, Madras, Oregon. The stone is a volcanic tuff with a rich reddish-brown color grading into dark browns and purples. Portions of the quarry have dark bands running through the stone. Quarry blocks are freed either with the aid of a wire saw or by drilling and broaching a series of closely spaced vertical holes. The quarry saw uses a two-strand twisted-wire cable. Use of the wire saw is made easy by the location of the quarry on the nose of a low ridge. A stiff leg boom at the edge of the quarry lifts the blocks and swings them onto a dolly mounted on rails which then moves the stone under the gang saw. Blocks as large as 8 by 10 feet can be handled. The gang saw is fitted with mild steel blades measuring 1/4 inch thick by 4 inches in width and 13 feet 6 inches in length. The framework is actuated by a pitman driven by a large electric motor which has a mechanical screw feed to slowly lower the blades as the stone is cut. The blades are spaced at intervals of 2 inches, 4½ inches, and 7 inches and the resulting slabs are then passed through a guillotine which breaks them into strips slightly under 4 inches in width. Garnet sand is used as an abrasive in the gang saw and is recovered and re-used by a simple system of launders and a pump. An electric-driven air compressor supplies the track-mounted wagon drill and the air-driven hoist for the stiff leg boom.

During normal operations when several faces of good stone are available, ten or more men are needed. Apparently the former use of dynamite, both in the quarry and in the construction of an irrigation tunnel which passes under a corner of the quarry, caused some damage to areas of the stone. These areas have been by-passed temporarily but will have to be removed to permit the opening of a lower bench. Some silicified zones have been encountered in the quarry. The stone crops out along a low ridge and has a minimum of overburden on the top and south sides but runs into increasingly thicker soil mantle to the north. There appears to be sufficient stone to last for many years.

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DRILLING PERMITS

Revised location for the Portland Company No. 1 test well, which was issued Permit No. 20 on October 15, is 1287 feet south of the north line and 1254 feet east of the west line of sec. 18, T. 24 S., R. 33 E., Harney County, Oregon.

Drilling Permit No. 21 was issued November 8, 1956, to the Seneca Oil, Gas and Development Company, John Day, Oregon. Lessors are Farrell, Byron, Grace, and Royce Lemons, Mt. Vernon, Oregon. The Seneca Oil, Gas and Development Company test is located in the NW¼ NE¼ sec. 18, T. 17 S., R. 29 E., Grant County, Oregon. Mr. W. J. Griffith, Box 333, John Day, is President and General Manager of Seneca Oil.

Drilling Permit No. 22 was issued November 20, 1956, to the Big Red Uranium Company, Vancouver, Washington. Lessor is John Richartz, Milton-Freewater, Oregon. Location of the Big Red Uranium Company wildcat well is in the NW¼ sec. 24, T. 6 N., R. 34 E., Umatilla County, Oregon. Mr. Albert Boone, 508 Main Street, Vancouver, Washington, is President of Big Red Uranium Company.

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BAUXITE BULLETIN ISSUED

"Ferruginous Bauxite Deposits in the Salem Hills, Marion County, Oregon," is the title of Bulletin No. 46 just issued by the State of Oregon Department of Geology and Mineral Industries. R. E. Corcoran, geologist with the Department, and F. W. Libbey, mining engineer and formerly Director of the Department, are co-authors of the 53-page publication which discusses the geology and economics of the deposits.

Bauxite was discovered in the Salem Hills by the Department in 1945 during an investigation of laterite deposits in northwestern Oregon. From 1953 to 1955 more detailed work was done which included a drilling and sampling program to determine, at least approximately, the quality and areal extent of the bauxite. More than 250 samples obtained in this investigation were analyzed chemically. Spectrographic, petrographic, and X-ray diffraction studies of a few selected samples were also made to supplement the results of the chemical analyses. The Salem Hills bauxite averages 35.0 percent Al_2O_3, 6.7 percent SiO_2, 31.5 percent Fe_2O_3, 6.5 percent TiO_2, and 20.2 percent loss on ignition.

A unique feature of the Salem Hills deposits is the large quantity of residual boulders and nodules of gibbsite or high-grade bauxite scattered widely over the surface. These analyze between 50 and 60 percent alumina and 2 or 3 percent silica. The quantity present has not been determined.

The United States is now importing almost 75 percent of all the bauxite it processes, and if foreign imports were cut off, much, if not all, of the higher grade domestic aluminum ore would be exhausted within five years. Under these conditions the lower grade ores such as are present in the Salem Hills would assume tremendous national importance because of low silica and low-cost mining.

Bulletin 46 may be obtained at the Portland office of the Department, 1069 State Office Building, or at Department field offices in Baker and Grants Pass. Price is $1.25 postpaid.

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PUBLIC LAW 167 PUBLICATION OF NOTICE BEGINS

Publication of "Notice to Mining Claimants" for determination of surface rights on unpatented mining claims under Public Law 167 has begun in Oregon. The U.S. Forest Service has notified the Department that its first case in Oregon is in the Quartzville area of Linn County. First publication of the Notice was in the weekly newspaper, New Era, of Sweet Home, on November 1. According to the law, the publication of the Notice must be made in nine consecutive issues. Legal descriptions of the lands on which surface determinations are to be made appear in the Notice.

Official public notice of land determinations by the Bureau of Land Management of surface rights in four townships in Josephine County is now being advertised in the Grants Pass Courier. The public lands involved are in T. 34 S., R. 5 W.; T. 34 S., R. 6 W.; T. 37 S., R. 5 W.; and T. 38 S., R. 5 W. First date of publication of the Notice was Wednesday, November 21, 1956. The Notice will appear in the Grants Pass Courier every Wednesday thereafter for nine weeks.

Other public lands under examination by the Forest Service and the Bureau of Land Management (see October 1956 Ore.-Bin for location of these areas) will be advertised similarly in a newspaper having general circulation in the county in which the lands involved are located.

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OWNERS OF VALID CLAIMS CAN PROTECT SURFACE RIGHTS

The date of the first public advertisement (Notice to Mining Claimants) on land determinations is the official date after which the surface rights of the claim may be contested by the Forest Service or the Bureau of Land Management. If a claim is proved invalid, the management of the surface resources comes under the jurisdiction of the Government agencies, according to Public Law 167 (see Ore.-Bin, August 1955 and April 1956). The only way a mining claimant can hope to protect his rights to the surface resources on his property is to file with the Bureau of Land Management a verified statement (a statement under oath) setting forth certain facts about his claim. Failure to file such a statement within 150 days of the first notice shall:

1. Be considered conclusive evidence that the mining claim owner waives and relinquishes any right, title, or interest under such mining claim as regards the surface rights.

2. Constitute a consent by the mining claimant that the mining claim shall be subject to the limitations and restrictions of Public Law 167.

3. Precludes thereafter any assertion of such mining claimant of any right, title, or interest in the mining claim contrary to or in conflict with Public Law 167.

After the mining claimant files a verified statement with the Bureau of Land Management, a mineral examiner will be sent to the mining claim to determine whether the claim should be recognized as valid. If the claim is found to be clearly valid and effective, the owner of the mine may conduct his operation as if Public Law 167 had never been passed. If, on the other hand, the Government doubts the validity of the mining claim, a hearing will be arranged by the Department of the Interior to be held in the county where the claims are located, unless the mining claimant agrees otherwise. The hearing will determine whether the mining claim is valid and effective or invalid and ineffective. Claims declared invalid and ineffective will have their surface subject to management and disposition by the Government bureaus.

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FREE FORMS AVAILABLE FOR MINING CLAIMANTS

The Department is distributing free of charge two forms (Nos. 3 and 4) to assist persons owning mining claims on public lands investigated by the Forest Service or the Bureau of Land Management under Public Law 167. The two forms apply only to unpatented mining claims located before July 23, 1955.

Form No. 4 is a request by the mining claimant for a copy of the Government's notice that land determinations have been made in the area where his claims are located. In order to be sure of receiving the Government bureau's "Notice to Mining Claimants," Form No. 4 should be filed with the County Recorder in the county where the mining claim or claims are located.

Form No. 3 is a verified statement by the mining claimant who wishes to keep the surface rights to his claim the same as before passage of Public Law 167. Form No. 3 is filed in response to the Government bureau's published "Notice to Mining Claimants" that land determinations are to be made. The Notice is published in a newspaper having general circulation in the county in which lands involved are located. If in a daily paper, the Notice will appear in the Wednesday issue and every Wednesday thereafter for nine weeks; if in a weekly paper, the Notice will appear

in nine consecutive issues; if in a semiweekly or a triweekly paper, the Notice will be in the issue of the same day of each week for nine consecutive weeks. Form No. 3 must be filed with the Bureau of Land Management, Department of the Interior, 1001 N.E. Lloyd Blvd., Portland 8, Oregon, within 150 days from the date of the first advertisement of the Notice. Anyone who fails to file a verified statement automatically forfeits to the Government the right to manage the surface resources of his claim.

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SOUTHWEST OREGON MINING NEWS

A 46-ton pod of massive chromite ore measuring 6 by 8 by 10 feet was recently taken out of the Lucky Hunch chromite mine by the owners, Fred Langley and C. W. Dean of Grants Pass. This pod is reported to be the largest chunk of chrome ore ever mined out in one piece in Oregon. Another large pod lies immediately south of the 46-ton pod, and other smaller ones are known to be present. Returns from the first shipment of ore to the Grants Pass depot in October averaged nearly 45 percent Cr_2O_3. The discovery was made a few months ago as the result of excavation by bulldozer of an area where massive chromite float had been found. The owners are enlarging the open cut and have built about 350 yards of road to the cut. The property is located in the SE¼ sec. 33, T. 37 S., R. 9 W., in Josephine County, about 10 miles down the Illinois River from Selma.

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Jean W. Pressler, Grants Pass, shipped 25 tons of copper from the Fall Creek mine to the Tacoma Smelter in September 1956. The mine is located on Fall Creek, a tributary of the Illinois River, in sec. 4, T. 38 S., R. 9 W., Josephine County. The mine was reopened in 1955 and the ore, a massive chalcopyrite, was mined during the winter 1955-56. It was hauled to the smelter by Dean Axtell Trucking Company.

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NORTHWEST CERAMIC INDUSTRY AND RESOURCES REVIEWED

"Ceramic industry development and raw-material resources of Oregon, Washington, Idaho, and Montana," by H. J. Kelly and others, has been published by the U.S. Bureau of Mines as Information Circular 7752.

The publication summarizes the present ceramic industries and raw-material resources for each of the four States, and is intended as a guide to future development of the industry in the light of an increasing market for ceramic products and availability of natural gas to a large portion of the Northwest. The report reviews the sources of clay, feldspar, expanding shales, and other ceramic as well as refractory materials by counties for each State. Included are illustrations and index maps showing location of deposits and ceramic plants.

Information Circular 7752 is available free of charge from: Publications Distribution Section, U.S. Bureau of Mines, 4800 Forbes Street, Pittsburgh, 13, Pennsylvania.

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RECORD ON ROGUE RIVER WITHDRAWALS STILL OPEN

A public hearing was held November 20 in Grants Pass on the proposed withdrawal of 23,000 acres of public land along the Rogue River from mineral entry. In addition to oral testimony from 18 witnesses, about 20 written statements were entered on the record. Mr. Virgil T. Heath, State Supervisor of the BLM, conducted the hearing and announced that the record would remain open until December 6 for additional written statements. Testimony should be sent to State Supervisor, Bureau of Land Management, 1001 N.E. Lloyd Blvd., P.O. Box 3861, Portland 8, Oregon.

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URANIUM PROSPECTING IN OREGON, 1956

By
Max Schafer*

Introduction

The search for uranium deposits in Oregon in 1956 was typified in two ways. First, there were no discoveries large or rich enough to show such immediate promise as the White King claims in Lake County. Second, the total number of prospectors decreased but the type of work done was better than before. Quantity decreased but quality was up.

The lack of any new deposits that showed as much immediate promise as the White King claims is disappointing and unexpected. It was felt that the White King claims would be a major "break-through" and once some of the important geological facts were learned concerning this deposit, other similar deposits would quickly be discovered. This view was perhaps overly optimistic. The belief is strong, however, that additional economic deposits of uranium will be discovered in the future. It is thought that more knowledge of the geology of uranium and of refined prospecting techniques will assist in uncovering deposits of major importance. One difficulty that has been and will continue to be encountered by the prospector is the problem of deep cover or overburden.

The weekend prospector equipped with a small Geiger counter and large hopes was not so much in evidence this past year. The principal amount of prospecting in 1956 was done by men or groups of men, some of whom were sponsored by businessmen. The prospectors were equipped with good detection instruments and generally had a bulldozer available for trenching. Many had small drills with which they could test "hot spots" to a depth of 50 to 100 feet and some used the new hand-held prospecting drills. In addition, more flying was done in 1956 by mining companies and private persons than before. It has become evident to the prospector that covering the claim with a detection counter is only the first step in exploring a claim, and that after a radioactivity anomaly is found, the source and distribution of the radioactivity must be determined by means of deeper exploration.

Uranium occurrences investigated by the Department during 1956 are given below. These occurrences do not include all of the known radioactive areas in Oregon, but represent the outstanding developments during the year.

Lakeview area

A preliminary report on the occurrences of uranium in the Lakeview area was published in the December 1955 Ore.-Bin. The following brief notes summarize the information learned during the 1956 field investigations.

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

The immediate area of the White King and Lucky Lass claims is underlain by Tertiary andesite and basalt flows, acid to intermediate tuffs, and bedded to massive tuffaceous, lacustrine deposits. The bedded lake deposits, which are the least extensive of the rock types, dip 15 to 45 degrees to the southwest and are conformable with the flows and tuffs.

Since the leasing of the White King property by the Lakeview Mining Company, extensive exploration has been carried out in the prospect area immediately east, northeast, and southeast of the discovery pit. The work has consisted largely of drilling with noncoring diamond bits and probing the holes with a detection counter. Little coring has been done because of difficulty in obtaining good core recovery. Cuttings from the drilling are studied by the mine geologist.

Drilling has penetrated recent stream alluvium, volcanic tuffs, and tuffaceous sediments. Some of the tuffs and sediments have been altered to opal or to clay. Uranium ore is found in a zone about 100 feet in thickness and is in sediments and tuffaceous sediments. The ore is confined principally to a tuffaceous agglomerate or breccia which is overlain by a clayey sediment. The mineralization within the agglomerate is associated with opalite cementing agglomerate fragments and is present to some extent in areas where a clayey cement predominates.

Correlation of rock types and surface study has brought out the presence of many small vertical faults which were not previously recognized. These faults, which have displacements of as much as 200 feet, are probably the main structural control in the location of the ore solutions which deposited the uranium in this particular area.

Pike Creek area

An occurrence of secondary uranium mineralization is located in Harney County in secs. 17 and 20, T. 34 S., R. 34 E., on the east face of Steens Mountain. The mineralization occurs in the Pike Creek volcanic series which is considered to be early Pliocene in age. This formation is made up of acid flows and tuffs exceeding 1500 feet in thickness. The uranium occurrence is at a contact between a rhyolitic intrusion breccia and a bedded acid tuff deposit. The hard, nonporous breccia also shows radioactivity along fractures and where iron and manganese oxides stain the rock. Visible autunite-like secondary uranium minerals are present along bedding and joint surfaces in the tuff and at the contact. Mineralization was not discovered beyond about $1\frac{1}{2}$ feet from the contact between the tuff and the intrusion breccia.

Bear Creek area

The discovery of the Bear Creek uranium occurrence near Bend in Crook County, Oregon, caused a flurry of excitement in the summer of 1955. Since that time about 500 feet of trenches have been dug and five drill holes totaling about 200 feet have been put down on an occurrence in sec. 13, T. 18 S., R. 16 E., 1.5 miles west of Bear Creek.

The mineralization at this prospect is in volcanic tuff of Clarno (Eocene) age. The Clarno formation in this area is composed of basalt flows, rhyolitic flows and tuffs, and tuffaceous sediments. The uranium is located in a small shear zone in silicified and porous tuff on the crest of a small ridge. The silicification is probably responsible for the existence of the ridge.

Trenching by bulldozer has cut the ridge in several places. Only one trench exposes visible uranium mineralization. On the east side of this trench a yellow-green fluorescent secondary uranium mineral coats fractures in silicified tuff. On the opposite side of the trench a green fluorescent secondary uranium mineral is disseminated in a loose porous gray tuff. Both of these zones are less than 3 feet wide and nearly vertical. High radioactivity extends for several feet on each side of the visible mineralization. The difference in the color of the minerals in the hard brittle rock and the porous rock is a relationship which has been noted also at

the White King deposit in Lake County. According to Forrest Kennaday,* Glide, Oregon, a shaft will be sunk to explore a 4-foot radioactive zone at a depth of 37 feet which was encountered in the drilling.

Powell Butte area

The radioactive material discovered in 1955 on the west side of Powell Butte in sec. 13, T. 16 S., R. 14 E., Crook County, was explored in 1956 by hand-mining methods. Prospecting has failed to uncover any sizeable concentration of uranium mineralization.

Powell Butte is an old rhyolitic highland of Clarno (Eocene) age. It is made up of acid and intermediate volcanic rocks with glassy welded tuffs and rhyolites predominating. The rocks of the Butte give an unusually high background reading and joints are particularly "hot." The anomalous radioactivity is associated with iron oxide-hydroxide staining or filling along the joints and with hyaline opal that fluoresces greenish-yellow.

Salem area

An occurrence of secondary uranium mineralization was found on land owned by Sam F. Speerstra of Salem in sec. 6, T. 8 S., R. 3 W., Marion County, in 1955 and is reported here for the first time. The occurrence is on the south slope of Illahe Hill about 4 miles south of Salem.

The uranium mineralization occurs in the Eugene formation of upper Oligocene age. The rock is a tuffaceous marine sandstone. Exploration work consisting mainly of pitting and some drilling has uncovered disseminated uranium minerals and small concentrations over a wide area. The minerals have tentatively been identified as tyuyamunite and autunite-zippeite.

Origin of the deposits

The occurrences noted above illustrate at least two types of uranium mineralization. It is believed that the deposits at the White King and the Bear Creek claims owe their mineralization to ascending hydrothermal solutions. The White King deposit is especially typical of a hydrothermal mineral deposit. At this property both pre- and post-mineral faulting have probably occurred. The first period of faulting provided channelways for the ascending mineralizing solutions and the second period of faulting broke up the ore bodies. There is a strong possibility that repeated movement has occurred along the same zones of weakness. Physical characteristics of the rock, such as porosity, have governed localization of the ore-bearing solutions. The richer ore occurs in layers of porous tuff which afforded easy access to mineralizing solutions rising along faults. The nonporous clayey tuff acted as a cap rock to contain the solutions. The assemblage of sulphides (realgar, orpiment, cinnabar, pyrite, and stibnite) is typical of a low-temperature, low-pressure mineral deposit. Galena was recently discovered in a drill hole associated with a black, sooty uranium mineral disseminated in opalite. This discovery sheds a little different light on the origin of the mineralization as lead sulphide is generally thought to form at a higher temperature than the other sulphides present. It is possible that more than one stage of mineralization took place and this could account for the mixed assemblage.

The uranium occurrence near Bear Creek in Crook County also appears to be hydrothermal in origin. This deposit, like the Lucky Lass claim, which is near the White King mine in Lake County, has no other visible mineralization besides the uranium, although samples from these two prospects contain traces of mercury. At the Bear Creek occurrence there is some evidence of silicification and alteration caused by hydrothermal activity.

* Personal communication.

The association of the uranium anomaly on Pike Creek in Harney County with the rhyolite intrusion breccia might indicate that this occurrence is also of hydrothermal origin. There is a possibility, however, that the source of the uranium in the tuffs is not hydrothermal but the result of release of uranium to ground water from the breakdown or uranium-rich volcanic rocks.

The high radioactive background associated with Powell Butte and the concentration of "hot spots" along fractures suggests that the uranium mineralization at this locality may be due to descending ground water or to ascending vapors derived from a cooling magma. If due to descending ground water, the source of the uranium would be the volcanic rock which is slightly enriched with uranium as an original constituent. Possibly this uranium could be transported by ground water circulating through fractures in the rock upon decomposition of the volcanic rock. If due to ascending vapors, the source of the uranium would be residual uranium from the magma which was the source of the volcanics that formed Powell Butte. This late-stage magmatic material would ascend the ancient vent through joints and fractures formed from contraction due to cooling. In either case, the uranium has probably been concentrated and possibly transported through colloidal action. This is borne out by the association of the "hot spots" with iron oxide-hydroxides and hyaline opal (water-clear, globular silica).

The origin of the uranium mineralization found in the marine sandstones of the Eugene formation on Illahe Hill south of Salem is difficult to explain. A source for the uranium other than from a magma is indicated, as no hydrothermal mineral deposits are known in the Eugene formation. A possible explanation for a uranium source is the volcanic ash that is found in the sandstones and shales of the formation. Chemical breakdown of the ash and tuff and its conversion to clay might make available any uranium present to circulating ground water. Concentration of the uranium thus available could be due to organic material or to gels of silica, iron, or others. Or possibly the mineralization could be attributed to a concentration of heavy minerals, some of which contained uranium, along an ancient beach or strand at the time sediments were accumulating to form the Eugene formation.

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NEW URANIUM HANDBOOK AVAILABLE

The U.S. Bureau of Mines has just published an illustrated, 130-page booklet entitled "Facts Concerning Uranium Exploration and Production," that promises to be a handy reference book for the uranium prospector and miner. The authors are John E. Crawford and James Paone.

The handbook answers many common questions regarding uranium exploration and development. It briefly and concisely reviews such subjects as the geology and mineralogy of uranium ores, methods of prospecting, favorable areas, sample testing, available maps, radioactivity instruments, staking claims, exploratory drilling, mining, milling, and refining. A section of the handbook is devoted to brief descriptions of uranium-bearing areas in the United States and Alaska; Oregon is included. Accompanying each subject treated in the handbook is a list of selected references for persons desiring more detailed information. Listed also are companies which supply equipment, offices which dispense information, assay laboratories, mills, and other services.

The handbook is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Price is 70 cents.

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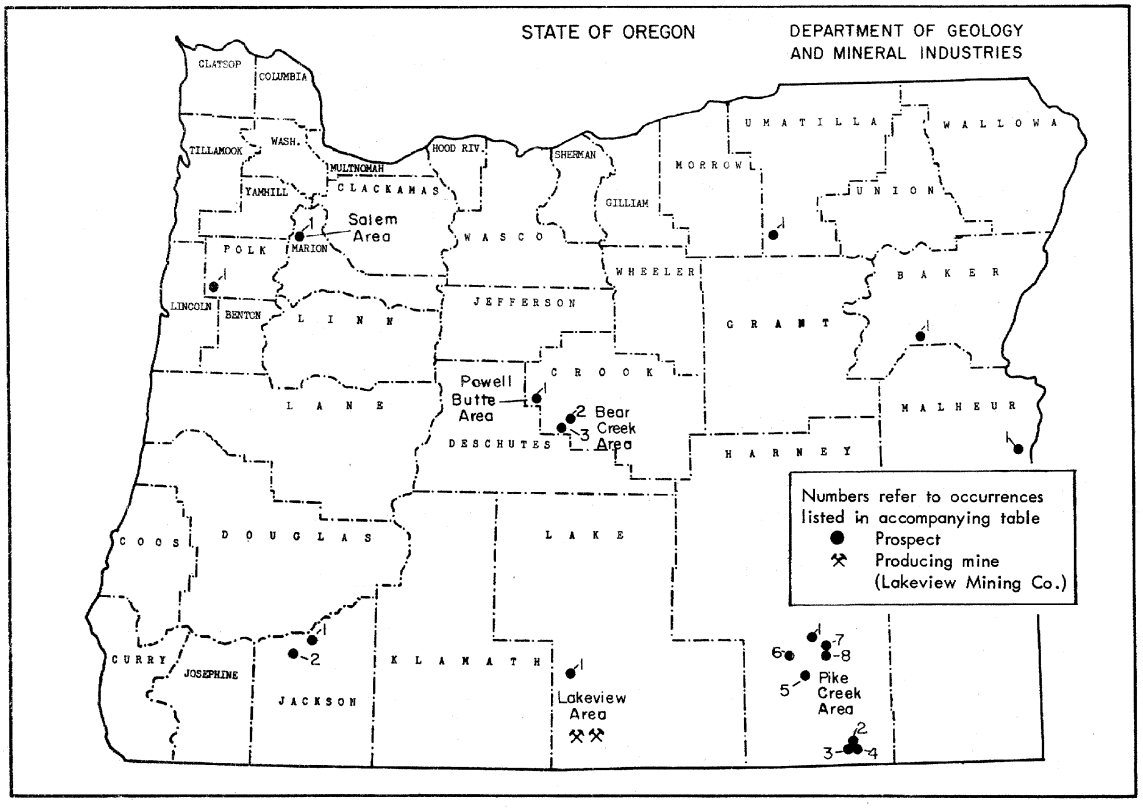
RADIOACTIVE OCCURRENCES IN OREGON, 1956

By
T. C. Matthews*

Pertinent facts on radioactive discoveries in Oregon during 1956 are presented in Table 1 (see Ore.-Bin, December 1955, for 1954-1955 summary). Information was based on samples submitted to the offices of the Department or collected in the field by members of the staff. Additional information was furnished by the Atomic Energy Commission, Salt Lake Area Office, and by persons reporting uranium occurrences. The index map shows the distribution of the occurrences. The numbers on the map correspond with those in the table. The name given refers to either the owner or operator of the claim or the person submitting the sample or information to the Department. Unless otherwise indicated, the tests for U_3O_8 equivalent were made by members of the Department staff and chemical analyses for U_3O_8 were made by L. L. Hoagland, Assayer-Chemist with the Department. All available samples were tested with the short-wave ultraviolet lamp, and the color of the fluorescence given. Since the presence of mercury may have bearing on the origin of the uranium mineralization, its presence or absence is noted.



* Spectroscopist, State of Oregon Department of Geology and Mineral Industries.

Table 1.

Radioactive Occurrences In Oregon, 1956

Map. No.	Name	Location Claim Name	Uranium Minerals	Host Rock and Associated Minerals	U_3O_8 Equiv.	U_3O_8 Chem.	Fluorescence	Mercury
BAKER COUNTY:								
1*	Unnamed	Dooley Mountain	Autunite	Silicified rhyolite tuff, limonite stained	.025	.036	Bright green crystals	Trace
CROOK COUNTY:								
1*	Harley Dosser Redmond, Oregon	Powell Butte T. 16 S., R. 14 E.	Meta-autunite (?)	Porphyritic rhyolite	.05 .16	.064 .148	None	Present
1	(same)	(same)			# .09			
2*	Bennie J. Schultz Eugene, Oregon	Sec. 21, T. 16 S., R. 17 E. Game Guides Group	Autunite	Tuff	.11	.25	Strong yellow-green	None
3*	Sage Hollow Mining Inc. F. J. Kennaday, Sec. Glide, Oregon	Bear Butte T. 18 S., R. 16 E. and R. 17 E.	Uranophane	Brecciated rhyolite	# .09			
3	(same)	(same)			# 1.41 # .77	1.83 1.23		
HARNEY COUNTY:								
1	Lester Rhoads Burns, Oregon	Steens Mountain Sec. 8, T. 34 S., R. 34 E.	Unknown	Semi-schistose greenstone	.11	.13	None	Trace
2	Douglas Shepardson Andrews, Oregon	Pueblo Mountains T. 40 S., R. 35 E.	Unknown	Quartz vein material with copper sulphides	.075	.07	None	Present
3	Roy M. Johnson La Center, Washington	Pueblo Mountains T. 40 S., R. 35 E.	Unknown	Quartz vein material with copper sulphides	.3	.53	None	Trace
4	Ronald C. Begg John Day, Oregon	Pueblo Mountains Sec. 8, T. 40 S., R. 35 E.	Unknown	Quartz vein material with copper sulphides	.36	.30	None	Trace
5	Preston C. Marshall Portland, Oregon	T. 36 S., R. 33 E.	Unknown	Coarse pumiceous sandstone	.02		Scattered yellow-green	None
6*	Dewey Quier Burns, Oregon Lee Kronberg Harold Davis	T. 34 S., R. 33 E. Lobo #3	Unknown	Porphyritic andesite breccia	.11	.07	Dull yellow-green on fractures	Trace
6	(same)	(same)			# .09			
7	Harold Davis Milwaukie, Oregon	T. 34 S., R. 34 E. No. 6, Mary D	Unknown	Chert with disseminated pyrite; veinlets of secondary quartz		# .188		
8*+	Fred Ladd Denio, Nevada Harry Alexander Miller Mining Co.	Steens Mountain Sec. 20, T. 34 S., R. 34 E.	Torbernite and uranophane (?)	Rhyolitic flows and tuffs	# .97	# .938		
JACKSON COUNTY:								
1+	Canyon Creek Mining Co. Arleigh Anderson, Sec. Trail, Oregon	Sec. 31, T. 33 S., R. 1 W.	Unknown	Rhyolitic flows and tuffs		# .15 # .24		
2+	D. C. Maple Central Point, Oregon	T. 34 S., R. 2 W.	Autunite	Rhyolitic flows and tuffs	.04			
2	(same)	(same)			.2	.2		
LAKE COUNTY:								
1	Lewis A. Kaehn Gilchrist, Oregon	Sec. 1, T. 36 S., R. 17 E.	Unknown	Fine volcanic ash and opalite	.10	.098	None	Trace

* Property examined by State of Oregon Department of Geology and Mineral Industries.
\+ Property examined by Atomic Energy Commission, Salt Lake Area Office.
# Information furnished by claim holder.

Note: All analyses by State of Oregon Department of Geology and Mineral Industries unless otherwise indicated.

Table 1 (cont.)

Map No.	Name	Location Claim Name	Uranium Minerals	Host Rock and Associated Minerals	U_3O_8 Equiv.	U_3O_8 Chem.	Fluorescence	Mercury
MALHEUR COUNTY:								
1+	R. D. & S. B. Rasmussen La Grande, Oregon	T. 21 S., R. 44 E.	Unknown	Siltstone	# .06			
MARION COUNTY:								
1*	Sam F. Speerstra Salem, Oregon	Sec. 6, T. 8 S., R. 3 W.	Tyuyamunite, autunite-zippeite (?)	Tuffaceous sandstone	.24	.23	None	None
1	(same)	(same)	(same)	Pulverized sandstone core	.28	.39	None	None
1	(same)	(same)	(same)	Sandstone with feldspar, chlorite, and amphibole	# .08			
1+	(same)	(same)	(same)		# .84			
1	(same)	(same)	(same)		# .41 # .17	# .54 # .198		
POLK COUNTY:								
1	L. R. Johnson Salem, Oregon	Sec. 15, T. 9 S., R. 7 W.	#Carnotite (?)	Sandstone	# .57 # .43			
UMATILLA COUNTY:								
1	Warren Wright Pendleton, Oregon	Sec. 3, T. 4 S., R. 32 E.	Allanite	Pegmatite	.07	.008	None	None

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NEW BASE MAP OF OREGON PUBLISHED BY U.S.G.S.

A new map of Oregon has been published recently in two editions by the U.S. Geological Survey. One edition, known as a "base" map, is published in three colors and shows principal drainage features, public land subdivisions, county boundaries, and railroads. The other edition, known as a "general use" map, is in eight colors. It includes all the information shown on the "base" map and in addition shows highways, towns, national parks, national forests, and Indian reservations. Both maps are at a scale of 1:500,000 (1 inch equals approximately 8 miles). Copies are available from the Geological Survey, Denver Federal Center, Denver, Colorado. Price for the "base" map is $1.00, and for the "general use" map is $2.00.

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DRILLING PERMITS

Drilling Permit 23 was issued December 21, 1956, to Standard Oil Company of California for a deep stratigraphic hole in the NW¼ sec. 6, T. 4 S., R. 21 E., near Condon, Gilliam County. Coordinates of the test are 4319 feet east and 2909 feet south of the NE corner of sec. 6. Elevation of drilling site is 2,747 feet. Lessors are Mr. and Mrs. H. L. Kirkpatrick, Condon, Oregon.

Revised location for Oroco Oil and Gas Company's McBride No. 1 test well which was issued Permit No. 19 September 27, 1956, is 1419 feet west of the east line and 1566 feet north of the south line of sec. 19, T. 16 S., R. 46 E., Malheur County, Oregon. Elevation at ground level is 2831 feet.

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DOMESTIC METAL PRICES

From E&MJ Metal and Mineral Markets, December 13, 1956

Quicksilver - $255-257 per 76-pound flask, New York.
Chromite - $ 59- 61 per long ton; Turkish, 48 percent Cr_2O_3, 3 to 1 chrome-iron ratio.
- $ 56- 58 per long ton; Turkish, 46 percent Cr_2O_3, 3 to 1 chrome-iron ratio.
Copper - 36.655 cents per pound, refinery (domestic average).

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CAR-LOT PURCHASE PROGRAM FOR CHROME

The following information on the car-lot buying of chrome ore for the Government stockpile is from the Federal Register of August 10, 1956, page 5989. Instructions on how to take advantage of this program have been requested from GSA, Seattle, but as yet they have not been received. It is suggested that anyone interested in obtaining further information write GSA at 120 Federal Office Building, 909 First Avenue, Seattle, Washington.

Any producer proposing to deliver chrome ore or concentrates, in one offering, consisting of one or more railroad carloads shall notify the Government of the intended delivery and request shipping instructions. Such notice shall state the approximate quantity proposed to be delivered, the approximate date of delivery, and the proposed shipping point (shipping point means the location at which the producer will make delivery f.o.b. railroad cars). Producers in the States of California, Nevada, and Arizona shall address such notice of delivery to the Regional Commissioner, General Services Administration, San Francisco 3, California. Producers in the States of Washington, Oregon, Idaho, Montana, and the Territory of Alaska shall address such notice of delivery to the Regional Commissioner, General Services Administration, Seattle 4, Washington.

Shipping instructions shall be issued to the producer by the Government. Offerings made shall be delivered, at the expense of the producer, f.o.b. railroad cars at the shipping point designated by the Government; type of railroad car to be designated by the Government. Fractional carloads will not be accepted. Charges incurred due to railway cars being loaded in excess of the maximum limit shall be for the account of the producer.

Sampling and screen size determination shall be made at the shipping point. Sampling, screen size determination, moisture content determination, and chemical analysis shall be performed, at the expense of the producer, by a commercial sampler-analyst firm approved by the Government. Sampling and screen size determination shall be made at the time of loading of the railroad car or cars and the certificate of the sampler-analyst shall so recite.

The weight of each offering shall be, at the Government's option, the gross railroad track scale weight of the car less the actual light weight of the car unloaded or the light weight stenciled on the car, less the moisture content as determined by the sampler-analyst. The weight certificate and the certificate of the sampler-analyst as to sampling, screen size, moisture content, and chemical analysis shall be final and conclusive. Demurrage charges incurred at the shipping point shall be for the account of the producer.

Title to and responsibility for the shipment shall remain vested in the producer until the producer is notified by the Government of the acceptability of the shipment. Upon receipt of the certificate of the sampler-analyst, the producer shall be notified with respect to the acceptability of the shipment. Upon notification of acceptance, the shipment shall move forward in accordance with the shipping instructions issued by the Government. Offerings failing to meet the specifications, terms, and conditions shall not be accepted. No offering shall be accepted on a weighted average basis. The producer shall be notified of a rejected shipment, and removal of the shipment shall be by and at the expense of the producer. The producer shall be held accountable for any expense incurred by the Government in connection with rejected shipments. Payment for accepted shipments shall be made in accordance with the established price provisions for the Government stockpile.

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