

# The Ore Bin



Vol. 35, No. 1  
January 1973

STATE OF OREGON  
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

Published Monthly By

Published Monthly By

## DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES  
Head Office: 1069 State Office Bldg., Portland, Oregon - 97201  
Telephone: 229 - 5580

2033 First Street	521 N. E. "E" Street
Baker 97814	Grants Pass 97526

2033 First Street	521 N. E. "E" Street
Baker 97814	Grants Pass 97526

18

Subscription rate - \$2.00 per calendar year  
Available back issues \$.25 each

Second class postage paid  
at Portland, Oregon



R. W. deWeese, Portland, Chairman  
William E. Miller, Bend  
Donald G. McGregor, Grants Pass

R. W. deWeese, Portland, Chairman  
William E. Miller, Bend  
Donald G. McGregor, Grants Pass

## R. E. Corcoran

Norman S. Wagner, Baker      Len Ramp, Grants Pass

Norman S. Wagner, Baker      Len Ramp, Grants Pass

Permission is granted to reprint information contained herein.  
Credit given the State of Oregon Department of Geology and Mineral Industries  
for compiling this information will be appreciated.

## OREGON'S MINERAL AND METALLURGICAL INDUSTRY IN 1972

Ralph S. Mason  
Deputy State Geologist  
Oregon Department of Geology and Mineral Industries

The year 1973 can be tagged as the year of "Enhanced Environmentalism" which follows hard on the heels of 1972 which saw "Enforced Environmentalism" become a reality with the inception of the Mined Land Reclamation Act on July 1. Enhancement will become increasingly apparent in the years ahead as pits are reclaimed upon abandonment. In addition to the environmental considerations, the enforcement of the Act has already developed one spin-off benefit in the form of an apparent two-fold increase in the number of known operating pits and quarries in the state. This should eventually result in a substantial increase in the total reported production of sand and gravel and stone.

Preliminary figures for mineral production in Oregon for 1972 show an increase of 2.5 percent, to \$79,800,000. This is a preliminary figure and is based largely on the pit price for the principal commodities, sand and gravel and stone. No figures for the metals produced in the state are available but would exceed \$700,000,000 in all probability.

### Environment --- Economy

The gulf between the two disciplines, ecology and economics, has always been wide, but there are signs that it may now be narrowing. The adoption of the Mined Land Reclamation Act last July opened the door which will lead to the eventual determination of the cost of environmentally acceptable practices which must be followed by the extractive industry. The impact of the required reclamation work which must be performed by industry when it abandons a worked-out pit will not become apparent for several years. The reclamation work will be an added charge to the operation and this charge will, as always, be passed on to the customer.

Environmental concerns were expressed in several other areas during the year. The Department of Environmental Quality imposed pollution

standards, including noise levels for Wildernesses, including the Rock Mesa area in the Three Sisters Wilderness. Rock Mesa contains a large reserve of block pumice. Exploratory drilling for oil and gas on Federal lands was delayed pending preparation of environmental impact statements and no Federal leases for geothermal energy drilling have been granted because of environmental requirements.

#### SOME OF OREGON'S MINERALS AT A GLANCE

Mineral	1970	1971
Clays .....	\$ 180,000	\$ 255,000
Copper .....	W	3,000
Diatomite .....	5,000	1,000
Gem stones .....	750,000	755,000
Gold (recoverable content of ores) .....	9,000	10,000
Lime .....	1,777,000	1,989,000
Mercury .....	112,000	W
Nickel .....	W	W
Pumice and volcanic cinder .....	1,221,000	1,239,000
Sand and gravel .....	25,978,000	28,707,000
Silver (recoverable content of ores) .....	6,000	6,000
Stone .....	20,948,000	26,708,000
Value of items that cannot be disclosed:	17,095,000	18,212,000
Bauxite (1970), cement (portland and masonry),		
clay (fire) (1970), talc, tungsten (1971), and		
values indicated by symbol W		
Total . . . . .	\$68,081,000	\$77,885,000

#### The Metals

Oregon's foremost metal-mining operation, the Hanna Mining Company's nickel mine at Riddle, Douglas County, was in production throughout the year. The mine and smelter constitute the only nickel production in the United States.

Gold production continued at a very low ebb during the year. Cornucopia Minerals, Inc. opened up the old deep placer ground on Pine Creek in northeastern Baker County in midyear and continued until shut down by weather. Although good values were known to exist in the creek, the presence of large boulders and the great depth to bedrock prevented mining for many years until heavy equipment was available. Nuclear Exploration and Development Corporation shipped gold ore from the old Bald Mountain mine in the Cracker Creek district of Baker County. The mine and the adjacent Ibex mine are located on the same vein. The two properties have a production history extending back almost 75 years.

Almost in inverse ratio to commercial gold production has been the

interest and activity by the non-professional gold hunter, skin diver and rockhound in looking for "colors" in Oregon's gold-bearing streams. "Gold and Silver in Oregon," a 350-page bulletin describing all known gold deposits and mines in the state was primarily designed to provide information to the professional community. Currently, however, the bulletin is of interest mainly to the non-professional since it serves as an excellent guidebook to several hundred mines and, perhaps, artifacts left behind a century ago.

Mercury production nose-dived to the near zero point in hot pursuit of an equally rapidly declining market price. Environmental concern over the role of mercury wastes and emissions was largely responsible for the sharp drop in use. Although world prices for the metal strengthened late in the year, the prospects for mercury mining in the state remained dim.

Aluminum production returned to normal late in the year when Reynolds Metals reopened potlines at its Troutdale plant, which had been cold for a year. Production at the Harvey Aluminum plant at The Dalles was continuous during 1972.

### Industrial Minerals

Production of sand and gravel in the state increased 6 percent in volume over the previous year. The unit price reported also increased 6 percent over 1971. Details of quantity and value are shown in the accompanying table. As noted in the introductory box, these figures are expected to change significantly in the future as the canvass by the Department proceeds. The sand and gravel industry, local and state governments, and the consuming public are involved in a diversely developing dilemma. Producers of the constantly diminishing, non-renewable reserves of this prime construction material are faced with ever-increasing demands by the consumer on the one hand and ever more stringent restrictions on production by regulatory agencies on the other.

Projections made by the Department indicate that known sand and gravel resources in the Willamette Valley will be exhausted by about the year 2010; this date is also predicted for depletion of sand and gravel in western Washington. Clearly every effort must be made now to ensure that maximum protection of this critical material for future use is achieved.

Crushed and dimension stone production declined 6 percent from 1971. Unit value increased approximately 2 percent. Sand and gravel and stone accounted for 78 percent of the non-metals produced in Oregon in 1972.

Natural lightweight aggregates such as pumice, volcanic cinders, and scoria were produced from pits in central Oregon. Quantity increased 22 percent while unit value remained unchanged from the previous year. Expanded shales were processed at a plant operated by Empire Building Materials in Washington County. The brick and tile industry continued production in much the same manner that it has for many years.

\* \* \* \* \*

## GEOHERMAL ACTIVITY IN 1972

Richard G. Bowen

Economic Geologist, Oregon Dept. of Geology and Mineral Indus.

Leasing for geothermal investigations continued on private lands in Oregon during the year. Gulf Oil Company extended its acreage, and Anadarko Petroleum picked up leases in the Alvord Lake area (Figure 1, page 9). The work on the lease blocks by exploration parties was mostly related to geologic research, but some geophysical studies consisting of seismic ground-noise, microearthquake, and electrical resistivity measurements were also made. Pacific Power and Light and Weyerhaeuser Timber Companies have continued geologic reconnaissance, airborne infrared mapping, and geochemical analysis of waters in Lake and Klamath Counties in an effort to target areas for more intensive exploration. Eugene Water and Electric Board financed some geophysical studies by the Geology Department of the University of Oregon. The Geophysical Research Group, Department of Oceanography, Oregon State University is making magneto-telluric, micro-earthquake, and ground-noise studies in the Klamath Falls region.

The Department of Geology and Mineral Industries was able to continue geothermal studies with a grant from the U.S. Bureau of Mines. The results of the geothermal gradient and heat-flow measurements made thus far by the Department are described in another section of this issue. A more detailed outline of the exploration plan appears in the July 1972 ORE BIN.

Late in the year, Magma Energy Company applied for a permit to drill a 6000-foot geothermal test on land which it had leased for several years near Vale. A permit to drill has been granted by the Department of Geology, but as yet the company has not received a solid-waste permit from the State Department of Environmental Quality.

Outside of Oregon, on areas of privately owned land, activity continued at a high level during the year. At The Geysers field in northern California units 7 and 8 were completed and placed on line during the summer and fall, bringing the installed capacity of the field to 302 megawatts. Construction is underway on units 9 and 10, which are scheduled for operation later this year. Unit 11 has been ordered and site preparation is underway for its installation; operation is expected in 1974. Unit 11, a 110-megawatt installation, will be the largest geothermal turbo-generator set in the world. Present turbo-generator sets are 55 megawatt, with two installed in each plant. Construction of the larger unit allows some economies of scale and will reduce the present low capital costs even more. It is interesting to note that new geothermal installations during the year cost about \$122/kw, while base-load fossil fuel plants were between \$200 and \$250/kw and nuclear plants ordered were between \$400 and \$475/kw.

The Union-Magma-Thermal partnership drilled 10 new wells in The Geysers area in 1972 to supply steam for the new plants under construction by Pacific Gas and Electric. Pacific Energy Corporation drilled 3 wells along the south side of the field during the year and is now negotiating with Pacific Gas and Electric for construction of a power plant on those leases.

In the Imperial Valley area, Magma Energy drilled five wells and is working with San Diego Gas and Electric to construct a binary fluid "Magmamax" power plant which is expected to be in operation in 1973.

Although Congress passed the law to allow geothermal exploration on Federal lands two years ago, implementation of the Federal leasing regulations is still delayed. Most of the steps required by Congress and by the National Environmental Protection Act before leasing can take place have been done. Preliminary draft of the leasing regulations and of the environmental impact statement were published and public hearings were held for comment; revised regulations were published in November 1972. After allowing time for public comment, the Secretary of Interior can place the regulations in force. However, actual leasing cannot take place until the final environmental impact statement has been completed and approved by the Secretary of the Interior.

It appears that Federal lands will be available for geothermal exploration in 1973. But the very restrictive regulations and onerous terms of the leases make it very doubtful that there will be much exploration on Federal lands. The Interior Department has not followed the mandate of Congress to "encourage the development of this resource;" it has instead made every effort to maximize the revenues from the leasing. These regulations have made exploration for geothermal resources more costly and more difficult than if the developer were looking for oil or gas, uranium, coal, or other leasable or claimable minerals.

\* \* \* \* \*

#### UNUSED WELLS NEEDED FOR TEMPERATURE LOGGING

In order to extend its geothermal study program in Oregon, the Department needs to know the location of all unused wells that are suitable for temperature measurements. To give a valid reading, the well must be one that has not been pumped for at least 6 months in western Oregon and 3 months in eastern Oregon. Depths should be greater than 500 feet for wells in the western part of the state and 300 feet in the eastern part. If you own such a well or know where one is located, please notify the Department.

GEOTHERMAL GRADIENT AND HEAT FLOW MEASUREMENTS  
BAKER AND MALHEUR COUNTIES, OREGON

Locality	North Lat.	West Long.	Depth meters	Elev. meters	Rock type	Average Gradient °C/km	K mcal/cm sec °C	Heat flow cal/cm <sup>2</sup> sec
<u>Chalk Butte</u>								
19-45S11	43°55'	117°10'	65	835	Tuffaceous sandstone	185±2	3.0±.2	5.7±.2
19-45S14	43°54'	117°10'	135	910	"	174±2	3.0±.2	5.4±.4
19-45S22	43°53'	117°11'	115	843	"	110±2	3.0±.2	3.3±.4
19-45S25	43°53'	117°09'	70	813	"	232±7	3.0±.2	6.9±.4
19-45S26	43°52'	117°10'	175	822	"	119±2	3.0±.2	3.6±.4
20-45S6	43°51'	117°15'	135	823	"	74±2		
20-45S10	43°50'	117°12'	135	780		114±2		
<u>Grassy Mountain</u>								
21-43S36	43°41'	117°23'	76	995	Tuffaceous sandstone	54±1	2.9±.2	1.5±.1
21-44S28	43°42'	117°20'	30	1000	"	106±1		
<u>Willow Creek</u>								
16-43S10	44°11'	117°26'	115	758		75		
16-43S13	44°10'	117°24'	170	768		* (20-130) 50 * (130-170) 90		
16-43S15	44°10'	117°26'	230	758		* (25-100) 35 * (100-230) 75		
16-43S23	44°09'	117°25'	170	749		* (20-110) 50 * (110-170) 90		
17-44S11	44°06'	117°17'	370	722		86±2		
17-44S31	44°02'	117°23'	70	819		86±2		
18-44S21	43°59'	117°20'	85	795		67±2		
18-41S35	43°51'	117°38'	45	887		44±6		
<u>Alvord</u>								
39-34S2	42°17'	118°41'	380	1498	Altered basalt	61±.4	3.7±0.2	2.3±0.2
<u>Powder River</u>								
8-42S24	44°51'	117°31'	70	835		40±4		
9-41S7	44°47'	117°44'	25	1131	Silicified gabbro	45		
<u>Huntington area</u>								
14-43S13	44°21'	117°24'	280	1174	Graywacke & phyllite	32±1		
15-45S7	44°16'	117°15'	170	857	Tuffaceous sandstone	* (20-90) 62±2 * (90-170) 30		
<u>Thomas Creek</u>								
37-19S30	42°20'	120°31'	135	1823		59±1		
37-18S14	42°22'	120°27'	75	1804	Tuff breccia	140±3	2.5±0.2	3.2±0.2
<u>Drew</u>								
32-2S4	42°49'	122°56'	215	931	Schist	20±1		

\*Two gradients are reported for these wells. This variation may be caused either by water movements in the aquifer or by difference in thermal conductivity of the bedrock at the depths measured.



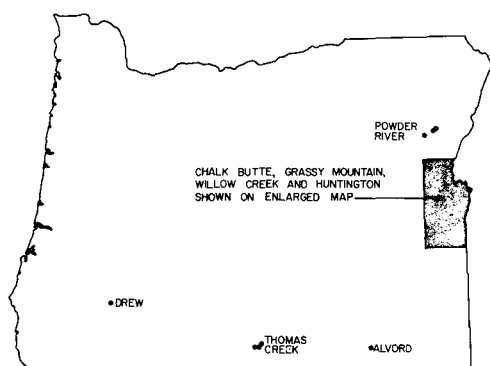
## PROGRESS REPORT ON GEOTHERMAL MEASUREMENTS IN OREGON

The accompanying list of geothermal gradients and heat-flow measurements is published here as a progress report on the geothermal study being conducted by the Oregon Department of Geology and Mineral Industries under the direction of R. G. Bowen. Cooperating in the study is Dr. David Blackwell of the Geology Department of Southern Methodist University, Dallas, Texas, who provided the heat-flow determinations. Funds for the program are provided by the U.S. Bureau of Mines.

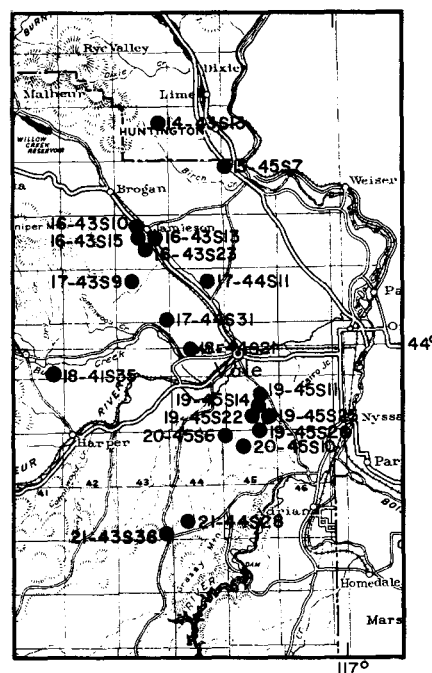
The goals and methods of the Department's geothermal study were outlined in the July 1972 ORE BIN, following publication of some preliminary temperature gradient measurements in the April issue.

During the summer of 1972, a concentrated effort was made to locate pre-drilled holes and make temperature gradient measurements. The data for 25 holes are presented in the list. Included in the list are temperature gradients for five of the holes reported on in the April 1972 ORE BIN (locality nos. 19-45S22, 19-45S26, 19-45S25, 20-45S10, and 39-34S2).

Preliminary heat-flow measurements are given for eight of the holes. These measurements are based on thermal conductivity determinations of cuttings and cores that the Department was able to obtain on some of the wells for which gradients had been measured. More refined heat-flow determinations will be published at a later date, after corrections for radioactivity and topography have been made; however, it is probable that the presently determined values will be only slightly altered by the correction.



Index maps showing sites of temperature-gradient and heat-flow determinations.



## OIL AND GAS EXPLORATION IN 1972

Vernon C. Newton, Jr.

Petroleum Engineer, Oregon Dept. Geology and Mineral Industries

No drilling was done in Oregon during 1972, but leasing activity continued at a high level for this area (Figure 1). Environmental concern delayed the start of a wildcat by Standard Oil of California in the remote southeastern corner of the state. For those unfamiliar with drilling success in Oregon, we should remark that the state is still without a single commercial discovery of oil or gas.

In spite of the lack of discovery, the geology of Oregon is not entirely discouraging to oil companies; five large firms prepared to launch exploration ventures during the year. The widespread volcanic history in Oregon has complicated the interpretation of the geology and has been a prominent factor in retarding wildcat drilling. Although no significant surface seeps of petroleum are known in the state, minor shows of hydrocarbons have been found in several wells, and sands which would make suitable reservoir rock for petroleum have been encountered.

### Petroleum geology

Tertiary marine sedimentary rocks ranging in thickness from a few thousand feet to more than 10,000 feet cover an estimated 11,000-square-mile area of western Oregon. Nearly as large an area of similar rocks, but of greater thickness, occurs on the bordering continental shelf. In this 20,000-square-mile region, a total of 25 deep test holes have been drilled both on-shore and offshore, but many more holes are needed to evaluate its potential more thoroughly. The cost of such additional exploration is estimated to be nearly \$100 million (Figure 2).

Marine rocks in central Oregon are covered for the most part by thick deposits of comparatively young volcanic rocks (see Figure 3), but beneath a large area of central Oregon lies a great thickness of Mesozoic and Paleozoic marine sedimentary rocks. Little is known about these formations at depth.

There are more than 600 square miles of Quaternary to Tertiary lacustrine rocks in the eastern part of the state, where the thickness measures several thousand feet. Numerous gas shows found in this area indicate that commercial amounts of natural gas may occur in a few of these fresh-water basins. The presence in the sedimentary section of a few fairly thick lava flows results in poor seismic records.

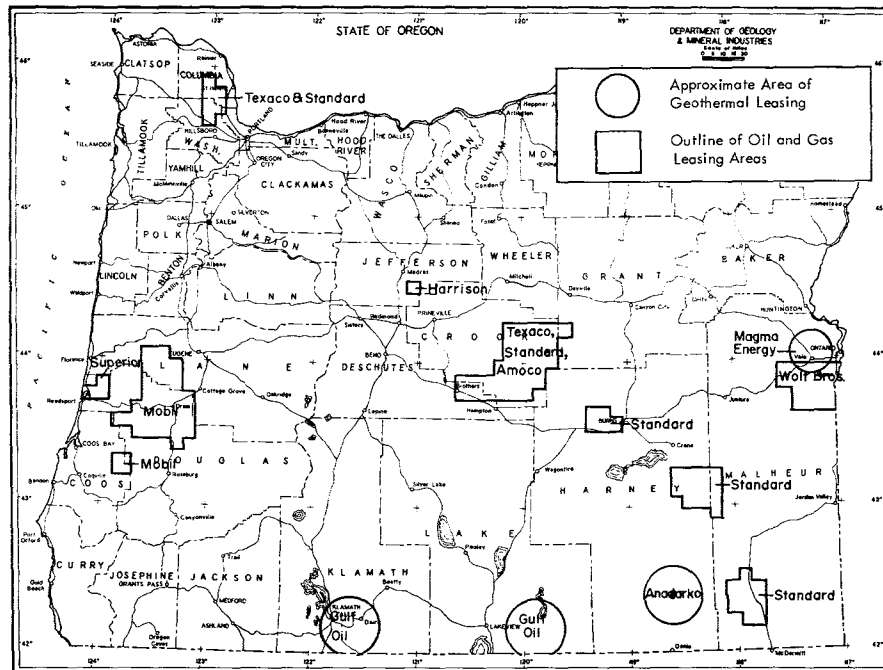


Figure 1. Map of Oregon showing location of petroleum and geothermal leases (effective December 1972).

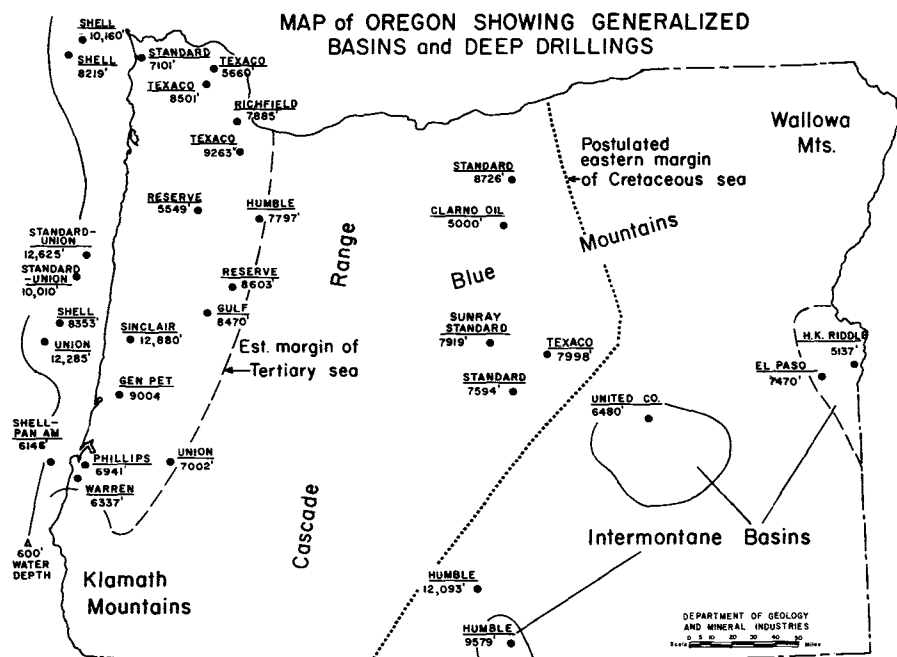


Figure 2. Map of Oregon showing generalized basins and deep drillings.

### Environmental problems

In October 1971, the State Department of Environmental Quality asked the U.S. Bureau of Land Management to file a full impact statement for a wildcat hole being drilled by Texaco in central Oregon. No drilling has been done in the state since that time. However, Standard Oil of California was successful in obtaining clearance from DEQ and BLM for an exploratory hole in southeastern Oregon on a Federal lease unit after several months of delay. The U.S. Bureau of Land Management agreed to prepare a statewide impact report for oil and gas leasing. Companies wishing to drill wildcats in Oregon must obtain waste disposal permits from DEQ in order to dispose of drill cuttings and mud wastes. Standard Oil is expected to begin drilling its Blue Mountain Federal unit by early spring.

### Leasing and exploration

More than 300,000 acres of Federal oil and gas leases were pending action by the Bureau of Land Management at the end of 1972 (Table 1). Applications for some of the acreage were submitted more than a year ago. Leases will not be issued until the statewide impact report for Federal leases in Oregon is completed. After its issuance, separate environmental analyses will be made for each new location. In the event of an oil or gas discovery, an impact statement will be required for each new field. Effect on the environment can best be determined when the size of the field and the probable extent of development operations are known.

Loss to county school and road funds resulting from delays in issuing Federal leases amounted to more than \$55,000 by the end of 1972.

### Field studies

One major oil company had a geological field party working in western Oregon during the year, and two large firms did limited geological studies in eastern Oregon. Several companies used the Department's sample library to assist with their geological investigations.

Non-explosive seismic studies were conducted in the Willamette Valley and in southwestern Oregon during 1972, and explosive seismic surveys were run in the Quaternary-Tertiary lake basin in Malheur County.

### Future exploration

The emphasis on the need for new energy supplies will accelerate the search for petroleum in Oregon for the next few years. A map of Oregon offshore geology by the U.S. Geological Survey and the Oceanography Department at Oregon State University, scheduled to be published in 1973, should help to renew interest in petroleum prospects in this region.

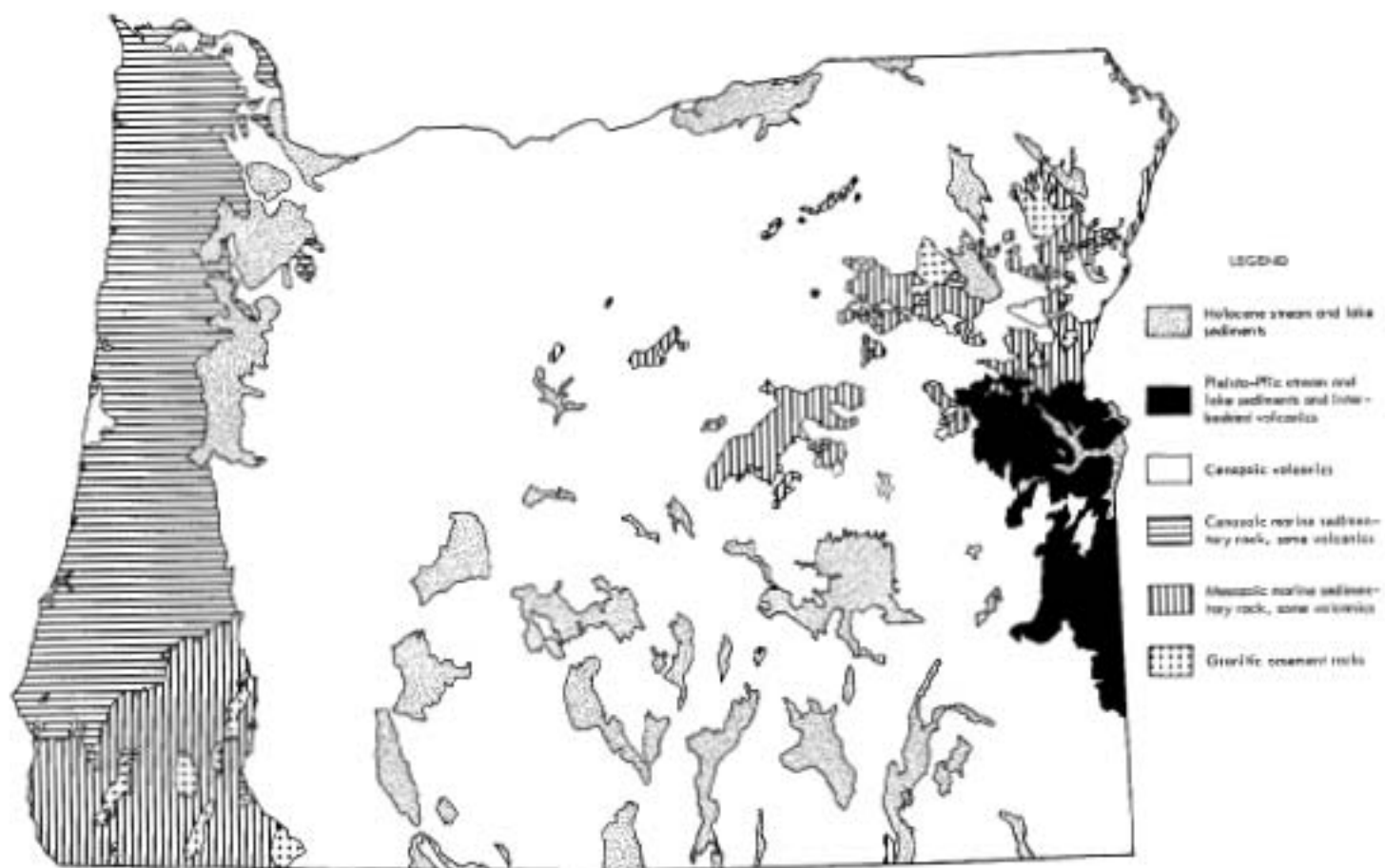


Figure 3. Map of Oregon showing exposures of major rock types.

Table 1. Oil and gas leases during 1972

<u>Company</u>	<u>County</u>	<u>Est. total</u>	<u>Status</u>
Standard Oil of California	Columbia	300,000 acres	Active
	Crook		
	Harney		
	Malheur		
	Washington		
Mobil Oil Co.	Coos	120,000 acres	Most pending approval by BLM
	Douglas		
Texaco, Inc.	Columbia	235,000 acres	Approx. 30,000 acres pending approval
	Crook		
Amoco	Crook	70,000 acres	Pending approval by BLM
	Malheur		
Superior Oil Co.	Douglas	40,000 acres	Active
Wolf Bros., Denver	Malheur	145,000 acres	Pending approval by BLM
Harrison, Seattle	Jefferson	10,000 acres	Active

Environmental controls have delayed activity in Oregon as well as in other parts of the United States, particularly in offshore regions. Drilling on the continental shelf will eventually be done when the need for petroleum becomes critical. A good example of the urgency for offshore drilling can be seen in the present North Sea operations. Drilling and development in this very difficult environment was stimulated by the need for energy supplies, and government officials in Great Britain, Holland, and Scandinavian countries are delighted to have the 30 or more underwater oil and gas fields to add to national resources.

\* \* \* \* \*

#### NORTH SEA OIL

Reserves are mounting in the newly found petroleum province underlying the North Sea. Fifteen oil fields and eight gas fields were discovered in this region last year. Proven reserves are now estimated to be 7 billion barrels of oil and 60 trillion cubic feet of gas. More than 20 oil fields and as many gas fields have been found since development began in the North Sea 5 or 6 years ago. Huge drilling rigs are being assembled which will be able to operate year-round in the ocean environment. Water depth ranges from 250 feet to 500 feet over most of the sea. (Oil and Gas Jour. Jan. 1973)

\* \* \* \* \*

## FIELD WORK IN OREGON DURING 1972

John D. Beaulieu  
Stratigrapher, Oregon Dept. Geology and Mineral Industries

During the 1972 field season at least 130 geologic field studies were conducted in the state of Oregon. The list below includes those of which the Oregon Department of Geology and Mineral Industries is aware. For convenience the state is roughly divided into six sections and the studies are grouped according to location.

The list is probably not complete, and the Department would appreciate receiving information about other studies in progress in this state. Resumes received thus far have been invaluable in completing this list and the Department expresses its gratitude for these contributions. Unless stated otherwise, no reports on the following studies are available through this Department.

### Northwestern Oregon

1. Recent sedimentation in Tillamook Bay: Gennaro Avolio, graduate student, PSU
2. High Cascades-Western Cascades contact: Brian Baker, Professor, U of O
3. Environmental Geology of upland Tillamook and Clatsop Counties: John Beaulieu, DOGAMI
4. Biostratigraphy of the type Nestucca Formation: A. D. Callender, Jr., graduate student, PSU
5. Gravity survey of part of northeast Portland: Dan Cash, professor, PSU
6. Geology near Oswald West State Park: Frank Cressy, master's candidate, OSU
7. Oligocene cetacean, "Butte Creek beds": John Falhaber, master's candidate, U of O
8. Ground water in the Harrisburg-Halsey area: F. J. Frank, USGS (Portland) in coop. with Oregon State Engineer
9. Water resources in central Lincoln County: F. J. Frank and A. Laenen, USGS (Portland), in coop. with Oregon State Engineer
10. Thermal surveillance of volcanoes: J. D. Friedman, USGS
11. Biostratigraphy of the type Yamhill Formation: L. R. Gaston, graduate student, PSU
12. Surf transformation near Newport: Mike Gaughan, master's candidate, oceanography, OSU
13. Eocene pleurotomariid gastropods: Carole S. Hickman, Adj. Res. Associate, Swarthmore College, Swarthmore, Pennsylvania
14. Lower Oligocene molluscan fauna: Carole S. Hickman, Adj. Res. Associate, Swarthmore College, Swarthmore, Pennsylvania

15. Bauxite deposits in northwestern Oregon: Ron Jackson, master's candidate, PSU
16. Soil and geology of part of the Western Cascades: Harold Legard, soils scientist, U.S. National Forest Service
17. Ground water of north Clackamas County: Al Leonard, USGS (Portland), in coop. with Oregon State Engineer
18. Coastal landforms: Ernest Lund, professor, U of O
19. Reconnaissance mapping of the Tillamook Uplands: Norman S. MacLeod, USGS
20. Radiometric dating of igneous rocks: Alexander McBirney, professor, U of O, and J. Sutton, professor, Ohio State U.
21. Engineering geology of part of coastal Lincoln County: Kent Mathiot, master's candidate, PSU
22. Contact of the Tyee and Yamhill Formations: Robert McWilliams, professor, Miami U., Hamilton, Ohio
23. Micropaleontology of the continental shelf: Greg Miles and Steven Conley, graduate students, U of O
24. Stratigraphy of parts of northwestern Oregon (for GSA Guidebook): Alan Niem, professor, OSU; Robert Van Atta, professor, PSU; Vaughan Livingston and Weldon Rau, Wash. Div. Mines & Geology
25. Environmental geology of the Portland area (for GSA Guidebook): L. Palmer, professor, PSU, and Roger Redfern, master's candidate, PSU
26. Radiometric dating: Donald Parker, doctoral candidate, OSU
27. Geology near Onion Peak: Tom Smith, master's candidate, OSU
28. Geodimeter study of Cascade volcanoes: D. A. Swanson, USGS
29. Gales Creek planktonic foraminifers: Dick Robertson, master's candidate, U of O
30. Geology and geomorphology of part of the Blue River drainage: Fred Swanson and Mike James, graduate students, U of O
31. Environmental geology of Marquam Gulch, Portland: Roger Redfern, master's candidate, PSU
32. Environmental geology of coastal Tillamook and Clatsop Counties: Herb Schlicker, John Beaulieu, and Gordon Olcott, DOGAMI, and Robert Deacon, Shannon and Wilson
33. Environmental geology of Lincoln County: Herb Schlicker, John Beaulieu, and Gordon Olcott, DOGAMI, and Robert Deacon
34. Geology of the central Oregon Coast: Parke D. Snively, Jr., Norman S. MacLeod, and Holly C. Wagner, USGS
35. Geophysics of the continental margin: Parke D. Snively and Norman S. MacLeod, USGS
36. Upper Eocene petrochemistry and magmatic history: Parke D. Snively and Norman S. MacLeod, USGS
37. Coastal processes between Netarts and Nehalem Bay: Tom Terrich, graduate student, oceanography, OSU



38. Volcanic and intrusive geology of the central Oregon coast (for GSA Guidebook): Parke D. Snelly and Norman S. MacLeod, USGS
39. Post-Sardine volcanic centers of the Western Cascades: Craig White, graduate student, U of O
40. Portland seismic study: Paul White, graduate student, PSU
41. Cenozoic floras: J. A. Wolfe, USGS

#### Southwestern Oregon

1. Miocene sequence in the Floras Lake-Cape Blanco area: Warren Addicott, USGS
2. Plio-Pleistocene molluscan paleoecology at Coos Bay and Cape Blanco: John M. Armentrout, professor, U of O
3. Oligocene molluscs of the Tunnel Point Formation, Coos Bay, Oregon: John M. Armentrout, professor, U of O
4. Glacial and neo-glacial geology of the Mountain Lakes area: Gary Carver, graduate student, U of W
5. Mineral potential of the Illinois River drainage: Terry Close, US Bur. of Mines (Spokane)
6. Black sands: Ed Clifton, USGS
7. Galice-Rogue-Dothan relationships: Henry Dick, graduate student, Yale U, and Len Ramp, DOGAMI (Grants Pass)
8. Jurassic of North America: Ralph Imlay, USGS
9. Quaternary sedimentation and coastal terraces: R. J. Janda, USGS
10. Sedimentation of the Sixes River estuary: Charles Jones, professor, Chadron State College, Chadron, Neb., and Sam Boggs, professor, U of O
11. Cretaceous of Oregon and California: D. L. Jones, USGS
12. Crabs from the middle Eocene Umpqua Formation: Marilyn Kooser, graduate student, U of O
13. Geothermal gradients: Arthur Lachenbruch, USGS
14. Josephine peridotite and Vulcan Peak peridotite: Robert A. Loney, USGS, and Glen R. Himmelberg, professor, U of Missouri
15. Microfossils of central and southwestern Tertiary formations: Daniel R. McKeel, U. Cal. Davis
16. Micropaleontologic sampling: Mobil Oil Co.
17. Geology of the Dutchman Butte quadrangle: Ranau Perttu, master's candidate, PSU
18. Mineral survey of Douglas County: Len Ramp, DOGAMI (Grants Pass)
19. Ground water in the Sutherlin area: J. H. Robison, USGS (Portland) in coop. with Douglas County
20. Hydrology of dune aquifers north of Coos Bay: J. H. Robison, USGS, (Portland) in coop. with Coos Bay-North Bend Water Board
21. Biostratigraphy of Paleogene orbitoids: Richard Thoms, professor, PSU

22. Geochemical sampling: Harry V. Warren, U of British Columbia
23. Late Pleistocene fish fauna, Elk River beds: Bruce J. Welton, senior student, PSU

#### North-central Oregon

1. Canyon Mountain Complex: Hans Ave Lallement, professor, Rice U
2. Zeolites of the John Day Formation: Don Baggs, master's candidate, PSU
3. Picture Gorge Basalt: Stewart Baldwin, graduate student, U of O
4. Picture Gorge Basalt: R. D. Bentley, professor, Central Wash. State College, and R. G. Cockerham, graduate student, Western Wash. State College
5. Yakima Basalt-Picture Gorge contact: Jon Fruchter and Simon Nathan, post-doctoral residents, U of O
6. Flat-topped volcanic landforms: Brian Gannon, graduate student, PSU
7. Columbia River Basalt: Gordon Goles, professor, U of O
8. Geology of Green Ridge: Peter Hales, master's candidate, OSU
9. Fission track dating of obsidian: Kathy Jordan, senior student, PSU
10. Geology along part of Highway 20 in the Cascades: Clarence Keech, master's candidate, OSU
11. Canyon Mountain Complex: Robert Loney, USGS, and Glen Himmelberg, professor, U of Missouri
12. Earth Resources Technology Study (ERTS) of Crook County: Robert Lawrence, OSU
13. Radiometric dating: Alexander McBirney, professor, U of O
14. Cretaceous and Cenozoic stratigraphy (for GSA Guidebook): Keith Oles, Harold Enlows, and Ed Taylor, professors, OSU, and P. T. Robinson, USGS
15. Evaluation of nuclear reactor sites at Boardman: Norman Peterson, DOGAMI, (Grants Pass)
16. Radiometric dating: Donald Parker, doctoral candidate, OSU
17. Water resources of the Warm Springs Indian Reservation: J. H. Robinson, USGS (Portland), in coop. with Warm Springs Confederated Tribes
18. Glacial chronology of the upper Metolius drainage: William Scott, graduate student, U of W
19. Biostratigraphy of the Snowshoe Formation: David Taylor, senior student, PSU
20. Pliocene stratigraphy of the Deschutes Formation: Ed Taylor, professor, OSU
21. Ophiolite field trip guide: Tom Thayer, USGS
22. Geology of chromium: Tom Thayer, USGS
23. Compilation of the Long Creek and Courtrock 15' quadrangles: Tom Thayer, USGS

24. Columbia River Basalt near Prineville: Verkota Rao Uppuluri, graduate student, U of O
25. Geology and geography of Crook County: D. H. Vice, Burlington Northern, St. Paul, Minnesota

#### South-Central Oregon

1. Gravity study of northern Summer Lake graben: H. R. Blank and Brian Baker, professors, U of O; and P. Travis, graduate student, U of O
2. Pumice flows near Crater Lake: Richard Fisher, professor, U. Cal., Santa Barbara
3. Crustal resistivity near Klamath Falls: William McFarland and Robert Whitsett, graduate students, oceanography, OSU
4. Geology and geochemistry of Mt. McLoughlin: LeRoy Maynard, master's candidate, U of O
5. Sampling of volcanic peaks: Gary L. Millhollen, professor, U of South Carolina
6. Alkali Lake chemical waste disposal site: Vernon Newton, DOGAMI
7. Geologic mapping near Paisley: Forrest Peters, graduate student, Colorado School of Mines
8. Geothermal exploration: Norman Peterson, DOGAMI (Grants Pass)
9. Sunstones: Norman Peterson, DOGAMI (Grants Pass)
10. Geothermal exploration: Winston Sahinen, Pacific Power and Light
11. Late Pleistocene and Holocene history of Warner Valley: David Weide, curator, Geology Museum, UCLA

#### Northeastern Oregon

1. Pliocene diatoms: George W. Andrews, USGS, Washington, D.C.
2. French Glen and Lost Basin quadrangles, Roger Ashley, USGS
3. Geothermal exploration: Richard Bowen, DOGAMI
4. Alpine glaciation: Elton Bentley, master's candidate, U of O
5. Triassic-Jurassic unconformity: Howard Brooks, DOGAMI (Baker)
6. Geology of the Huntington quadrangle: Howard Brooks, DOGAMI (Baker)
7. Geology of the Canyon Creek quicksilver mine area, Grant County: Al Edwards, master's candidate, U of O
8. Bayhorse mine region near Huntington: Tom Henricksen, doctoral candidate, OSU
9. Trace elements in banded rhyolites: Gary Hallock, master's candidate, PSU
10. Origin of copper deposits near Keating: Ray Hammitt, graduate student, U of O
11. Quartzburg Mining District, Bates quadrangle: Floyd Johnson, master's candidate, OSU

12. Neoglaciation in the Wallowa Mountains: Eugene Kiver, chairman, Dept. Geology, Eastern Wash. State College
13. Geology of the lower half of the Imnaha Canyon: Wallace Kleck, doctoral candidate, WSU
14. Seven Devils Volcanics: John M. Morganti, graduate student, WSU
15. Geology of the Ice Lake-Matterhorn-Sacajawea Peak-Hurwal Divide area: Kenneth Neal, master's candidate, PSU
16. Geology near Dale: Robert Olsen, master's candidate, U of O
17. Geology of the lower Grande Ronde River area: Steven Riedel and Martin Ross, graduate students, WSU
18. Authigenic zeolites in the Durkee Basin: Richard Sheppard and A. J. Gude, III, USGS
19. Eagle Cap Wilderness: E. T. Tuckek, A. B. McMahon, and P. L. Weis, USGS (Spokane)
20. Granitic rocks and basaltic dike swarms: W. H. Taubeneck, professor, OSU
21. Burnt River Schist and Elkhorn Ridge Argillite: David L. White, graduate student, Indiana State U
22. Mineral potential of BLM and State lands: Norman Wagner, DOGAMI (Baker)
23. Greenhorn Mountain district, Bates quadrangle: Greg Wheeler, doctoral candidate, U of W

#### Southeastern Oregon

1. Geothermal exploration: Ivan Barnes, USGS
2. Water budget of Malheur Lake: Larry Hubbard, USGS (Portland) in coop. with Corps of Engineers
3. Stratigraphy of the Harney Formation: Alan Niem, professor, OSU
4. Ignimbrites of the Danforth Formation: Donald Parker, doctoral candidate, OSU
5. Authigenic lacustrine cherts near Rome: Richard Sheppard and A. J. Gune, III, USGS
6. State map of Oregon: George Walker, USGS
7. Geothermal exploration: George Walker, USGS

\* \* \* \* \*

#### CHARLTON RETIRES FROM MEI

Dr. David B. Charlton, Staff Consultant for Metallurgical Engineers, Inc., retired Dec. 29, 1972, after a distinguished career in chemistry and microbiology. He operated an independent analytical laboratory in the Portland area for 40 years, during which time he played a leading role in advocating better control of the nation's air, water, and natural resources.

\* \* \* \* \*

## USES FOR WASTE GLASS DISCOVERED

The U.S. Bureau of Mines laboratory in Tuscaloosa, Alabama, has been doing some interesting experiments in recycling waste glass from municipal incinerator residues. Three Report of Investigations (R.I. 7605, R.I. 7701, and R.I. 7708) indicate that it is economically feasible to use waste glass for making building brick, as a flux for clay products, and for producing glass wool.

According to the Bureau, about 15 million tons of glass is discarded in municipal wastes annually. Of this, about 2 million tons pass through incinerators and can be recovered by ore-processing techniques developed by the Bureau. Operating at a feed rate of 1,000 pounds per hour, the plant can recover 578 pounds of cullet-grade glass (material suitable for recycling into new glass) and 414 pounds of waste glass per ton of residue. The waste material used in the Bureau's experiments was the type worthless for cullet.

Results of the first phase of the investigations (R.I. 7605) indicate that face brick of good color and high quality can be produced using waste glass as the principal component. A second experiment (R.I. 7701) shows that waste glass reduces firing temperature and firing time significantly when used as a flux in common-brick clays. A third experiment (R.I. 7708) resulted in the production of glass wool that meets the commercial standards for wall and ceiling insulation.

\* \* \* \* \*

## U.S. DEPENDENT ON MINERAL IMPORTS

Hollis M. Dole, Assistant Secretary of the Interior for Mineral Resources, recently outlined the degree to which the United States is becoming dependent on foreign supply sources for its mineral requirements. Speaking at a recent AIME meeting, Dole said, "The gap between our supply and our demand (for minerals) has risen from \$2 billion in 1950 to \$8 billion in 1970, and is projected to increase to \$31 billion in 1985 and \$64 billion in the year 2000." He based these figures on Interior's first annual report under the Mining and Minerals Policy Act of 1970. Among the problems that prevent the full potential of the nation's resources from being realized, Dole stated, are environmental constraints that have forced the closing of almost half the nation's zinc refining capacity; the loss of markets by coal which is unable to meet sulphur content limitations; the denial of access or withdrawal from development of mineralized lands; and competition from other nations for access to foreign supplies.

(Nevada Mining Association News Letter, Nov. 15, 1972)

\* \* \* \* \*

## BULLETIN ON DOUGLAS COUNTY AVAILABLE

The latest bulletin (No. 75) to be issued by the Department is "Geology and Mineral Resources of Douglas County, Oregon," by Len Ramp, geologist at the Grants Pass Field Office. The 106-page publication contains information compiled from all available published and unpublished reports and mine-file records.

Main topics include the general geology of the county, the history of its mining and mineral production, summaries of the metallic mineral deposits with short descriptions of known mines and prospects, and a review of the industrial minerals and rocks and the mineral fuels.

Douglas County is famous for having the only nickel mine in the United States. The mine and smelter, situated near Riddle and operated by the Hanna Mining Co., have produced continuously since 1954. This mine puts Douglas County at top of all counties in value of mineral production.

Other metallic minerals with past production and possible potential include gold, copper, silver, mercury, and chromite. Among the non-metallic minerals, sand, gravel, and crushed rocks, the basic materials for construction, are in ample supply at the present time. Fairly large reserves of sand and gravel occur along the Umpqua River, but demand for these materials is rapidly growing with increased population and development.

Some of the other non-metallic mineral deposits include limestone, silica, asbestos, emery, olivine, sulfur, and talc and soapstone. Small deposits of coal are known, and geologic conditions are favorable for oil and gas and geothermal energy resources.

The bulletin is illustrated by numerous photographs and maps and is accompanied by a multicolored geologic map showing distribution of rocks ranging from Triassic to Quaternary. A glossary of technical terms is also included. Bulletin 75 is for sale by the Department at its offices in Portland, Baker and Grants Pass. The price is \$3.00.

\* \* \* \* \*

### ORE BIN RENEWAL NOTICE

As a service to our subscribers who may have failed to renew their ORE BIN subscription, the January issue is being sent to all names on the 1972 subscription list.

You have until February 10 to send \$2.00 and keep your subscription coming without a break.

SEND ADDRESS CHANGES PROMPTLY, PLEASE

## AVAILABLE PUBLICATIONS

(Please include remittance with order; postage free. All sales are final - no returns. Upon request, a complete list of Department publications, including out-of-print, will be mailed)

### BULLETINS

8. Feasibility of steel plant in lower Columbia River area, rev. 1940: Miller . . .	\$0.40
26. Soil: Its origin, destruction, preservation, 1944: Twenhofel . . .	0.45
33. Bibliography (1st suppl.) geology and mineral resources of Oregon, 1947: Allen . .	1.00
35. Geology of Dallas and Valsetz quadrangles, Oregon, rev. 1963: Baldwin . . .	3.00
36. Papers on Tertiary foraminifera: Cushman, Stewart & Stewart, vol. 1 \$1.00; vol. 2 .	1.25
39. Geology and mineralization of Morning mine region, 1948: Allen and Thayer . .	1.00
46. Ferruginous bauxite deposits, Salem Hills, 1956: Corcoran and Libbey . . .	1.25
49. Lode mines, Granite mining district, Grant County, Oregon, 1959: Koch . . .	1.00
52. Chromite in southwestern Oregon, 1961: Ramp . . .	3.50
57. Lunar Geological Field Conf. guidebook, 1965: Peterson and Grah, editors . . .	3.50
58. Geology of the Suplee-Izee area, Oregon, 1965: Dickinson and Vigrass . . .	5.00
60. Engineering geology of Tualatin Valley region, 1967: Schlicker and Deacon . .	5.00
61. Gold and silver in Oregon, 1968: Brooks and Ramp . . .	5.00
62. Andesite Conference Guidebook, 1968: Dole . . .	3.50
64. Geology, mineral, and water resources of Oregon, 1969 . . .	1.50
66. Geology, mineral resources of Klamath & Lake counties, 1970: Peterson & McIntyre	3.75
67. Bibliography (4th suppl.) geology and mineral industries, 1970: Roberts . . .	2.00
68. The Seventeenth Biennial Report of the State Geologist, 1968-1970 . . .	1.00
69. Geology of the Southwestern Oregon Coast, 1971: Dott . . .	3.75
70. Geologic formations of Western Oregon, 1971: Beaulieu . . .	2.00
71. Geology of selected lava tubes in the Bend area, 1971: Greeley . . .	2.50
72. Geology of Mitchell Quadrangle, Wheeler County, 1972: Oles and Enlows . . .	3.00
73. Geologic formations of Eastern Oregon, 1972: Beaulieu . . .	2.00
74. Geology of coastal region, Tillamook Clatsop Counties, 1972: Schlicker & others	7.50
75. Geology, mineral resources of Douglas County, 1972: Ramp . . .	3.00
76. Eighteenth Biennial Report of the Department, 1970-1972 . . .	1.00
77. Geologic field trips in northern Oregon and southern Washington, 1973 . . .	in press

### GEOLOGIC MAPS

Geologic map of Oregon west of 121st meridian, 1961: Wells and Peck . . .	2.15
Geologic map of Oregon (12" x 9"), 1969: Walker and King . . .	0.25
Geologic map of Albany quadrangle, Oregon, 1953: Allison (also in Bulletin 37) . .	0.50
Geologic map of Galice quadrangle, Oregon, 1953: Wells and Walker . . .	1.00
Geologic map of Lebanon quadrangle, Oregon, 1956: Allison and Felts . . .	0.75
Geologic map of Bend quadrangle, and portion of High Cascade Mtns., 1957: Williams	1.00
GMS-1: Geologic map of the Sparta quadrangle, Oregon, 1962: Prostka . . .	1.50
GMS-2: Geologic map, Mitchell Butte quad., Oregon: 1962, Corcoran and others . .	1.50
GMS-3: Preliminary geologic map, Durkee quadrangle, Oregon, 1967: Prostka . . .	1.50
GMS-4: Gravity maps of Oregon, onshore & offshore, 1967: Berg and others [sold only in set] flat \$2.00; folded in envelope	2.25
GMS-5: Geology of the Powers quadrangle, 1971: Baldwin and Hess . . .	1.50

### OIL AND GAS INVESTIGATIONS SERIES

1. Petroleum geology, western Snake River basin, 1963: Newton and Corcoran . . .	2.50
2. Subsurface geology, lower Columbia and Willamette basins, 1969: Newton . . .	2.50

[Continued on back cover]



The ORE BIN  
1069 State Office Bldg., Portland, Oregon 97201

## The Ore Bin

POSTMASTER: Return postage guaranteed.



### Available Publications, Continued:

#### SHORT PAPERS

- |   |        |
|---|--------|
| 18. Radioactive minerals prospectors should know, 1955: White and Schafer . . . . . | \$0.30 |
| 19. Brick and tile industry in Oregon, 1949: Allen and Mason . . . . .              | 0.20   |
| 21. Lightweight aggregate industry in Oregon, 1951: Mason . . . . .                 | 0.25   |
| 24. The Almeda mine, Josephine County, Oregon, 1967: Libbey . . . . .               | 2.00   |

#### MISCELLANEOUS PAPERS

- |  |      |
|--|------|
| 1. Description of some Oregon rocks and minerals, 1950: Dole . . . . .                 | 0.40 |
| 2. Key to Oregon mineral deposits map, 1951: Mason . . . . .                           | 0.15 |
| Oregon mineral deposits map (22" x 34"), rev. 1958 (see M.P. 2 for key) . . . . .      | 0.30 |
| 4. Rules and regulations for conservation of oil and natural gas (rev. 1962) . . . . . | 1.00 |
| 5. Oregon's gold placers (reprints), 1954 . . . . .                                    | 0.25 |
| 6. Oil and gas exploration in Oregon, rev. 1965: Stewart and Newton . . . . .          | 1.50 |
| 7. Bibliography of theses on Oregon geology, 1959: Schlicker . . . . .                 | 0.50 |
| 7. (Supplement) Bibliography of theses, 1959 to Dec. 31, 1965: Roberts . . . . .       | 0.50 |
| 11. A collection of articles on meteorites, 1968, (reprints, The ORE BIN) . . . . .    | 1.00 |
| 12. Index to published geologic mapping in Oregon, 1968: Carcoran . . . . .            | Free |
| 13. Index to The ORE BIN, 1950-1969, 1970: Lewis . . . . .                             | 0.30 |
| 14. Thermal springs and wells, 1970: Bowen and Peterson . . . . .                      | 1.00 |
| 15. Quicksilver deposits in Oregon, 1971: Brooks . . . . .                             | 1.00 |

#### MISCELLANEOUS PUBLICATIONS

- |   |  |
|---|--|
| Landforms of Oregon: a physiographic sketch (17" x 22"), 1941 . . . . . | 0.25                                   |
| Index to topographic mapping in Oregon, 1969 . . . . .                  | Free                                   |
| Geologic time chart for Oregon, 1961 . . . . .                          | Free                                   |
| The ORE BIN - available back issues, each . . . . .                     | 0.25                                   |
| Postcard - geology of Oregon, in color . . . . .                        | .10¢ each; 3 - 25¢; 7 - 50¢; 15 - 1.00 |

The ORE BIN - annual subscription . . . . . 2.00