

DISTINCTIVE CONGLOMERATE LAYER NEAR LIME,
BAKER COUNTY, OREGON*

By Howard C. Brooks**

Introduction

Near Lime in southeastern Baker County a distinctive bed of red and green conglomerate about 360 feet thick marks the boundary between Triassic and Jurassic rock sequences.

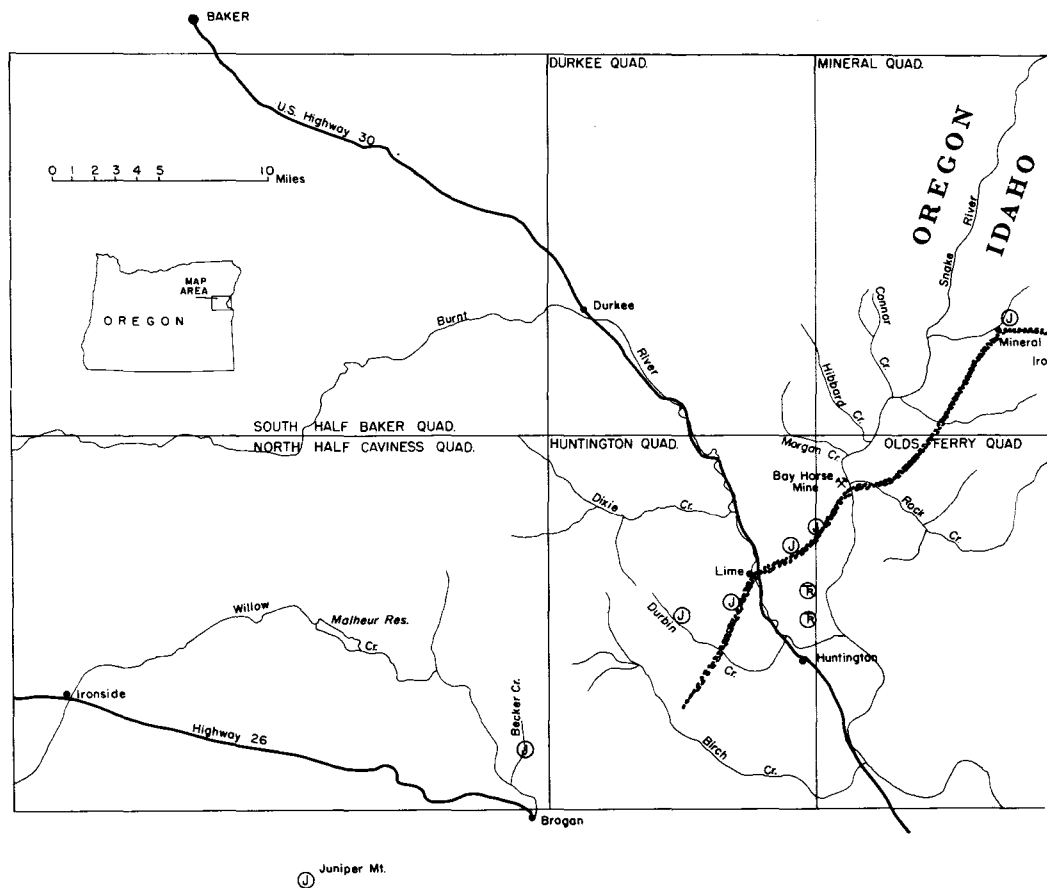
The conglomerate, as shown on the accompanying map, is traceable for more than 20 miles extending in a southwesterly direction from Iron Mountain, east of Mineral, Idaho, to Limestone Butte west of Huntington, Oregon. It crosses parts of the Mineral, Olds Ferry, and Huntington 15-minute quadrangles. Because of its stratigraphic position and distinctive lithology, the conglomerate forms a horizon marker that should prove very helpful in deciphering the Mesozoic stratigraphy and tectonic history of the southeastern Blue Mountains.

This is a progress report based largely on about 30 days field work in the vicinity of Lime during 1966 and cursory knowledge of the area acquired over a period of several years. N. S. Wagner, geologist at the Department's Baker office, has long recognized the conglomerate as a distinctive unit of wide distribution and has, therefore, aided and encouraged this study. The aid of Dr. George Williams of the University of Idaho, who is presently mapping the Idaho portions of the Mineral and Olds Ferry quadrangles is also gratefully acknowledged.

Previous work in the vicinity of the conglomerate includes two mining district reports: one by Livingston (1925) on the Mineral and Bay Horse areas, the other by Mackin (1953) on the Iron Mountain area. University of Oregon master's theses maps were prepared for the Oregon part of the Olds Ferry quadrangle by Spiller (1958) and for the Huntington quadrangle by Berry (1956) [NE quarter]; Kennedy (1956) [NW quarter]; and Beeson (1955) [south half]. The students described the red and green conglomerate, but

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Index map showing approximate surface trend of the red and green conglomerate layer (pebble pattern) and location of Jurassic (J) and Triassic (R) fossils.

did not map it as a separate unit. As part of his doctoral requirements at the University of Oregon, Wolff (1965) mapped the north half of the 30-minute Caviness quadrangle which adjoins the Huntington quadrangle on the west.

In all of the quadrangle areas shown on the map, pre-Tertiary rocks of probable Mesozoic age are abundantly exposed. Accurate dating of these rocks, however, has been hampered by the extreme scarcity of fossil evidence.

Description of the Red and Green Conglomerate

The conglomerate, which is well exposed on the Snake River divide about four miles east of Lime, shows a remarkable consistency in composition and physical characteristics throughout its 20-mile extent. Probably its most distinctive macroscopic characteristic is its peculiar mottled color. Reds and purples predominate, but greens are also present in nearly every outcrop and hand specimen, and, locally, green is the salient color. On close observation, it is seen that many individual rock fragments are white to dark gray. Thin sections show numerous fine specks of magnetite, some of which may have altered to hematite and chlorite, giving the rock its red and green colors.

The conglomerate consists largely of clastic debris from andesitic and dacitic volcanic rocks which are commonly porphyritic. Quartz, limestone, sandstone, and chert clasts are numerous. The conglomerate is for the most part poorly sorted. The pebbles are subrounded and sphericity is poorly developed. In hand specimens from most outcrops typical particle sizes range from fine sand to cobbles as much as 2 inches long (figure 1). Occasionally boulders 10 inches across are found. Mackin (1953) mentions that in the Iron Mountain area the conglomerate contains limestone boulders as much as 10 feet in diameter.

Where bedding can be seen in the conglomerate, it is usually defined by thin, sandy layers intercalated in the coarser material and by variations in fragments size. In places, the pebbles lie with their longest dimensions parallel to the plane of bedding. Graded beds are found in most outcrops.

The thickness of the red and green conglomerate has been measured only on the Snake River Divide east of Lime. Here it is about 360 feet thick; elsewhere, thicknesses appear to be comparable. The layer has an over-all surface trend of roughly N. 40° E. and an average dip of about 30° NW.

The conglomerate has been sheared and mildly metamorphosed. In places fracture surfaces exhibit a phyllitic sheen, owing to the development of chlorite and sericite.

Figures 2, 3, and 4 show typical outcrops of the conglomerate in the Lime-Snake River area.

Stratigraphic Relationships near Lime

Triassic rocks

Between Lime and the Bay Horse mine on the west bank of the Snake River, the conglomerate rests discordantly upon a northwesterly tilted sequence of massive greenstones and associated sedimentary beds. These rocks .



Figure 1. Conglomerate boulder illustrates typical fragment size range. Pencil gives scale. Note graded bedding and tendency of pebbles to lie flat in plane of bedding.

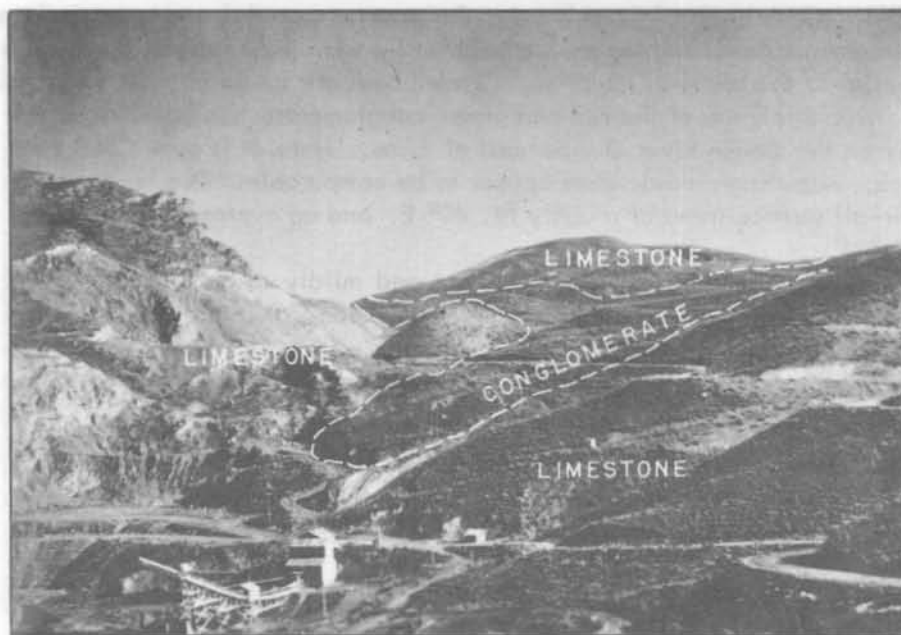


Figure 2. View eastward up Marble Canyon. Oregon Portland Cement Co. limestone quarry on left. The conglomerate rests on uneven erosion surface developed on the massive Upper Triassic (?) limestone.



Figure 3. View northeast across Snake River from point near Bay Horse mine. Conglomerate caps ridge in middle distance and overlies Upper Triassic greenstone and limestone. Gypsum has been mined from cuts labeled (G) just above river's edge. Rocks in road cut in foreground are also Upper Triassic greenstones.



Figure 4. View northeast from point near cement plant at Lime. Conglomerate in middle ground unconformably overlies Upper Triassic limestone and associated sediments and is overlain by Jurassic sandstones and shales.

are well displayed along the Snake River road from Bay Horse south to Huntington and from Huntington north along Burnt River (U.S. Highway 30) to Lime. Fossils collected from sedimentary interbeds in this sequence were identified by J. B. Reeside, Jr., and S. Muller as Upper Triassic (Beeson, 1955), and by T. Susuki (written communication, 1964). East of Lime in Marble Canyon, and also on the high ridge west of Lime, the red and green conglomerate rests upon massive limestone. The limestone has not been dated by fossil evidence, and its contact relations with the greenstones to the south are obscured by landsliding. It is probably part of the upper Triassic sequence.

Jurassic rocks

In the Lime area the red and green conglomerate unit is overlain by a sequence of khaki- to buff-colored tuffaceous sandstones and shales. Small limestone lenses are present locally, especially in the lower part of the sequence. The rocks are well compacted and are sheared to a moderate degree. The sandstones contain sericite and chlorite; the shales are mildly phyllitic. Fossils have been collected in the vicinity of Lime from three sites over a distance of 6 miles. Each occurs near the base of the sequence. After studying the collections, Dr. Ralph Imlay tentatively concluded the fossils are probably representative of upper Lower Jurassic (written communication, 1966).

The relationship between the conglomerate and the overlying Jurassic sandstone and shale sequence in the Lime area has not been confidently established. In places the change from conglomerate to sandstone appears to be gradational through several tens of feet. Elsewhere the change is abrupt. There is sufficient consistency in the attitude of bedding and other structural features to suggest that deposition was not interrupted for any great amount of time, and that the conglomerate marks the base of the Jurassic section in this region.

The thickness of the Jurassic sequence has not been determined. To the north, the khaki- to buff-colored sandstones and shales are in contact with a thick, tightly folded series of grayish to black phyllites and slaty rocks of unestablished age. The phyllites and slates are well exposed along Burnt River in the vicinity of Dixie Creek and along Morgan, Hibbard, and Connor Creeks, which flow eastward into the Snake River.

Regional Correlations

Fossiliferous Jurassic strata are reported from relatively few places in southeastern Blue Mountains and adjoining western Idaho. In the Mineral area, Livingston (1925) discovered Upper Jurassic ammonites in a series of black mudstones. The fossils were further described by Imlay (1964).

Williams (in preparation) shows that Jurassic rocks rest on the red and green conglomerate which, in turn, overlies greenstones believed to be correlative with the Triassic rocks in the Lime area.

Southeast of Brogan in the Juniper Mountain area, Wagner, Brooks, and Imlay (1963) found Middle Jurassic ammonites in dark-colored shales and sandstones. Here, the Jurassic rocks are separated from undated greenstones and limestone by a thin layer of reddish sandstone and shale which may represent a southwesterly extension of the red and green conglomerate.

In the Huntington quadrangle, Wagner and Brooks collected Jurassic fossils from a small locality on Durbin Creek in 1964. The site was later collected by Dr. Imlay. No formal report of this discovery has been made.

In the Caviness quadrangle, a solitary ammonite fragment found by Wolff (1965) in the Becker Creek area was regarded by Imlay as probably Jurassic in age.

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REGIONAL GRAVITY OF OREGON

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The following text describes two maps in a series of three entitled "Gravity Maps of Oregon (Onshore and Offshore)" published by the State of Oregon Department of Geology and Mineral Industries as No. 4 in its Geologic Map Series. The two maps here described are: Map GMS 4-a, "Free-Air Gravity Anomaly Map of Oregon", and Map GMS 4-b, "Complete Bouguer Gravity Anomaly Map of Oregon." They were prepared by the above authors. The third map (offshore), designated as Map GMS 4-c, "Free-Air Gravity Anomaly Map West of Oregon," was prepared by P. Dehlinger, R. W. Rinehart, R. W. Couch, and M. Gemperle, Department of Oceanography at Oregon State University.

The three maps are printed on 43- by 54-inch transparent sheets at a scale of 1:500,000. They are sold in an unbroken series for \$2.00 in flat form, \$2.25 folded in envelope, and \$2.50 rolled in map tube, and can be purchased from the Department's Portland office.

Also available from the Department is the Geologic Map of Western Oregon, published in 1961; it is printed at the same scale as the gravity maps and sells for \$2.00, with the gravity maps.

Introduction

From 1962 to 1966, a research program to establish gravity base station control and compile data for more than 8000 gravity measurements made in Oregon was conducted at Oregon State University. The purpose of this work was to construct gravity maps for the State of Oregon that had enough detail to be useful for regional geologic studies.

Woollard and Rose (1963) established 10 base stations in Oregon as part of the international gravity network. Berg and Thiruvathukal (1965) refined the values of gravity for the 10 base stations and established 22 additional bases. The Oregon base network was tied directly to the gravity station at the Carnegie Institution of Washington, D. C., which was measured relative to Potsdam, Germany. The accuracy of the base station control relative to Washington, D. C. is estimated to be better than ± 0.3 mgal. All gravity data used in this paper are relative to the gravity values of the Oregon base network.

Woollard and Rose (1963) presented a simple Bouguer gravity anomaly

map of Oregon contoured on a 20-mgal interval. Bromery and Snavely (1964) published a simple Bouguer gravity anomaly map of northwestern Oregon contoured at 5 mgal. Blank (1966) published a Bouguer gravity anomaly map of southwestern Oregon using a contour interval of 10 mgals. The U.S. Geological Survey (Woollard and Joesting, 1964) published a simple Bouguer gravity anomaly map of the United States (including Oregon) which was contoured on a 10-mgal interval. All of the gravity data for Oregon that were used in the above works were used in this research. In addition, data for about 2500 and 1100 gravity stations in the state were obtained from the Standard Oil Co. of California and the Humble Oil & Refining Co., respectively. Additional gravity measurements for 2500 stations in southwestern Oregon were made available by the U.S. Geological Survey. Measurements at 500 selected stations were made by members of the Geophysical Research Group, Oregon State University, to fill gaps in the station coverage of the state.

Four thousand stations out of more than 8000 available were chosen for the purpose of constructing the gravity maps of Oregon. Consideration of the deleted stations would not change the contours of the map. The average station coverage for west of about 119° W. longitude is about one station every 25 square miles. East of that longitude, it is about one station every 100 square miles. However, there are exceptions to these coverages. For example, in areas of easy access by highways the station coverage may be very large, whereas in southeastern Oregon the coverage is sparse because of difficult access.

Corrections to Data

Data from all organizations were corrected to read observed gravity relative to the base station at Corvallis, Oregon (OSU-1). Standard corrections that were made to the data consist of corrections for instrumental drift and elevation (free air + Bouguer correction, $\rho = 2.67 \text{ gm/cc}$). The datum for the reductions was mean sea level.

Many different gravity meters were used during the process of data accumulation. Most instruments used by other organizations were of the Worden type. Measurements were made by our group using both Worden (master) and La Coste-Romberg gravity meters having sensitivities of about 0.1000 mgal and 1.000 mgal per dial division, respectively.

Elevation control along highways was by bench marks and road intersections as given by USGS topographic maps. The accuracy of these elevations is within one foot. However, a considerable number of elevations for stations was determined by altimetry. Elevations determined by altimeters are believed to be accurate to within 10 feet. A few stations in areas of high relief may have uncertainties greater than 10 feet.

Terrain corrections were calculated for 460* gravity stations distributed equally over the entire state. The corrections were made using Hammer's terrain correction chart (Hammer, 1939) for zones D (175 to 558 ft.) through M (48, 365 to 71, 996 ft.). The terrain corrections for these selected stations were plotted on a map of the state and contoured, and terrain corrections for the remaining stations were interpolated from the contours.

Complete Bouguer gravity: The elevation and terrain corrections were added to the observed gravity to obtain the corrected gravity. Values of theoretical gravity computed by using the International Gravity Formula of 1930 were subtracted from the corrected gravity for each station to obtain the complete Bouguer anomaly values.

Free air gravity: The free air and terrain corrections were added to the observed gravity to obtain the corrected gravity. The terrain-corrected free air anomaly values were obtained by using the International Gravity Formula of 1930 as described above.

Precision of Data

Since many organizations participated in obtaining the data for this research, a check was made on the precision of observed gravity values at 100 stations throughout the state that were occupied by more than one group. The mean deviation was 0.04 mgal and the maximum deviation was 3.76 mgal. The standard deviation was 1.10 mgal. All data used for this comparison were corrected to read relative to the gravity base value at Corvallis, Oregon.

To check the precision of the interpolated terrain corrections, 38 stations were randomly selected and terrain corrections were computed. The average of the differences between the computed and the interpolated terrain corrections was 0.12 mgal and the maximum deviation was 5.39 mgal. The standard deviation was 1.61 mgal.

In view of the above results, the majority of the data used to construct the gravity maps is considered by the authors to be precise to within 2 mgal for the computations that have been made. However, extreme deviations (5 mgal or more) in a few areas of great relief have been incorporated into the maps.

* Included in this number are some station corrections made by Blank (1965) of the U.S. Geological Survey, who corrected each station in southwestern Oregon for terrain.

Gravity Maps of Oregon

Complete Bouguer Anomaly Map: The contour interval for the map is 10 mgal. Some contours in eastern Oregon are dashed because additional data may alter them slightly. The distinctive features of the map are listed below.

1. The gravity field decreases from + 60 mgal in northwestern Oregon to -190 mgal in southeastern Oregon, a difference of 250 mgal. The general trend of the decreasing field to the southeast reflects variations in regional geology, which include variations in crustal thickness and changes in density of the crust and the upper mantle. Seismic refraction studies based on a quarry blast indicate an apparent crustal thickness of 16 kilometers for the region of the northwestern Oregon Coast Range (Berg and others, 1966). These results are tentative and more information is needed to determine more precisely the anomalous condition that exists in the vicinity of the gravity highs of + 50 mgal in the northwestern portion of the state. These results may indicate a deep-seated anomalous distribution of mass beneath the Coast Range.

Deep electrical resistivity work (Cantwell and others, 1965, and Cantwell and Orange, 1965) has shown a distinct difference between the electrical properties of the deep crust in northern and southern Oregon east of the Cascade Mountains. Northern Oregon was characterized by low resistivity values and no resistive basement was found, whereas the data in southern Oregon indicated the existence of a resistive basement. The above authors suggest the possibility that the difference could be associated with a basaltic oceanic crust in northern Oregon and a granitic continental crust in southern Oregon.

Pakiser (1963) gives a crustal thickness of about 47 km near Boise, Idaho. However, extrapolation of crustal sections into Oregon from the crustal section near Boise, Idaho, should be done with reservations, since the possibility of lateral variations in crustal and mantle densities cannot be discounted. Southeastern Oregon is at the northern edge of the Basin and Range system (Eardley, 1962) and the upper mantle of this system, in general, has been found to have low density and seismic velocity (Pakiser, 1963).

2. Three regular gravity features are evident on the complete Bouguer gravity anomaly map. The first is along the eastern margin of the Oregon Coast Range. The steep east-west gradient (5 mgal/mile) between Corvallis and the Columbia River indicates a major structural feature such as faulting, which is in agreement with Bromery and Snavely (1964), and faulting could extend south into the Roseburg area along a continuation of the gradient. A few earthquakes have been reported around Roseburg (Berg and Baker, 1963), but the area does not seem to be very active seismically.

The second regular gravity feature is the gradient (about 2 mgal/mile) along the western margin of the Cascade Range. The gravity contours,

although serpentine in form, are continuous from the northern section of the Oregon Cascades to the eastern boundary of the Klamath Mountains. This feature shows that gravity decreases towards the Cascade Range and results, in part, from thickening of the crust towards the east. It is not known if faulting is associated with this gravity trend, but seismic activity has been slight.

The third regular gravity feature is the regularity of the gravity contours in the region of the Blue Mountain front (defined by Taubeneck, 1966, as the boundary between the Blue Mountains and the Columbia Basin). There has been some seismic activity along this gravity trend, but the activity has not been great. This region may be a transition zone with a former oceanic type crust characteristic of the Columbia Basin and a crust of more nearly a continental type to the south (Cantwell and Orange, 1965; Skehan, 1965; and Taubeneck, 1967).

3. The Cascade Range trends north-south along the eastern margin of the regular gravity gradient east of the Coast Range. The gravity contours are affected by the volcanic mountain range such as to make gravity less than would be the case if the mountains were not there. This would indicate that the crust is less dense in this region and/or the mountains rest on a low-density mantle (roots). Individual mountains do not have large negative anomalies associated with them, indicating that the greater part of any isostatic compensation would be regional.

4. There is a system of closed gravity highs and lows in the general region of the Blue Mountains (immediately south of the Blue Mountain front and in the region of Baker, Oregon). Some of these gravity anomalies are associated with intrusions, and others have no surface geologic expression. A similar type pattern of gravity anomalies exists in the region of the Klamath Mountains. The geologic implications of these gravity features are unknown at the present time.

5. South of 44° N. longitude and along the Oregon-Idaho border (Owyhee Upland), several closed gravity highs that extend along the border are apparent. These anomalies are probably associated with intrusions. Outcrops of pre-Tertiary intrusions are known to exist in the vicinity of the most southerly high.

6. The northern limit of the Basin and Range Province extends into southern (central and eastern) Oregon. The northern limit of the province cannot be determined from the gravity map. The well-defined closed gravity highs over the mountains and lows over the basins, both in a general north-south trend (characteristic of other parts of the province, according to Cook and Berg, 1961), are not apparent. More detailed gravity data may show some of these features. However, this region may be a younger Basin and Range development (Walter Youngquist, personal communications) and/or transitional Basin and Range type structure (affected by transition into a highly volcanic region), and gravitational measurements may not reflect variations in structure as strongly here as elsewhere.

7. There are many localized gravity anomalies shown in the complete Bouguer gravity anomaly map. Some of these anomalies are associated with surface geological expressions (cones, intrusions, and so forth), but some cannot be correlated with the surface geology. The latter anomalies are real and should be more thoroughly investigated, using the gravitational as well as other methods.

Free Air Gravity Anomaly Map: The free air anomaly map is contoured on a 10-mgal interval. The observed gravity values used to construct this map were corrected for terrain and altitude effects. One can imagine this map as a sea-level surface on which all of the mass above sea level has been concentrated. Thus, the variation in height of different stations is removed from the gravity measurements. Anomalies exhibited on this map reflect variations in mass beneath different areas. However, some variations of subsurface horizons do affect the gravity in nearby areas. This effect would not be as pronounced as that from surface terrain.

There is a considerable variation in gravity anomalies in this map (+140 to -80 mgal). However, most of the anomalies are small in areal extent. Excesses or deficits of mass from a standard (zero anomaly) geologic column would appear to be localized, mainly. Thus, extreme deviations from hydrostatic equilibrium would appear to be limited to small areas.

Additional analysis of the data presented in these maps is currently in progress and will be presented for a doctoral dissertation by John V. Thiruvathukal at Oregon State University.

All the gravity data for the state are on file with the State of Oregon Department of Geology and Mineral Industries.

Acknowledgments

Hollis M. Dole, State Geologist of Oregon, originally suggested that a gravity map of the State of Oregon could be constructed mainly by using existing data. We wish to thank Mr. Dole and the staff of the State of Oregon Department of Geology and Mineral Industries for their help and encouragement during the course of this project.

Gravity data were provided by Standard Oil Co. of California, Humble Oil Co., U.S. Geological Survey, University of Wisconsin, University of Oregon, Naval Oceanographic Office, Southern Methodist University, and the State of Oregon Department of Geology and Mineral Industries.

Delmar L. Evans, Robert Gaskell, Orin W. Knee, John H. Livingston, Philip R. Laun, William R. McKnight, Mark E. Odegard, Wilbur A. Rinehart, Suryya K. Sarmah, and Lynn D. Trembly made gravity measurements during the course of the project.

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B.L.M. ADMINISTRATION TOLD

The U.S. Bureau of Land Management has published "BLM Facts," a booklet containing tabulated information on the activities of the bureau. Of particular interest to the claim holder is the following table which summarizes the bureau's activities with respect to mineral patents, permits, and Public Law 167 claim determinations during fiscal years 1965 and 1966. Figures for the State of Washington are also included.

<u>Minerals</u> Item	<u>Oregon</u>		<u>Washington</u>	
	FY 1965	FY 1966	FY 1965	FY 1966
Mineral Patents Issued----	2	1	3	--
Mineral Permits & Licenses	--	2	2	1
Mineral Leases-----	8	39	2	4
P.L. 167 Determinations				
Completed, acres-----	540,201	125,077	--	--
Cumulative Determinations, acres-----	1,409,451	1,534,528	143,414	143,414
Claims Retaining Surface				
Rights, number-----	95	95	6	6
acres-----	1,900	1,900	120	120
Percent of Mineralized Area on which P.L.167 Action is completed-----	40	45	95	95

<u>Land Patents Issued</u> Kind of Patent	<u>FY 1965</u>		<u>FY 1966</u>	
	No.	Acres	No.	Acres
<u>Oregon</u>				
Homestead-----	2	60	1	40
Desert Land-----	2	200	2	156
Public Sale-----	14	2,977	6	560
Exchange-----	35	20,798	34	25,961
Small Tract-----	1	5	1	6
Recreation Sale-----	4	95	6	3,104
Reclamation Sale-----	5	550	1	120
Other-----	4	315	--	--
Total-----	67	25,000	51	29,947
<u>Washington</u>				
Homestead-----	1	160	--	--
Desert Land-----	--	--	--	--
Public Sale-----	5	255	1	120
Small Tract-----	--	--	--	--
Recreation-----	2	11	--	--
Exchange-----	2	5,478	2	5,894
Mineral Patent-----	--	--	--	--
Reclamation Sale-----	--	--	--	--
Other-----	6	1,655	4	3,019
Total-----	16	7,559	7	9,033

The bureau administers only 275,000 acres in Washington in contrast to 16,017,000 acres in Oregon; 25 percent of Oregon is BLM land, but only one percent is administered in the State of Washington.

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PARKERVILLE PLACER MINE CONVERTS

The Parkerville placer mine in the Greenhorns, Grant County, is being converted from a hydraulic operation to a washing plant by A. W. Brandenthaler. The new plant will have a capacity of about 1000 yards per day. Presently the crew of 10 men is constructing a series of settling ponds to clarify the plant effluent before it is returned to the North Fork of Burnt River.

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BRETZ QUICKSILVER MINE SOLD

The Bretz mine in southwestern Malheur County has been sold to New Idria Mining & Chemical Co., Idria, Cal. The Bretz was owned by Minerals & Chemicals Philipp Corp. of New York and had been operated by Sam Arentz until last fall. The mine was discovered in 1917, and during the half century since has produced more than 15,000 flasks of mercury. During the past 10 years most of the ore has been obtained from surface pits. The ore was concentrated in a flotation plant before retorting.

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BRANDENTHALER OPERATING BUFFALO MINE

A. W. Brandenthaler of Baker has reopened the Buffalo mine in the Granite district of eastern Grant County. Brandenthaler is operating the Buffalo under a lease-purchase option from the Union Pacific Railroad. Jim Jackson, who operated the mine for 15 years prior to the Union Pacific period of ownership, will be in charge of the mining and milling. The mine crew will extend the drift on the No. 5 level along the vein cut by UP last year. Milling will begin when the new drift is complete.

The Buffalo mine has a history extending back to the beginning of the century. Records indicate that nearly \$1,000,000 in gold, silver, copper, lead, and zinc has been produced from the property.

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BOURNE MINES DEVELOPED BY OMEGA MINES, LTD.

Omega Mines, Ltd., under the supervision of Henry Bowyer, has continued to develop the complex of veins in the old mines at Bourne in the Cracker Creek district of Baker County. A nine-man crew has been driving a tunnel on the Excelsior No. 1 level for the past season and work is expected to continue for at least another year. Adjacent properties which will benefit from the development program include the Columbia, North Pole, and the E and E.

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