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65th ANNUAL MEETING - CORDILLERAN SECTION GEOLOGICAL SOCIETY OF AMERICA
Eugene, Oregon, March 27-29, 1969

FIELD TRIP GUIDEBOOK

GEOLOGY OF THE NEWPORT AREA, OREGON [1]

By Parke D. Snavely, Jr.[2], Norman S. MacLeod[2], and Weldon W. Rau[3]

This report on the "Geology of the Newport area, Oregon" was written specifically for a field trip to be held during the 65th Annual Meeting of the Cordilleran Section of the Geological Society of America in March, 1969. Part I of this article, "A geologic sketch of the Newport area, Oregon," was published in the February issue of The ORE BIN (Snavely and others, 1969). Part II, presented here, is the guidebook for a field trip designed to provide a synoptic view of the Tertiary sedimentary and volcanic rocks of the Newport area. The writers hope that the geologic data and road logs presented in these two articles will be useful not only to the geologists attending the meeting, but also to others interested in the stratigraphy, petrology, and paleontology of the Oregon Coast Range.

PART II. GEOLOGIC FIELD TRIP GUIDE, NEWPORT AREA, OREGON

The field trip consists of two geologic tours. On Tour 1, the Tertiary sedimentary rocks exposed along the Yaquina River between Newport and Toledo, Oregon, will be examined. This tour will start at the mouth of Yaquina Bay where Miocene sedimentary rocks are exposed and will proceed generally eastward and downsection. Tour 2 is primarily concerned with volcanic rocks of early Eocene, late Eocene, and middle Miocene age that form important stratigraphic units in the Oregon Coast Range. Figure 1 shows the locations of geologic maps for areas to be visited on Tour 1 (plate 1) and Tour 2 (plate 2). The reader is referred to Part I of this article (Snavely and others, 1969) for other geologic data pertinent to the field trip.

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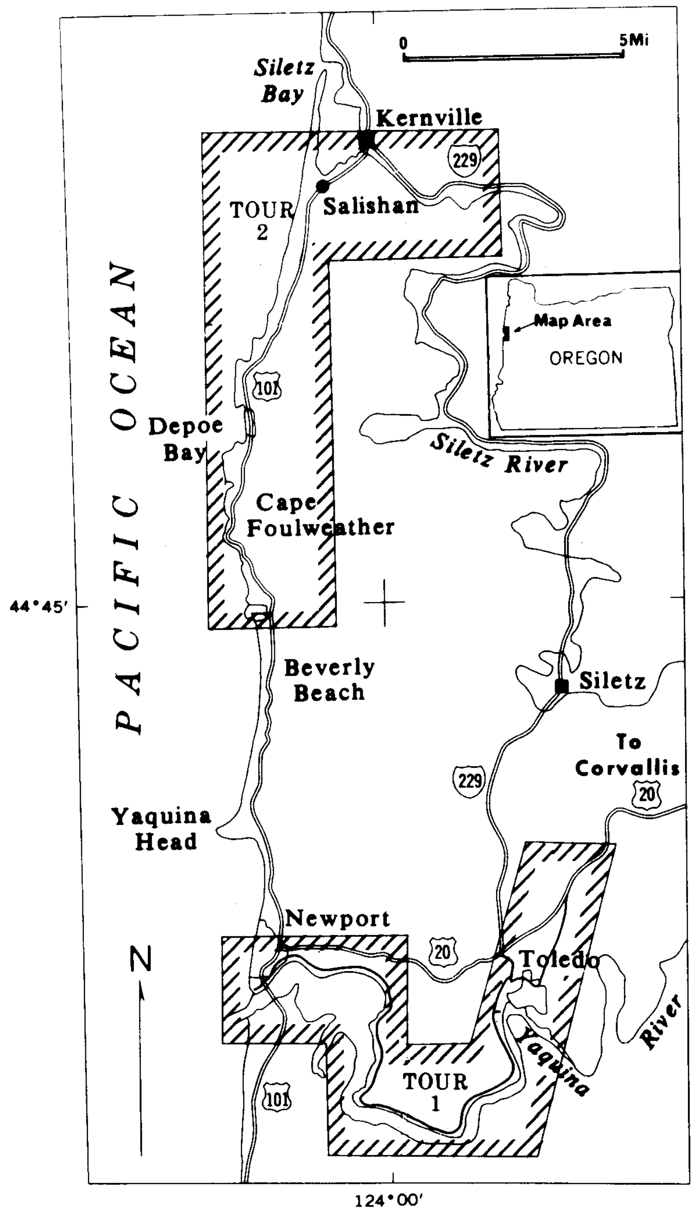


Figure 1. Index map showing locations of Tours 1 and 2 (plates 1 and 2) in the Newport area of central western Oregon.

Mileage

0 Stop 1 — Start of trip. Yaquina Bay State Park, Newport, Oregon (see plate 1). Follow path to base of jetty, north side of Yaquina Bay. The unconformable contact between the basal concretionary arkosic sandstone of the middle Miocene Astoria Formation and the underlying lower Miocene Nye Mudstone is exposed in the sea cliff (Snavely and others, 1964). The following foraminiferal species are among those that occur in the Astoria Formation but do not occur below this contact:

Buliminella elegantissima (d'Orbigny)
Robulus mayi Cushman and Parker
Uvigerinella californica ornata Cushman.

Common species occurring in the Nye Mudstone up to the contact but not above are:

Elphidium cf. *E. minutum* (Reuss)
Uvigerina auberiana d'Orbigny
Uvigerinella obesa impolita Cushman and Laiming.

Although the unconformity between the Astoria and Nye Formations is not always apparent in single exposures, regional mapping has shown that the Astoria Formation overlaps the Nye Mudstone and rests on the upper Oligocene Yaquina Formation about $8\frac{1}{2}$ miles north of this stop. The Nye-Astoria contact is best exposed at Jumpoff Joe (fig. 2), $1\frac{1}{2}$ miles north of Stop 1. Marine Pleistocene terrace deposits overlie both Miocene units at this stop. To the north along the beach, massive to well-bedded fossiliferous sandstone of the Astoria Formation contains interbedded siltstone, basaltic sandstone, and water-laid dacitic tuff beds up to 12 feet thick.

Proceed east along Yaquina Bay Road which descends over Pleistocene terrace deposits to the bay front. The old fishing community of Newport rests on the Nye Mudstone.

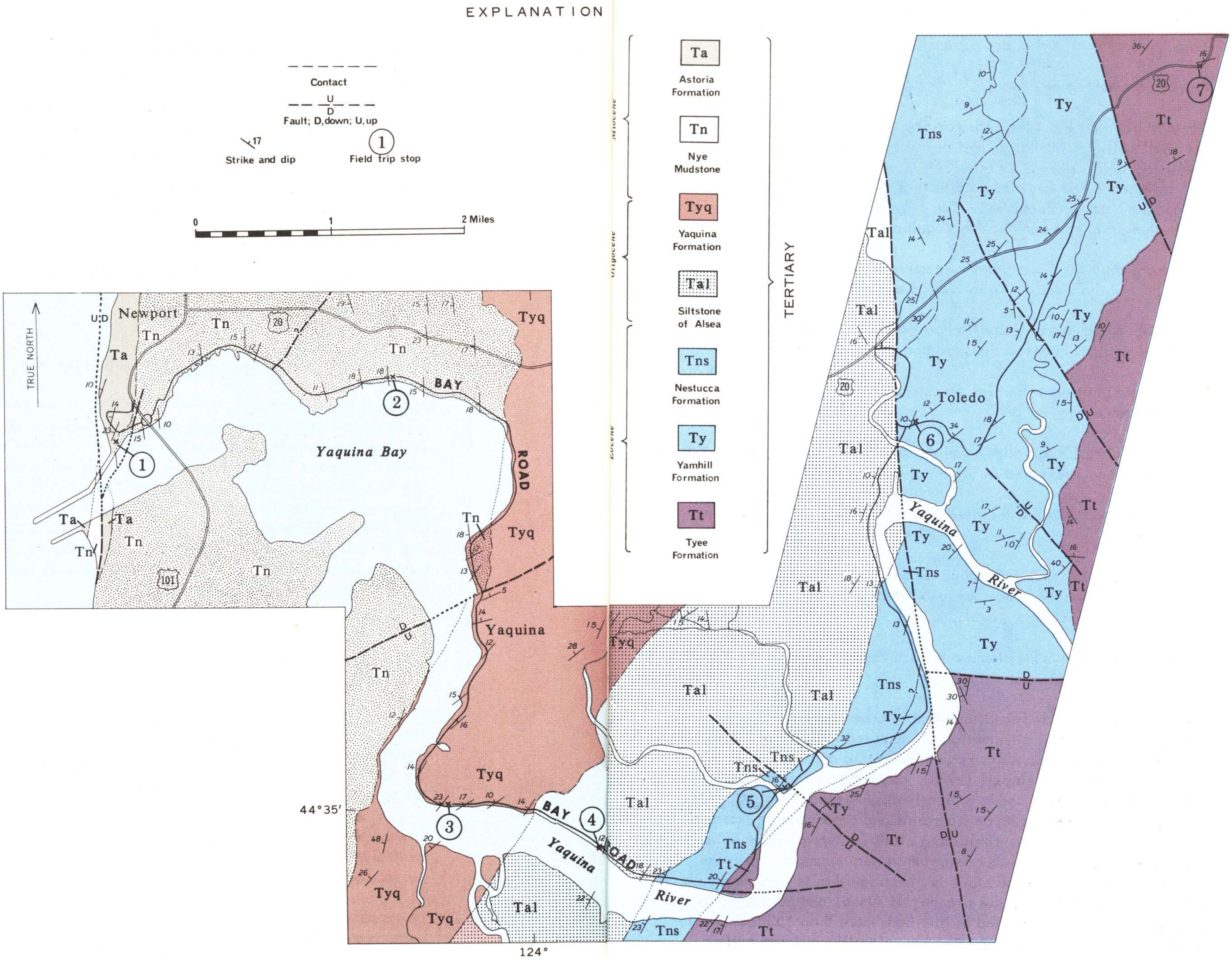
1.0 — On the north side of the road are lower Pleistocene sands that fill channels cut into the Nye Mudstone. They are overlain by light-brown weathering upper Pleistocene marine sand and gravel. Landslides are common on the north side of Yaquina Bay, which is underlain by the Nye Mudstone.

1.7 — Oregon State University Marine Science complex is visible on the south side of the bay. Flat upland areas north and south of the river are marine Pleistocene terrace deposits modified by large sand dunes.

2.6 Stop 2 — The middle part of the Nye Mudstone, which here contains dolomite beds, is exposed in the road cut (fig. 3). The Nye Mudstone consists predominantly of massive, organic-rich mudstone and siltstone. Brown

Plate 1.

Geologic map showing locations of field-trip stops on Tour 1. Pleistocene deposits not shown.



fish scales and vertebrae are common. Although the rocks contain only a sparse molluscan fauna, Foraminifera, which are assigned to the Saucesian Stage of Kleinpell (1938), are generally abundant. The Foraminifera, as well as oxygen isotope ratios, indicate a cold-water environment during deposition.

Proceed east along Bay Road.

3.5 Contact between the Nye and Yaquina Formations is concealed in the small valley. The lower part of the Nye Mudstone becomes increasingly sandy toward its base and grades over a 50-foot interval into tuffaceous fine-grained sandstone of the upper part of the upper Oligocene Yaquina Formation. The contact is well exposed 2 miles south along the west bank of the Yaquina River.

Road turns southward along bay. Massive tuffaceous siltstone of the upper part of the Yaquina Formation is exposed in road cuts.

4.6 Road loops southwest at Coquille Point and cuts up-section to cross again the contact between the Nye and Yaquina Formations.

5.0 Fault contact between the Nye Mudstone and upper part of the Yaquina Formation.

5.3 Fishing village of Yaquina. Massive fossiliferous concretionary Yaquina sandstone is exposed in large cut north of village.

5.7 Thin- to thick-bedded and cross-bedded sandstone of the Yaquina Formation.

6.2 Road follows along strike of Yaquina Formation. Across the river (west) the Yaquina-Nye contact is exposed along river bank about 10 to 20 feet above water level.

6.5 Riverbend Moorage. Pleistocene terrace deposits overlie the Yaquina Formation on the left.

6.9 Stop 3 Massive to well-bedded sandstone and interbedded dark-gray marine siltstone of the Yaquina Formation are exposed in road cut. The siltstone in this outcrop contains Foraminifera that are referred to the Zemorrian Stage of Kleinpell (1938). Sandstone forms the bulk of the Yaquina Formation and is typically cross-bedded (fig. 4), gritty, and contains abundant pumice fragments and carbonaceous material. Thick conglomerate beds, containing clasts of silicic volcanic and metamorphic rocks, and less common thin coal seams occur in the sandstone. Intercalated siltstone is indistinguishable in appearance from the underlying unit, the siltstone of Alsea, and occurs as thin beds such as at this stop, and as interbeds more than 150 feet thick. Regionally, the Yaquina Formation has a lenslike outcrop pattern, and to the north and south it strikes into offshore areas. At Seal

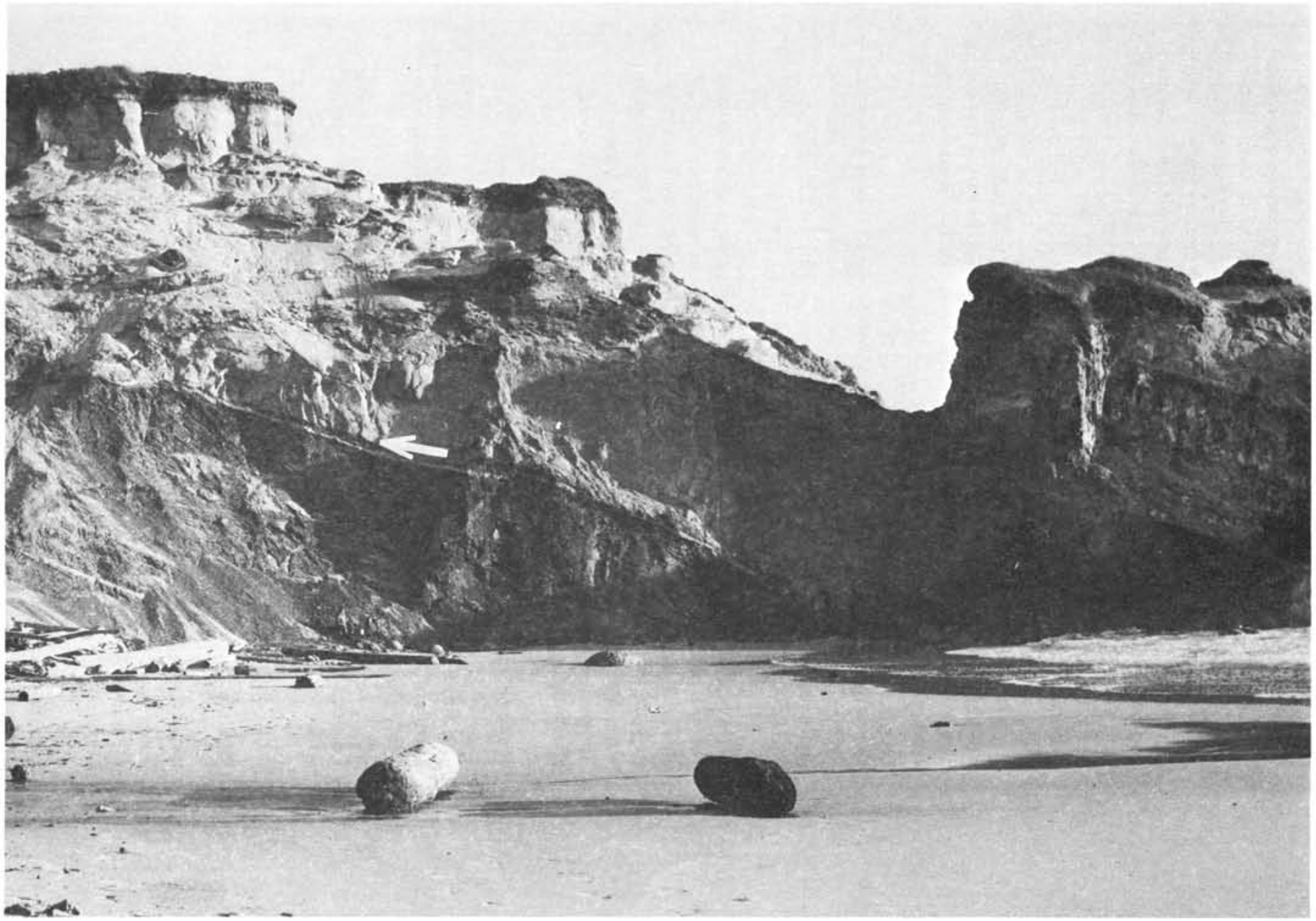


Figure 2. Unconformable contact (arrow) between the Nye Mudstone and overlying Astoria Formation at Jumpoff Joe, $1\frac{1}{2}$ miles north of Stop 1. Both these Miocene units are overlain by Pleistocene marine terrace deposits.

Rocks, its most southern onshore exposure, the Yaquina Formation is less than 500 feet thick. In the type section along the Yaquina River it is 1700 feet thick, and 10 to 15 miles to the north in the drainages of Spencer and Rocky Creeks it is well over 2000 feet thick. Near Kernville, 22 miles north of Stop 3, the Yaquina Formation again thins to about 500 feet. The lenticular shape and sedimentological characteristics of the Yaquina Formation suggest that it is of deltaic origin.

Proceed east along Bay Road.

7.1 Yaquina Formation. Carbonaceous siltstone and tuff beds overlie cross-bedded sandstone; pyrite nodules occur locally in the sandstone. Several subcommercial lignite beds were mined in this area near the turn of the century.

7.6 Conformable contact between the Yaquina Formation and an underlying siltstone unit of Oligocene age. This unnamed unit, well developed along Alsea Bay, is herein informally referred to as the "siltstone of Alsea."

8.2 Stop 4 Siltstone of Alsea. Massive concretionary tuffaceous siltstone and fine sandstone, contains thin tuff beds. Mollusks from this part of the unit indicate a middle Oligocene age. The abundant ash and pumice in the Oligocene strata in western Oregon and Washington were derived from pyroclastic volcanism in an ancestral Cascade Range. Pumiceous mudflow breccias with clasts of felsic volcanic rocks occur in this part of the sequence at Alsea Bay.

Proceed eastward on Bay Road.

8.6 The basal part of the siltstone of Alsea is exposed in road cut. Foraminifera from this outcrop indicate an early Oligocene age (Refugian Stage of Kleinpell, 1938).

8.8 Contact between the siltstone of Alsea and thin-bedded tuffaceous siltstone of the Nestucca Formation.

8.9 Glauconitic sandstone in the Nestucca Formation of latest Eocene age (A-1 zone of Laiming, 1940) is exposed in road cut.

9.3 Unconformable contact between the Nestucca Formation and Tyee Formation (middle Eocene). The unconformity at the base of the Nestucca Formation is the major unconformity in the Oregon Coast Range.

9.4 Graded sandstone and siltstone beds of the middle Eocene Tyee Formation.

9.7 Road turns north and cuts back up-section into the Nestucca Formation.

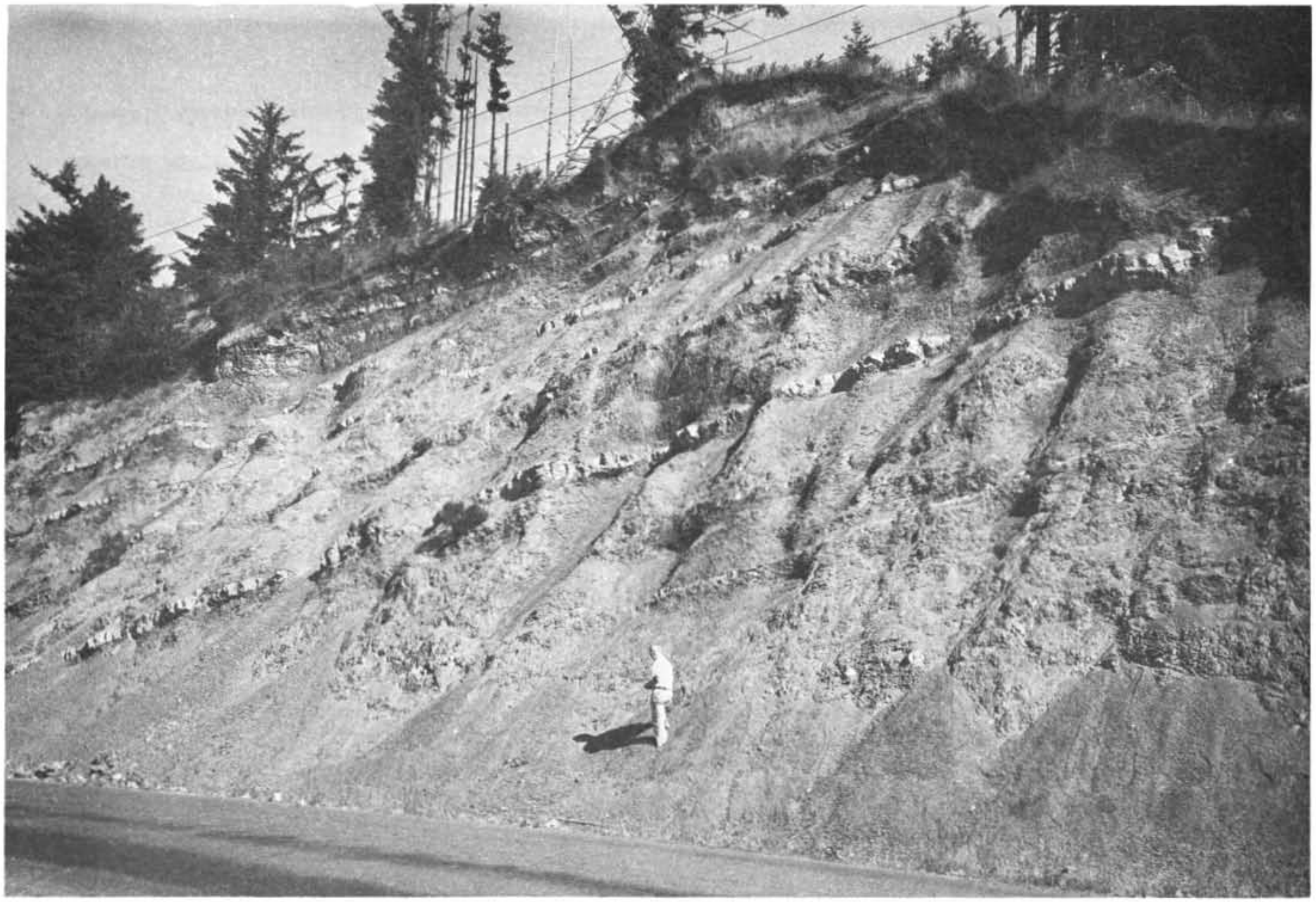


Figure 3. Dolomitic beds and lenses in the Nye Mudstone, north side of Yaquina Bay (Stop 2).

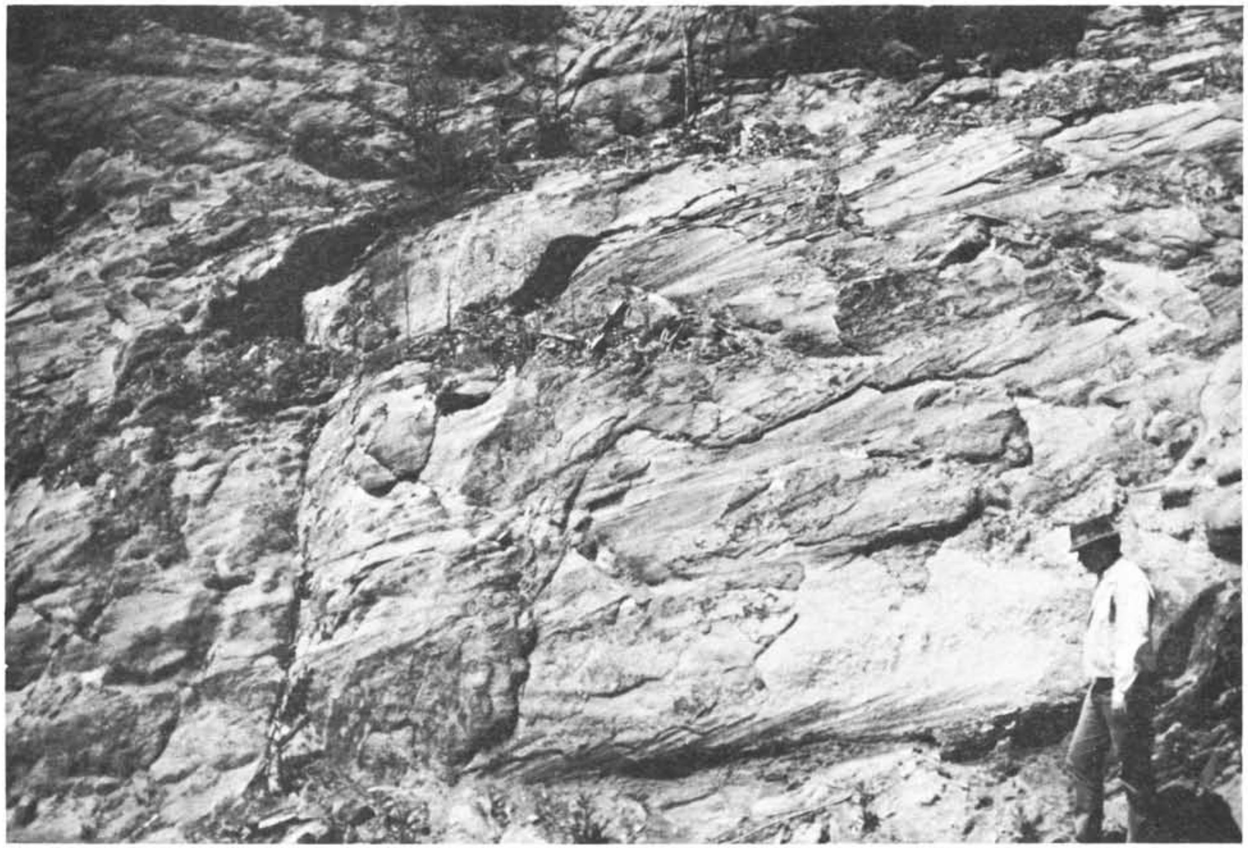


Figure 4. Cross-bedded sandstone of the Yaquina Formation along Rocky Creek, 1 mile northeast from Otter Crest.

10.1 Channel Marker No. 37 (mileage check).

10.3 Stop 5 Upper Eocene Nestucca Formation; thin-bedded tuffaceous siltstone contains 1- to 4-inch-thick light-brown ash beds and 1-foot-thick beds of tuffaceous glauconitic siltstone. Siltstone from this location contains a foraminiferal fauna assigned to the late Narizian Stage of Mallory (1959) and early Refugian Stage of Kleinpell (1938). The Nestucca in this area is only about 800 feet thick, whereas in the type area 30 to 40 miles to the north in the Hebo quadrangle it is more than 5000 feet thick. In the Toledo area it onlaps a structural high of middle Eocene rocks and in turn is overlapped by the siltstone of Alsea. The small fault at the east end of the outcrop downdrops the overlying siltstone of Alsea.

Continue northeast on Bay Road.

11.0 Flat-lying Pleistocene estuarine deposits.

12.3 Glauconitic sandstone in the upper part of the Nestucca Formation.

13.2-13.5 Large exposure of the siltstone of Alsea contains thin, light-colored volcanic ash beds. Georgia-Pacific Corp. sawmill and paper plant are on right.

13.9 Junction of old Highway 20 and Yaquina Bay Road. Turn right. Intersection is near the fault contact between the lower and middle Oligocene siltstone of Alsea and concretionary siltstone of the Yamhill Formation of late middle and early late Eocene age.

14.0 "Minnie's Sunset Cafe" locality (Cushman and others, 1949) of the Yamhill Formation. This formation underlies the town of Toledo and although poorly exposed is more than 2000 feet thick. Foraminifera at this location are assigned to the A-2 zone of Laiming (1940), whereas the lower part of the sequence contains a B1-A fauna. The Yamhill is an organic-rich siltstone and mudstone which contains abundant yellowish-gray calcareous concretions and thin arkosic sandstone beds. The Yamhill and older formations (Eocene) are more structurally complex than the Tertiary sequence above the upper Eocene unconformity. In the area between Toledo and Siletz many folds and faults mapped within the Yamhill and Tyee Formations do not extend above the unconformity at the base of the Nestucca Formation.

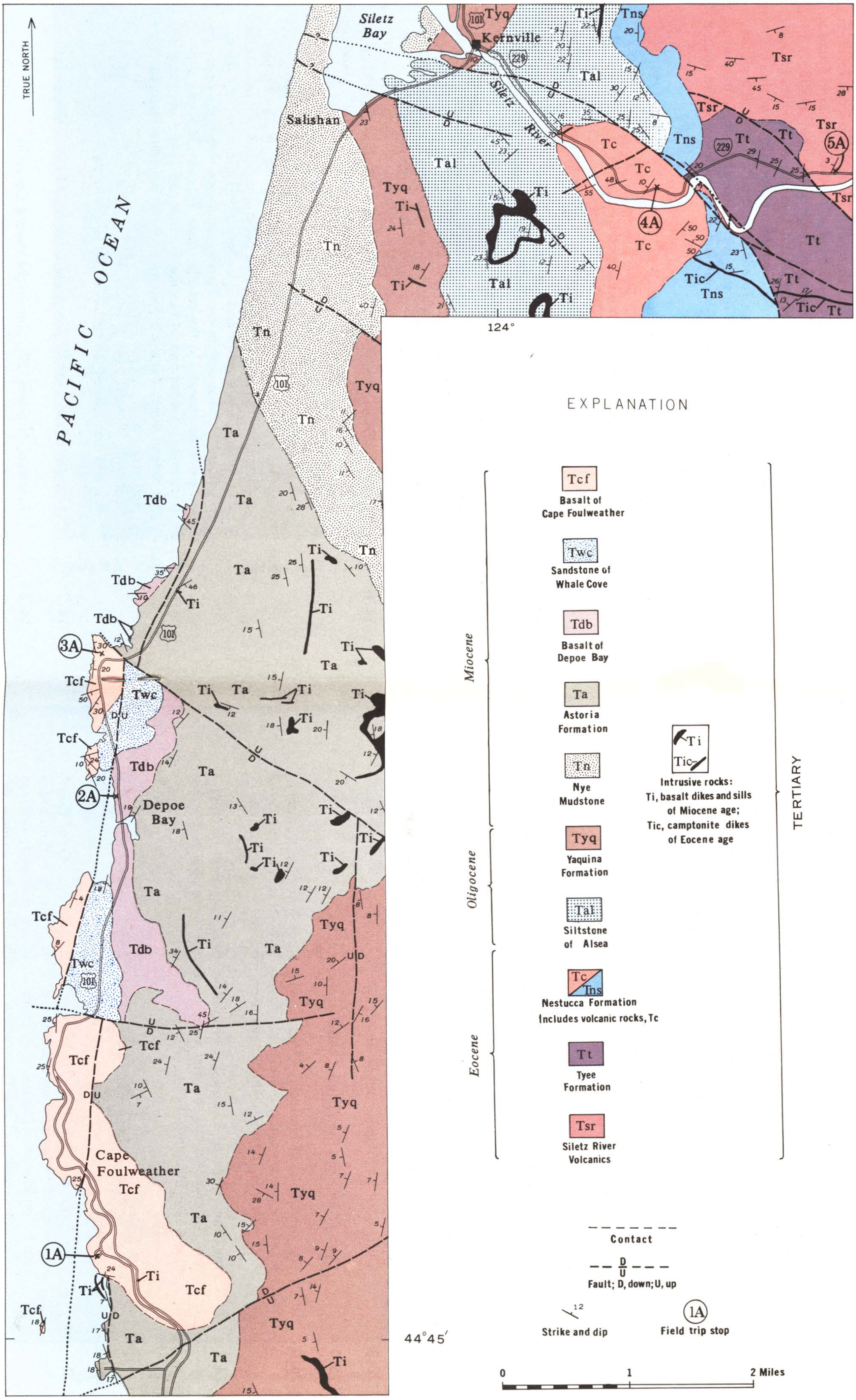
Proceed east toward Corvallis on old Highway 20.

14.7 Siltstone of the Yamhill Formation is exposed in road cuts on left.

16.5 Junction, Highway 20. Turn right toward Corvallis.

17.8 Contact between the Yamhill and Tyee Formations.

Plate 2. Geologic map showing locations of field-trip stops on Tour 2. Pleistocene deposits not shown.



18.2 Stop 7 Sandstone and siltstone of the Tyee Formation are exposed in new road cut. Individual beds are graded from sandstone at the base to siltstone at the top. Beds contain sole markings such as groove and flute casts (fig. 5) that have a northerly orientation. Siltstone clasts are abundant in the lower sandy parts of most beds, and carbonaceous material is generally scattered throughout. Except for Foraminifera in rare, thin pelagic claystone partings that occur at the tops of a few beds, fossils are absent. The graded beds, sole markings, internal structures, and lack of fossils indicate that the sandstone and siltstone beds that constitute the Tyee Formation are turbidites (Snavely and others, 1964). The northerly orientation of flute and groove casts in the Tyee Formation over much of the Oregon Coast Range indicates that the source area was about 150 miles to the south of this locality in the ancestral Klamath Mountains. About 30 miles to the north the turbidites grade laterally into a predominantly siltstone sequence (lower part of the Yamhill Formation).

Turn around and return west toward Newport on Highway 20.

20.2-20.9 Road cuts in the Yamhill Formation.

21.5 Contact between the Yamhill and Nestucca Formations.

21.7 Junction between Highways 20 and 229.

21.9 Road cut on north is in the siltstone of Alsea.

23.0 Contact between siltstone of Alsea and Yaquina Formation.

23.6 Outcrop of Yaquina sandstone on north.

25.0 Contact between the Yaquina and Nye Formations.

26.0 East city limits of Newport, Oregon, with outcrop of Nye Mudstone on north side of road. The city of Newport is built on Pleistocene marine-terrace deposits which have been modified by sand dunes.

27.7 Junction, Highway 20 and U.S. Highway 101. Turn north on Highway 101 and continue to Otter Crest on Cape Foulweather (9 miles) where Tour 2 begins.

Field Trip Guide - Tour 2

Mileage

0 Stop 1A Otter Crest Lookout, Cape Foulweather (see plate 2). Otter Crest and much of the coastal area for some 6 miles to the north are underlain by middle Miocene volcanic rocks which are informally referred to as the "basalt of Cape Foulweather." This unit is the younger of two middle Miocene volcanic sequences which are exposed along the

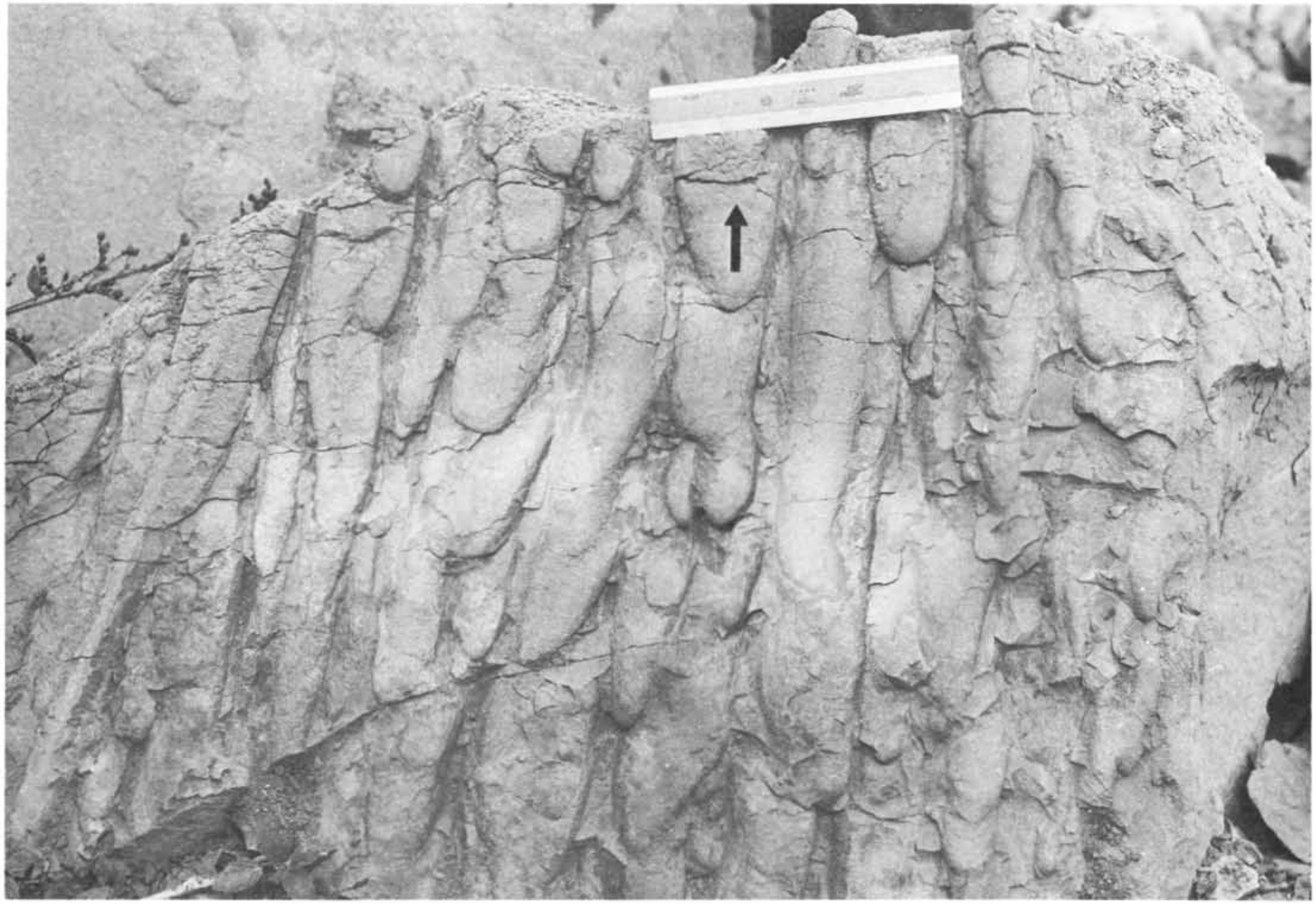


Figure 5. Flute casts on the sole of a sandstone bed in the Tyee Formation, Green Mountain, near Valsetz, Oregon. Arrow indicates direction of current movement. Scale is approximately 6".

Figure 6. Ring dikes intruding sandstone of the Astoria Formation on the wave-cut platform immediately south of Otter Crest Radial dike (lower left), offset along inner ring dike, extends to outer ring dike. Marine Pleistocene terrace deposits cap both headlands in upper part of photograph.

northern part of the Oregon coast. Flow breccia, extrusive breccia, and intercalated massive flows constitute the bulk of the basalt of Cape Foulweather at Otter Crest, whereas farther from the vent area (Stop 3A), water-laid lapilli tuff predominates. Blocks of Astoria sandstone are contained within some breccia units. An example is located immediately north of Otter Crest at the base of the cliff. Numerous dikes, sills, and small plugs intrude the breccia near Otter Crest indicating that this area was a local center of Miocene volcanism. Two ring dikes and several radial dikes are exposed on the wave-cut platform just south of Otter Crest (fig. 6). The basalt of Cape Foulweather also crops out at Yaquina Head, about 5 miles south of Otter Crest, and on the large island (Otter Rock) immediately west of Otter Crest. The two smaller islands immediately to the south (Gull Rock and Whaleback), however, are composed of subaerial basalt flows of an older (middle Miocene) unit. This unit, well exposed at Depoe Bay, is informally called the "basalt of Depoe Bay." The terrace on Otter Crest is about 500 feet above sea level and is the highest of several Pleistocene terraces developed along this coastline. Constructional marine terraces about 50 feet above sea level are developed on westward-dipping sandstone and siltstone of the Astoria Formation on the two nearby headlands to the south (fig. 6). The headland on the far southern horizon (35 miles distant) is composed of a 2000-foot-thick sequence of subaerial basalt flows of late Eocene age. Table Mountain, the prominent flat-topped mountain on the southeast horizon, is underlain by a 250-foot-thick nepheline syenite sill.

Proceed northward on old Highway 101.

0.5 Basalt sill exposed in road cut.

1.6 West-dipping flow breccia is exposed near tideline.

1.9 Intersect Highway 101.

2.3 Whale Cove on left is underlain by sandstone of middle Miocene age, herein referred to as the "sandstone of Whale Cove," which separates the basalt of Cape Foulweather from the slightly older basalt of Depoe Bay.

4.1 Bridge at Depoe Bay.

4.3 Stop 2A The basalt of Depoe Bay is exposed on the east margin of the outer bay on which Highway 101 is constructed. Dikes, sills, and plugs are abundant immediately east of Depoe Bay. At Depoe Bay the volcanic unit lies unconformably on the Astoria Formation, which is exposed in the inner bay, and is overlain by sandstone and siltstone of middle Miocene age -- the sandstone of Whale Cove. The basalt of Cape Foulweather overlies the sandstone and siltstone and forms the projecting headlands on the outer bay. At this stop, the basalt of Depoe

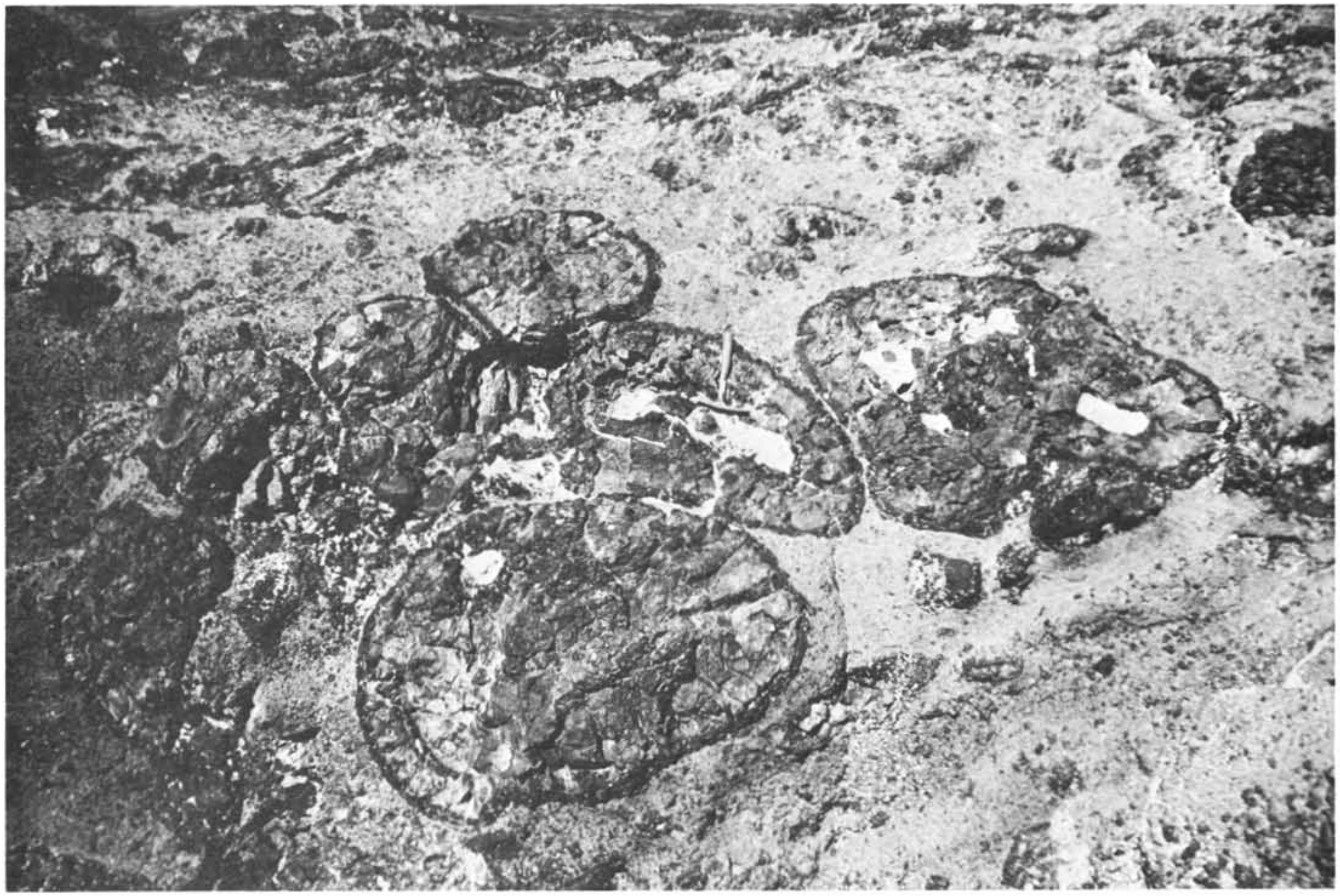


Figure 7. Isolated pillow breccia at Depoe Bay, Oregon (Stop 2A).

Bay is composed of exceptionally well-developed isolated pillows in breccia (fig. 7). The pillows have ropy rims and some have multiple chilled margins and drained-out cores. Inclusions of Astoria sandstone within the pillows are common. Rims of pillows and fragments in the breccia are composed of basaltic glass (sideromelane and tachylite); some glass is palagonitized.

Proceed north on Highway 101.

5.4 Turn left at State Park entrance.

5.6 Stop 3A Boiler Bay State Park, Government Point.
Water-laid, well-bedded lapilli tuff and breccia of the basalt of Cape Foulweather are exposed along the coast (fig. 8). These deposits probably formed a broad apron around the vent at Cape Foulweather. Grading in many individual beds suggests that they were deposited by density currents; more massive units probably represent breccia transported by mass movement such as submarine landsliding. Boiler Bay, immediately to the north, is eroded in the Astoria Formation and is capped by a 50-foot-high terrace deposit. On the north side of Boiler Bay, dikes of peperite and massive basalt cut the Astoria Formation. Cascade Head, the prominent headland on the skyline 15 miles to the north, is underlain by upper Eocene subaerial porphyritic basalt flows.

Proceed north on Highway 101.

6.4 Peperite dikes exposed on east side of roadway.

6.7 Fogarty Creek State Park. Sandstone of the Astoria Formation and Miocene basalt breccia are well exposed along coast.

7.1 Highway constructed on Pleistocene terrace modified by sand dunes.

10.6 Salishan Lodge and Siletz Bay.

10.8 Tuffaceous siltstone and glauconitic sandstone of the Yaquina Formation are exposed on southeast side of highway.

11.8 Siletz River bridge.

Turn right on Highway 229 toward Siletz.

11.9 Iron-stained sandstone of the Yaquina Formation is exposed on north side of highway.

12.1 Outcrops of tuffaceous siltstone and ash beds of the siltstone of Alsea are exposed on north side of highway.

Figure 8. Middle Miocene water-laid lapilli tuff and breccia at Government Point (Stop 3A). These deposits of fragmental basaltic debris formed a broad apron around the former local center of volcanism near Cape Foulweather.

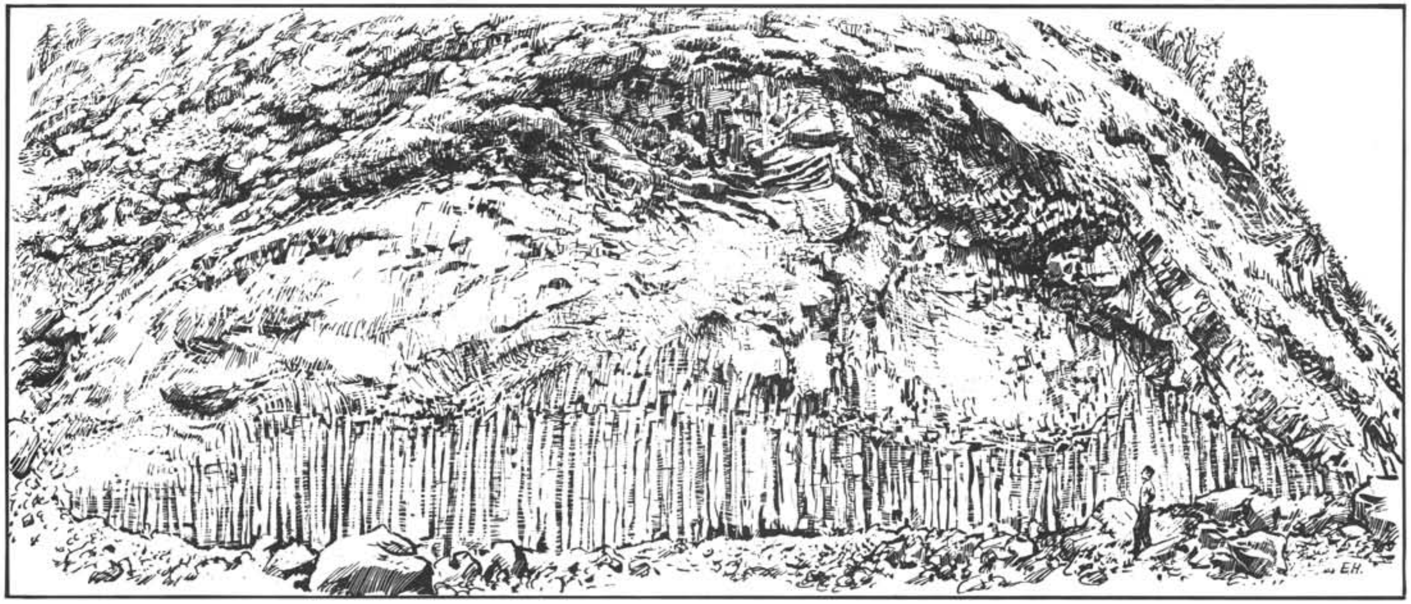


Figure 9. Filled feeder-tube in the Siletz River Volcanics at Kauffman quarry (Stop 7A). Columnar-jointed alkalic basalt in the center of the filled tube is surrounded by a carapace of pillow basalt. Line drawing from photographs.

12.7 Quarry on ridge on south side of Siletz River is in a basalt sill equivalent to the basalt of Depoe Bay.

12.9 Top of extrusive camptonite sequence of late Eocene age.

13.7 Stop 4A Quarry in camptonite breccia. The base of the camptonite sequence is made up of pillow lava which grades upward into interbedded water-laid tuff and breccia. Most of the fragmental material was originally camptonitic glass clouded with crystallites, but the glass is now largely altered. Sparse biotite and hornblende phenocrysts are scattered through the breccia. Dikes of biotite camptonite fed this extrusive sequence. One of these dikes is well exposed in a roadside quarry 6 road miles east along the Siletz River on Highway 229. The camptonite flow sequence is a temporal equivalent of the upper Eocene basalt exposed at Cape Perpetua and Cascade Head; some basalt at Cascade Head is transitional to camptonite in composition.

Proceed east on highway.

14.9 Tyee Formation exposed in road cut.

15.2 Natural levees developed along the Siletz River.

15.3 Contact between the Tyee Formation and Siletz River Volcanics.

15.4 Turn left on small road to Kauffman quarry.

15.4 Stop 5A Kauffman quarry (private property). Columnar-jointed filled feeder-tube is exposed at base of quarry and is surrounded on the sides and top by large elongate pillows (fig. 9). The pillows and filled feeder-tube rest on fine-grained basaltic sandstone. The basalt is part of the lower and lower-middle Eocene Siletz River Volcanics which is the oldest exposed unit in the Oregon Coast Range. The lower part and bulk of the Siletz River Volcanics is composed of tholeiitic basalt. The upper part in the Euchre Mountain quadrangle consists of a thin veneer of alkalic basalt, ankaramite, feldspar-phyric basalt, and picrite-basalt (Snavely and others, 1968). The somewhat altered alkalic basalt exposed in the Kauffman quarry is typical of this upper unit. A small, filled feeder-tube on the east side of the quarry contains aphyric alkalic basalt at the base and grades upward into porphyritic augite basalt in the center. It formed by lava erupted from a shallow magma chamber in which crystals had settled to the base during differentiation. Feeder-tubes such as these exposed at Kauffman quarry are common in the Siletz River Volcanics. Lava flowed downslope in these tubes below a self-formed protective cover of pillow lava.

End of field trip.

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YEAR OF THE METEORITE CONTINUED

The interest expressed by the science departments of grade and high schools, rock and mineral clubs, and the general public has encouraged the committee which established the Year of the Meteorite to extend the effort through 1969.

To date the committee has answered hundreds of letters and examined a great number of specimens. So far, all specimens have been "meteor-wrongs."

With the momentum that was gathered in 1968, the committee feels this effort should be continued, and as more people become interested the better the chance will be for a meteorite discovery. So won't you join with us in the search?

* * * * *

ROCKHOUND PARK ESTABLISHED

The New Mexico Park and Recreation Commission has developed Rockhound State Park in the southwest part of the state. The 250-acre park is 12 miles southeast of Deming in the Little Florida Mountains. Deming Ranchettes, a land-development corporation, donated the land. The park may be unique in that rock-hunters are encouraged to take samples home with them. Amethyst, opal, and agate are among minerals found in the park. (The AGI Report, December 23, 1968.)

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METALS AND MINERALS CONFERENCE SITE CHOSEN

The city of Coeur d'Alene, Idaho will play host this year to the Pacific Northwest Metals and Minerals Conference on April 17, 18, and 19. The site chosen for the conference reflects the booming interest in silver, which is produced in three of the nation's largest silver mines nearby. Half of the entire national output of silver comes from mines in the Coeur d'Alene district.

Delegates to the conference will have the unusual opportunity to take field trips through various mines and mills in the district on the first day of the session. The district boasts the deepest lead-zinc mine in the world. The Coeur d'Alenes also have the only mines in the world where silver is found at great depth.

After the full day of field trips there will be two days of technical sessions devoted to the following topics: Mining, Mineral Processing, Geology, Exploration and Geophysics, Extractive Metallurgy, Non-metallic Minerals, and Automatic Data Processing. In addition to the technical sessions, there will be luncheons on both days and a banquet on Friday evening. Special events are also planned for ladies by the women's auxiliary of the American Institute of Mining, Metallurgical, and Petroleum Engineers.

The Pacific Northwest Metals and Minerals Conference was conceived by the Oregon Section of AIME, and the first of a continuing series of annual meetings was held in April 1948. Subsequent meetings of the conference have been hosted at Seattle, Spokane, and Vancouver, B.C. This year marks the first time that Coeur d'Alene has held the conference.

Following the practice adopted more than 20 years ago, the conference will be open to the general public. Registration materials and additional information on the conference may be obtained by writing to: A.I.M.E., c/o Northwest Mining Assn., W. 522 First Avenue, Spokane, Wash. 99204.

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FOSSIL VERTEBRATES ON EXHIBIT IN PORTLAND

A remarkable collection of skulls, teeth, jaws, and other bones of extinct mammals of Oligocene and Miocene ages has been loaned to the Department by Dave Taylor and Bruce Welton of Portland. The exhibit is in one of the hall cases opposite the elevator on the 10th floor of the State Office Building in Portland. The fossils were discovered, dug out, and prepared with great pains by these two young men. Most of the specimens are from the John Day Formation in central Oregon, although a few are from the Oligocene White River beds of South Dakota. Not all of the specimens have been identified with certainty as yet, but among those determined are oreodons and early forms of horses, cats, dogs, foxes, rodents, pigs, and rhinos. In addition to the mammals, there are three giant fossil turtles.

Adjacent to the case of fossil animals is the outstanding collection of fossil plants from the John Day Formation which is on loan from Lee Jenkins of Hood River. The two exhibits as a unit exemplify the flora and fauna typical of western North America 30 million years ago. All of these fossils show by their excellence why the John Day Formation in Oregon is one of the finest sources in the world for fossil remains of Tertiary plants and animals.

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AVAILABLE PUBLICATIONS

(Please include remittance with order. Postage free. All sales are final and no material is returnable. Upon request, a complete list of the Department's publications, including those no longer in print, will be mailed.)

BULLETINS

2.	Progress report on Coos Bay coal field, 1938: Libbey	$ 0.15
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 supplement) of geology and mineral resources of Oregon, 1947: Allen	1.00
35.	Geology of Dallas and Valsetz quadrangles, Oregon, rev. 1963: Baldwin	3.00
36.	(1st vol.) Five papers on Western Oregon Tertiary foraminifera, 1947: Cushman, Stewart, and Stewart	1.00
	(2nd vol.) Two papers on Western Oregon and Washington Tertiary foraminifera, 1949: Cushman, Stewart, and Stewart; and one paper on mollusca and microfauna, Wildcat coast section, Humboldt County, Calif., 1949: Stewart and Stewart	1.25
37.	Geology of the Albany quadrangle, Oregon, 1953: Allison	0.75
46.	Ferruginous bauxite deposits, Salem Hills, Marion County, Oregon, 1956: Corcoran and Libbey	1.25
49.	Lode mines, Granite mining dist., Grant County, Ore., 1959: Koch . .	1.00
52.	Chromite in southwestern Oregon, 1961: Ramp	3.50
53.	Bibliography (3rd supplement) of the geology and mineral resources of Oregon, 1962: Steere and Owen	1.50
56.	Fourteenth biennial report of the State Geologist, 1963-64	Free
57.	Lunar Geological Field Conference guide book, 1965: Peterson and Groh, editors	3.50
58.	Geology of the Suplee-Izee area, Oregon, 1965: Dickinson and Vigrass .	5.00
60.	Engineering geology of the Tualatin Valley region, Oregon, 1967: Schlicker and Deacon	5.00
61.	Gold and silver in Oregon, 1968: Brooks and Ramp	5.00
62.	Andesite Conference Guidebook, 1968: Dole, editor	3.50
63.	Sixteenth Biennial Report of the State Geologist, 1966-1968	Free

GEOLOGIC MAPS

Preliminary geologic map of Sumpter quadrangle, 1941: Pardee and others . . .	0.40
Geologic map of the St. Helens quadrangle, 1945: Wilkinson, Lowry & Baldwin .	0.35
Geologic map of Kerby quadrangle, Oregon, 1948: Wells, Hotz, and Cater . .	0.80
Geologic map of Albany quadrangle, Oregon, 1953: Allison (also in Bull. 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 reconnaissance geologic map of central portion, High Cascade Mountains, Oregon, 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 et al. .	1.50
GMS-3 - Preliminary geologic map, Durkee quad., Oregon, 1967: Prostka . .	1.50
Geologic map of Oregon west of 121st meridian: (over the counter) . . . . . folded in envelope, $2.15; rolled in map tube, $2.50	2.00
Gravity maps of Oregon, onshore and offshore, 1967: [Sold only in set]: flat . . folded in envelope, $2.25; rolled in map tube, $2.50	2.00

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Available Publications, Continued:

SHORT PAPERS

2.	Industrial aluminum, a brief survey, 1940: Leslie L. Motz	$ 0.10
18.	Radioactive minerals the prospectors should know (2nd rev.), 1955: White and Schafer	0.30
19.	Brick and tile industry in Oregon, 1949: Allen and Mason	0.20
20.	Glazes from Oregon volcanic glass, 1950: Charles W.F. Jacobs	0.20
21.	Lightweight aggregate industry in Oregon, 1951: R. S. Mason	0.25
23.	Oregon King Mine, Jefferson County, 1962: F.W. Libbey and R.E. Corcoran	1.00
24.	The Almeda Mine, Josephine County, Oregon, 1967: F.W. Libbey	2.00

MISCELLANEOUS PAPERS

2.	Key to Oregon mineral deposits map, 1951: R. S. Mason	0.15
3.	Facts about fossils (reprints), 1953	0.35
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: H.G.Schlicker	0.50
7.	(Supplement) Bibliography of theses, 1959 to Dec. 31, 1965: M. Roberts	0.50
8.	Available well records of oil & gas exploration in Oregon, rev. '63: Newton	0.50
10.	Articles on Recent volcanism in Oregon, 1965: (reprints, The ORE BIN)	1.00
11.	A collection of articles on meteorites, 1968: (reprints, The ORE BIN)	1.00
12.	Index to published geologic mapping in Oregon, 1968: R. E. Corcoran	Free

MISCELLANEOUS PUBLICATIONS

Oregon mineral deposits map (22 x 34 inches), rev. 1958	0.30
Oregon quicksilver localities map (22 x 34 inches), 1946	0.30
Landforms of Oregon: a physiographic sketch (17 x 22 inches), 1941	0.25
Index to topographic mapping in Oregon, 1961	Free
Geologic time chart for Oregon, 1961	Free

OIL and GAS INVESTIGATIONS SERIES

1.	Petroleum geology of the western Snake River basin, Oregon-Idaho, 1963: V. C. Newton, Jr., and R. E. Corcoran	2.50