

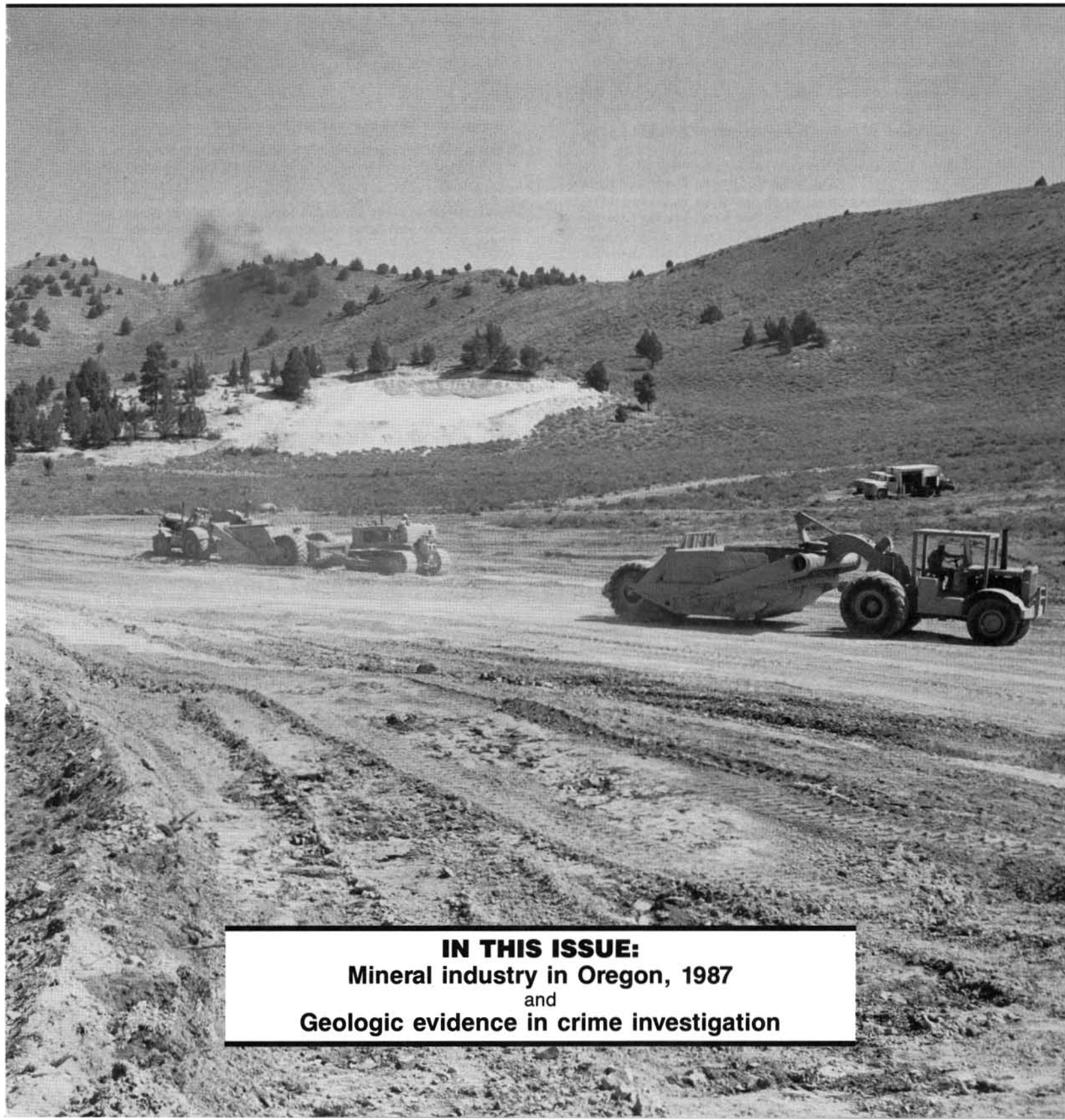
# OREGON GEOLOGY

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APRIL 1988



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and  
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# OREGON GEOLOGY

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## Information for contributors

*Oregon Geology* is designed to reach a wide spectrum of readers interested in the geology and mineral industry of Oregon. Manuscript contributions are invited on both technical and general-interest subjects relating to Oregon geology. Two copies of the manuscript should be submitted, typed double-spaced throughout (including references) and on one side of the paper only. If manuscript was prepared on common word-processing equipment, a file copy on 5¼-in. diskette may be submitted in addition to the paper copies. Graphic illustrations should be camera-ready; photographs should be black-and-white glossies. All figures should be clearly marked, and all figure captions should be typed together on a separate sheet of paper.

The style to be followed is generally that of U.S. Geological Survey publications (see the USGS manual *Suggestions to Authors*, 6th ed., 1978). The bibliography should be limited to "References Cited." Authors are responsible for the accuracy of the bibliographic references. Names of reviewers should be included in the "Acknowledgments."

Authors will receive 20 complimentary copies of the issue containing their contribution. Manuscripts, news, notices, and meeting announcements should be sent to Beverly F. Vogt, Publications Manager, at the Portland office of DOGAMI.

## COVER PHOTO

Eagle-Picher Minerals, Inc., operation in Malheur County, mining diatomaceous earth. Related article on Oregon's mineral industry in 1987 begins on next page.

## Mining Awareness Week proclaimed

In recognition of mining's important contribution to the economy of Oregon, Governor Neil Goldschmidt, on March 17, 1988, issued a proclamation declaring the week of April 24-30 Mining Awareness Week in Oregon. We are proud to present our readers with the text of the Governor's proclamation.

### PROCLAMATION

Whereas: The minerals extracted from the earth have opened doors to progress throughout history and are vital to the continuation of civilization; and

Whereas: Mineral discovery was an integral part of Oregon's history; and

Whereas: Mining will continue to make essential contributions to the economy of Oregon and the Nation; and

Whereas: Modern mining includes the best available reclamation technology to ensure beneficial subsequent use of mining sites; and

Whereas: The ability of the domestic mining industry to survive and prosper at home and in the international market is vital to the economic well-being and competitiveness of Oregon and the Nation;

Now, therefore, I, Neil Goldschmidt, Governor of the State of Oregon, hereby proclaim April 24-30, 1988, as

### Mining Awareness Week

in Oregon, in recognition of mining, which created, established, and maintained our Nation's industrial cornerstone resulting in benefits to the entire world.

In witness whereof, I hereunto set my hand and cause the Great Seal of the State of Oregon to be affixed. Done at the Capitol in the City of Salem, State of Oregon, on the day, March 17, in the Year of our Lord, One Thousand Nine Hundred Eighty-Eight.

Neil Goldschmidt, Governor

## Crater Rock Museum specimens featured in State Capitol display

Roxy Ann Gem and Mineral, Inc., of Medford supplied the display currently shown in the Oregon Council of Rock and Mineral Clubs (OCRMC) display case at the State Capitol in Salem. Installed by Wes and Dorothy Riley, the display features more than 50 specimens from the collection of the Crater Rock Museum owned by the Medford club. The museum, located next-door to the club's meeting hall, is a "must-see" for visitors to southern Oregon.

Roxy Ann's display at the Capitol shows materials from nine Oregon counties: Petrified wood rounds and limbs from Crook, Deschutes, Gilliam, Jackson, Malheur, and Sherman Counties; thundereggs from Crook, Harney, Jefferson, and Wasco Counties; sagenite agate from Jackson County; plume agate from Jefferson County; and Copco agate from Jackson County.

Polished thunderegg halves are shown on the top shelf of the case; sagenite, plume, and Copco agate specimens on the middle shelf; large rounds and small limbs of petrified wood on the lower shelf; and 18 miniature slabs of sagenite, plume, and Copco agate on the illuminated bottom of the case.

The display will remain in place until May 14, 1988, and will be followed by exhibits of rocks and minerals from Far West Lapidary and Gem of Coos Bay (May to September) and the Trail's End Gem and Mineral Club of Astoria (September to January).

—OCRMC news release

# Exploration and mining activity in Oregon, 1987

by Len Ramp, Resident Geologist, Grants Pass Field Office, Oregon Department of Geology and Mineral Industries

## SUMMARY

During 1987, the level of exploration and mining activity in Oregon increased over that of 1986. The value of nonfuel mineral production increased from \$126 million in 1986 to \$154 million in 1987, and the total mineral production including natural gas increased from \$135 million in 1986 to \$160 million in 1987. The drop in the total value of metal production due to the August 1986 shutdown of the Hanna nickel mine and the 1987 shutdown of the Hanna smelter near Riddle was more than offset by the increase in production of diatomite from the Eagle-Picher operation near Vale and the statewide rise in demand for construction materials such as sand and gravel and stone.

During 1987, 595 mine sites were active. Approximately 30 were metallic- and industrial-mineral mines, and the rest were mainly sand and gravel and stone operations. During the same period, a total of 37 metallic-mineral sites were explored by 29 separate companies. Some of the exploration projects were continued from the preceding year, and several new ones were added.

OREGON'S MINERAL PRODUCTION				
MILLIONS OF DOLLARS				
	ROCK MATERIALS	METALS & INDUSTRIAL MINERALS	NATURAL GAS	TOTAL
	Sand & Gravel, Stone	Cement, Nickel, Pumice, etc.		
1972	54	22	0	76
1973	55	26	0	81
1974	75	29	0	104
1975	73	33	0	106
1976	77	35	0	112
1977	74	35	0	109
1978	84	44	0	128
1979	111	54	+	165
1980	95	65	12	172
1981	85	65	13	163
1982	73	37	10	120
1983	82	41	10	133
1984	75	46	8	129
1985	91	39	10	140
1986	96	30	9	135
1987	102	52	6	160

Summary of mineral production in Oregon for the last 16 years. Data for 1987 derived from U.S. Bureau of Mines annual preliminary mineral industry survey and Oregon Department of Geology and Mineral Industries natural gas production statistics.



Mill at Greenback Mine, Josephine County (active mine site II).



Table 1. *Active mines in Oregon, 1987*

Map no.	Data
<b>Industrial minerals</b>	
1.	Ash Grove Cement West (cement, limestone), sec. 11, T. 12 S., R. 43 E., Baker County. Company continued production of crushed limestone (marble) for refining beet sugar and production of cement from marble and shale mined by the plant site along Interstate Highway 84 near Durkee. Production is valued at about \$25 million per year.
2.	Eagle-Picher Minerals, Inc. (diatomite), Tps. 19 and 20 S., Rs. 35, 36, and 37 E., Harney and Malheur Counties. The company operates a mill near Vale and produces diatomite, which is processed by air classification and flux calcining (partial fusion and agglomeration) and sold under the brand name of Celatom. Diatomite is used as a filter aid for water, beverages (beer), syrups, juices, edible oils, fuels, and pharmaceuticals.
3.	Teague Mineral Products (bentonite and zeolite), secs. 8, 28, and 29, T. 23 S., R. 46 E., Malheur County. Bentonite is used in drilling muds and as pet litter, as binder for hay pelletizing, and as a sealant for ponds, ditches, and solid-waste disposal sites. Clinoptilolite (zeolite), produced from a mine on Succor Creek, is used mostly for pet litter but also in odor-control products and as fungicide carrier and ammonia absorbent in aquarium systems. Clinoptilolite also readily absorbs radioactive cesium.
4.	Oil-Dri Production Company (diatomite), secs. 14, 21, and 23, T. 27 S., R. 16 E., Christmas Valley, northern Lake County. The company is continuing production of diatomite, which is packaged as pet litter for several companies under various brand names.
5.	Central Oregon Bentonite Company and Oregon Sun Ranch, Inc. (bentonite), sec. 4, T. 19 S., R. 21 E., Crook County. Both companies continued production of bentonite clay from adjacent properties near Clover Creek, a tributary of Camp Creek.
6.	Cascade Pumice and Central Oregon Pumice, Tps. 17 and 18 S., R. 11 E., in the Bend area, Deschutes County. Both continued production of screened pumice primarily for lightweight aggregate in concrete block manufacturing.
7.	CooSand Corporation (silica sand), sec. 34, T. 24 S., R. 13 W., Coos County. The company continued production of glass sand and abrasive sand from dunes. The sand is shipped by rail to Portland. Part is cleaned magnetically and used in the production of colored-glass containers such as beverage bottles, and part is used as air-blast sand and railroad traction sand.
8.	Bristol Silica and Lime Company (silica), sec. 30, T. 36 S., R. 3 W., Jackson County. Production of silica rock for decorative granules, abrasives, poultry grit, and filtration media continued. The company's adjacent dolomite deposit was explored, and equipment is being installed to produce dolomite in the near future. No lime was produced in 1987.



Bonanza Mining Company placer, Baker County (active mine site 22).

Table 1. *Active mines in Oregon, 1987—continued*

Map no.	Data
9.	Steatite of Southern Oregon (soapstone), secs. 10 and 11, T. 41 S., R. 3 W., Jackson County. Production of block soapstone for carving continued during the year.
10.	D and D Ag Lime and Rock Company (agricultural lime), sec. 20, T. 28 S., R. 5 W., Douglas County. The company worked the old Oregon Portland Lime Quarry and produced a small amount of agricultural lime during the year.
<b>Lode gold mines</b>	
11.	Greenback Mine, sec. 33, T. 33 S., R. 5 W., Josephine County. Geo Gold and Silver and Josephine County Partners optioned the property, revamped the mill, opened up the lower workings, and produced some gold. Operators pumped out the winze, laid track on the 900 level, and did sampling. About 200 tons of ore from the Hammersley Mine dump were reportedly processed through the Greenback Mill.
12.	Maid of the Mist Mine, sec. 4, T. 39 S., R. 4 W., Upper Applegate district, Jackson County. The mine is operated in a small way by three senior citizens, Art Goss, Dudley Smith, and Lou Kula, who have cleaned out old adits and started milling small quantities of ore with a small ball mill.
13.	Gold Blanket Mine, sec. 14, T. 38 S., R. 9 W., Illinois River district, Josephine County. Near-surface deposits consist of several small quartz veins and flat-lying mineralized shears in altered siltstone and chert of a volcanoclastic unit of Late Jurassic age. A small mill is used for minor production by claim owners. The operation is seasonal.
14.	Oregon King Mine (gold and silver), sec. 30, T. 9 S., R. 17 E., Ashwood district, Jefferson County. ORECO Enterprises, Inc., conducted a successful heap-leach operation. Winter shutdown and continued production in 1988 are planned.
15.	Lower Grandview (Thomason) Mine, sec. 6, T. 14 S., R. 37 E., Baker County. Operated in a small way by owner Art Cheatham, this seasonal operation employed three workers, used a small mill, and had modest production for the past several years.
16.	Pyx Mine, sec. 1, T. 10 S., R. 35 E., Greenhorn district, Grant County. The mine was worked on a seasonal basis by Myron Woodley. Small production was reported from near-surface pocket enrichment and underground veins. Ore was milled at Woodleys Mill in Sumpter.
17.	Virtue Mine, sec. 21, T. 9 S., R. 41 E., Virtue district, Baker County. The mine was worked by Keith Lyons and Jeff Young. Small production using Lyon's small custom mill in nearby Baker was reported. The mine was an important early-day producer from small high-grade veins. Total recorded production during 1862-1884, 1893-1899, and 1906-1907 was \$2.2 million.



Open cut and adits at Gold Blanket Mine, Josephine County (active mine site 13).

Table 1. Active mines in Oregon, 1987—continued

Map no.	Data
18.	Golden Eagle Mine (Eagle Group), sec. 19, T. 9 S., R. 38 E., on Lake Creek, Baker County. Owner-operator Woody Allstead is working the small high-grade deposit using a closed-circuit portable mill. This operation shuts down during the winter due to snow.
19.	Iron Dyke Mine, sec. 21, T. 6 S., R. 48 E., on the Snake River, Baker County. Silver King Mines, Inc., produced 15,000 tons of ore averaging 3.5 percent Cu, 0.35 oz/ton Au, and 0.5 oz/ton Ag that was trucked 22 mi to be processed in the Silver King mill at Copper Cliffs Mine near Cuprum, Idaho. Eleven people were employed in this operation.
20.	Gold Ridge Mine, secs. 16 and 17, T. 12 S., R. 43 E., Baker County. Milton Mitchek, operator, had some production during the year using a small mill at the mine.
21.	Ruth Mine, sec. 27, T. 8 S., R. 5 E., North Santiam district, Marion County. Shiny Rock Mining Company milled ore and shipped flotation concentrates containing Au, Ag, Pb, and Zn to China.

#### Placer mines

22. Bonanza Mining Company placer, sec. 3, T. 7 S., R. 45 E., Pine Creek, Cornucopia district, Baker County. This placer mine, which was the state's largest placer operation in 1987, employs about 12 people and uses sound environmental practices. Manager-operator is Tom Bonn, mining engineer, who designed the equipment and operating plan. A truck-mounted grizzly, trommel, and sluice are used to wash the gold from the gravel.
23. Goldwater, Inc., placer, T. 12 S., R. 38 E., on Pine Creek near Hereford, upstream from Oregon Highway 7, Baker County. A small-scale trommel and backhoe-loader are used, and the mine has been active for about six months each year for several years.
24. Broken Pick placer, sec. 12, T. 13 S., R. 41 E., on Clarks Creek, Baker County. This small-scale operation has also been active for several years.
25. Josephine Creek and tributaries, Josephine County, has three or four small operations in Tps. 38 and 39 S., R. 9 W.
26. Sucker Creek placers, Tps. 39 and 40 S., Rs. 6 and 7 W., Josephine County. These have three or four seasonal operations.
27. Coffee Creek placer, sec. 7, T. 30 S., R. 2 W., Douglas County. This seasonal operation has been worked for several years.
28. Coyote Creek placers, sec. 24, T. 33 S., R. 6 W., Josephine County. This placer is operated on a seasonal basis by Jack Smith.
29. Lower Grave Creek (Skipper's placer), secs. 31 and 32, T. 33 S., R. 7 W., Josephine County. This is a small-scale seasonal placer.
30. Galice area placers, Tps. 34 and 35 S., R. 8 W., Galice Creek, Rocky Gulch, Taylor Creek, and Peavine, Josephine County. All are small seasonal operations.



Broken Pick Mining Company placer mine on Clarks Creek in Baker County (active mine site 24).



Exploratory drilling at Quartz Mountain gold mine, Lake County (exploration site 25).

#### ACTIVITY

##### Metals

ORECO Enterprises conducted a heap-leach operation at the Oregon King gold-silver mine (active mine site 14 on map and in Table 1) in Jefferson County. Silver King Mines, Inc., mined gold, silver, and copper ore at the Iron Dyke Mine (active mine site 19) in Baker County.

The search continued for epithermal gold. These deposits are often associated with hot-spring deposits of siliceous sinter, jasperoids, opalite, and mercury. Host rocks are volcanic intrusive and extrusive rocks and tuffaceous and lacustrine sediments. The two principal areas of epithermal gold exploration activity include (1) the areas surrounding Vale in northern Malheur County near the eastern edge of the state, and (2) the Lakeview area in southern Lake County in the south-central part of the state. A few of the other areas that are being explored may also be classified as epithermal gold deposits.

Exploration activity included geochemical sampling, geological mapping, test drilling, and trenching. New claims were located, and previously staked claims were maintained.

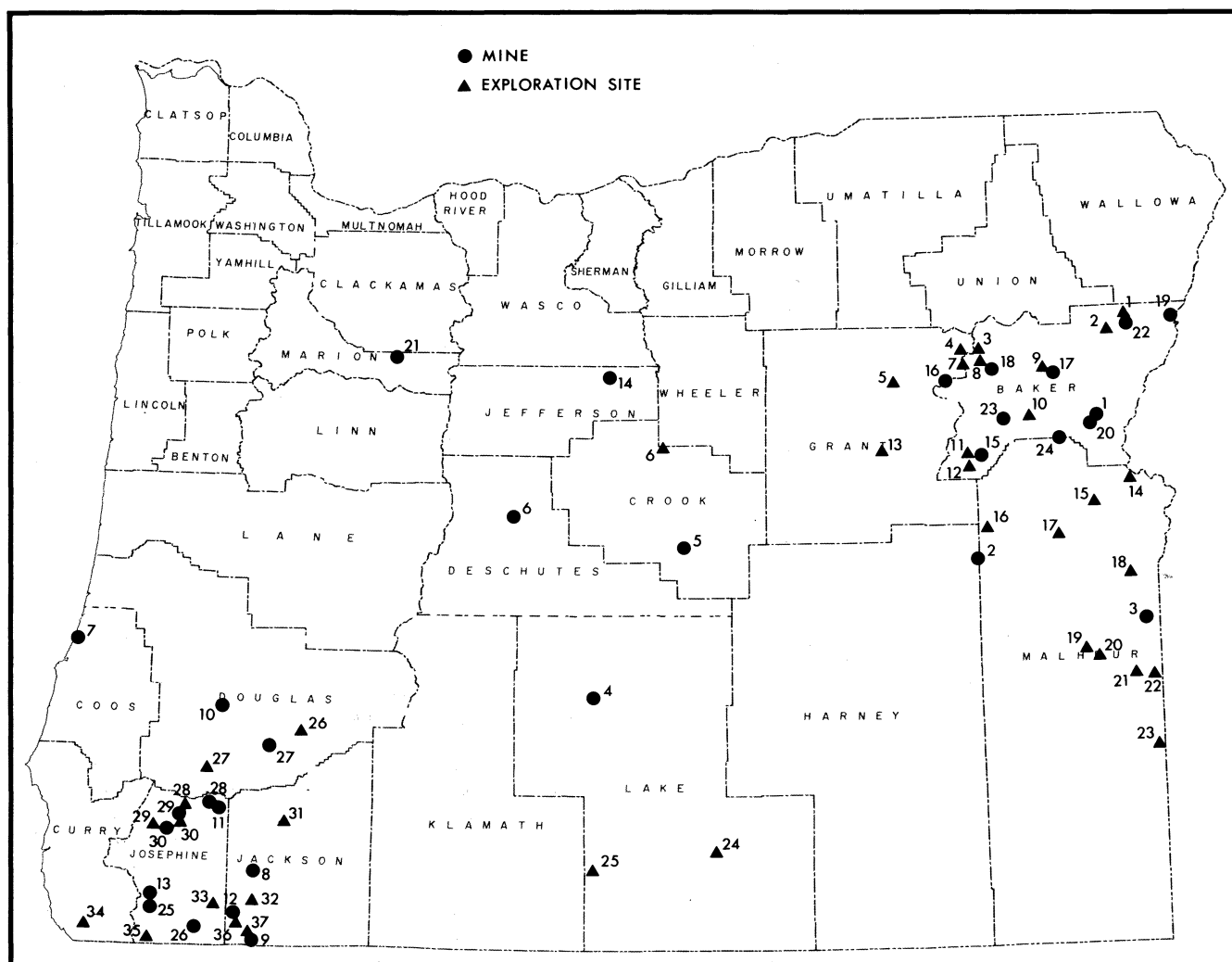
Volcanogenic sulfide deposits formed in submarine ophiolites and island-arc volcanic rocks are still being held and explored in southwestern Oregon. One example, the Turner-Albright Mine (exploration site 35 on map and in Table 2) in southern Josephine County, is held by Savanna Resources, who have drilled reserves of complex polymetallic sulfide ore with gold, silver, copper, zinc, and cobalt values. Recent ore-dressing work has been done by the U.S. Bureau of Mines on drill-core samples from this deposit.

Other volcanogenic sulfides are the Silver Peak Mine (exploration site 27) in southern Douglas County by Formosa Exploration, Inc., and the Goff Mine (exploration site 28) in northern Josephine County by AMSELCO (now known as BP America).

Exploration in the Baker area of northeastern Oregon was focused mainly on quartz veins and mineralized shear zones. The gold mineralization is genetically related to granitic intrusive rocks. The principal host rocks are argillite and chert of the Permo-Triassic Elkhorn Ridge Formation. A few of the deposits are in fractured hydrothermally altered zones in granitic intrusive rocks and narrow veins in gabbro and meta-andesite. Some attention is also still being paid to large areas of hydrothermal alteration in Tertiary volcanic rocks of the Western Cascades.

##### Industrial minerals

Industrial minerals continued to be a significant portion of the state's mineral production. Eagle-Picher Minerals, Inc. (active mine



## EXPLANATION

### ACTIVE MINES

1. Ash Grove Cement West (cement, limestone)
2. Eagle-Picher Minerals, Inc. (diatomite)
3. Teague Mineral Products (bentonite, zeolite)
4. Oil-Dri Production Company (diatomite)
5. Central Oregon Bentonite Company and Oregon Sun Ranch, Inc. (bentonite)
6. Cascade Pumice and Central Oregon Pumice (pumice)
7. CooSand Corporation (silica sand)
8. Bristol Silica and Lime Company (silica)
9. Steatite of Southern Oregon (soapstone)
10. D and D Ag Lime and Rock Company (agricultural lime)
11. Greenback Mine (gold)
12. Maid of the Mist Mine (gold)
13. Gold Blanket Mine (gold)
14. Oregon King Mine (gold, silver)
15. Lower Grandview (Thomason) Mine (gold)
16. Pyx Mine (gold)
17. Virtue Mine (gold)
18. Golden Eagle Mine (Eagle Group) (gold)
19. Iron Dyke Mine (gold, silver)
20. Gold Ridge Mine (gold)
21. Ruth Mine (gold, silver, lead, zinc)
22. Bonanza Mining Company placer (gold)

23. Goldwater, Inc., placer (gold)
24. Broken Pick placer (gold)
25. Josephine Creek and tributaries (gold)
26. Sucker Creek placers (gold)
27. Coffee Creek placer (gold)
28. Coyote Creek placers (gold)
29. Lower Grave Creek (Skipper's) placer (gold)
30. Galice area placers (gold)

### EXPLORATION SITES AND AREAS

1. Cornucopia Mine (gold)
2. Dolly Varden Mine, Eagle Creek district (gold)
3. Meadow Lake (gold)
4. Baby McKee, Alpine and Davenport (gold)
5. Susanville Mine (Bull of the Woods) (gold)
6. Ochoco Mine (gold)
7. Bald Mountain-lbex (gold)
8. Cracker Oregon Gold Mine (E and E) (gold)
9. Gray Eagle Mine, Virtue district (gold, antimony)
10. Dooley Mountain area (perlite)
11. Record Mine (gold)
12. Grouse Spring prospect (copper, silver)
13. Prairie Diggings prospect (gold)
14. Lackey prospect (gold)

15. Hope Butte (gold)
16. Castle Rock (gold)
17. Harper Basin Diatomite (diatomite)
18. Shell Rock Butte (gold)
19. Quartz Mountain (gold)
20. Red Butte (gold)
21. Bannock project (gold)
22. Mahogany project (gold)
23. Oregon-Idaho border area (gold)
24. Miners Draw-Coyote Hills (gold)
25. Quartz Mountain (gold)
26. Zinc Creek (gold)
27. Silver Peak Mine (gold, copper, zinc)
28. Hungry Hill-Goff Mine (gold, silver)
29. Howard Creek area (gold)
30. Alameda Mine (gold, silver)
31. Shamrock Mine, Hull Mountain area (copper, nickel, cobalt, platinum, gold)
32. Forest Creek area (gold)
33. Jones Marble (white marble)
34. Mount Emily area (gold)
35. Turner-Albright Mine (gold, copper, zinc, cobalt)
36. Palmer Creek area (gold)
37. Squaw Creek area (gold, copper)

Mining and mineral exploration in Oregon in 1987 (excluding sand and gravel and stone). Active mines are keyed to Table 1; exploration sites and areas are keyed to Table 2.

Table 2. *Exploration sites and areas in Oregon, 1987*

Map no.	Name	Location Sec./T.(S.)/R.	Commodity	Comments
1.	Cornucopia Mine	27/6/45 E. Baker County	Au (gold)	UNC Mining and Milling Corp.; volume sampling, core drilling, mapping, geochemistry, drifting.
2.	Dolly Varden Mine, Eagle Creek district	19,30/7/44 E. Baker County	Au	COMINCO American, Inc.; mapping, surface sampling, drilling.
3.	Meadow Lake	5/8/37 E. Baker County	Au	Chevron Resources; trenching, surface sampling, mapping.
4.	Baby McKee Alpine and Davenport	11/8/36 E. 14/8/36 E. Grant County	Au	Cable Cove Mining; portal and adit renovation, long-hole drilling.
5.	Susanville Mine (Bull of the Woods)	7,8/10/33 E. Grant County	Au	Widman Brothers; surface work and some rotary-hammer drilling.
6.	Ochoco Mine	29,30/13/20 E. Crook County	Au	Orbana Resources; core drilling.
7.	Bald Mountain-Ibex	3,4/9/36 E. Baker County	Au	American Copper Nickel holding property.
8.	Cracker Oregon Gold Mine (E and E)	32,33/8/37 E. Baker County	Au	Boise-Cascade; dump sampling and evaluation; contracted for 1,000 ft of new drift and crosscuts to vein.
9.	Gray Eagle Mine, Virtue district	7/9/41 E. Baker County	Au, Sb (antimony)	Morrison Knudsen Co.; surface sampling and mapping; drilling is planned.
10.	Dooley Mountain area	—/11,12/40 E. Baker County	Perlite	Supreme Perlite; continuing evaluation of perlite deposits in area.
11.	Record Mine	1,2/14/36 E. Baker County	Au	Golconda Resources Ltd.; drilling.
12.	Grouse Spring prospect	24,25/14/36 E. Baker County	Cu (copper), Ag (silver)	Manville Corp.; diamond drilling.
13.	Prairie Diggings prospect	33/13/32 E. Grant County	Au	GSR Goldsearch Resources, Inc.; 7,000 ft of drilling; applied for mining permits.
14.	Lackey prospect	22,27/15/45 E. Malheur County	Au	Permian Resources; drilling.
15.	Hope Butte	21/17/43 E. Malheur County	Au	Chevron Resources; drilling.
16.	Castle Rock	8,9/18/37 E. Malheur County	Au	Chevron Resources; surface sampling, mapping.
17.	Harper Basin diatomite	—/18,19/41,42 E. Malheur County	Diatomite	Manville Corp.; drilling.
18.	Shell Rock Butte	18/21/45 E. Malheur County	Au	Permian Resources; drilling.
19.	Quartz Mountain	6/25/43 E. Malheur County	Au	Chevron Resources; drilling.
20.	Red Butte	26,27,34,35/25/43 E. Malheur County	Au	Chevron Resources; hand trenching.
21.	Bannock project	11/26/45 E. Malheur County	Au	Chevron Resources; surface sampling, mapping.
22.	Mahogany project	25,26/26/46 E. Malheur County	Au	Chevron Resources; surface sampling.
23.	Oregon-Idaho border area	—/—/— Malheur County	Au	Beaver Resources Ltd.; large area, aerial thematic mapping.
24.	Miners Draw-Coyote Hills	14,15,22,23/35/23 E. Lake County	Au	U.S. Minerals Exploration; 12 reverse circulation holes drilled.
25.	Quartz Mountain	26,27,34,35/37/16 E. Lake County	Au	Galactic Resources Ltd./Quartz Mountain Gold Corp. drilling, trenching, metallurgical testing, permitting.
26.	Zinc Creek	23/29/1 W. Douglas County	Au	Inland Gold; reconnaissance.
27.	Silver Peak Mine	23/31/6 W. Douglas County	Au, Cu, Zn (zinc)	Formosa Exploration, Inc.; mapping, sampling, core drilling, evaluation.
28.	Hungry Hill-Goff Mine	20,29,30/33/7 W. Josephine County	Au, Ag	AMSELCO/BP-America; renewed exploration permit with Josephine County.
29.	Howard Creek area	—/34/8,9 W. Josephine County	Au	Sawyer Consultants; exploration of large block claims, mapping, sampling.

Table 2. *Exploration sites and areas in Oregon, 1987—continued*

Map no.	Name	Location Sec./T.(S.)/R.	Commodity	Comments
30.	Almeda Mine	13/34/8 W. Josephine County	Au, Ag	Kennecott Exploration; completed evaluation of 1986 drilling, turned back to owners February 1987.
31.	Shamrock Mine, Hull Mountain area	19/34/2 W. Jackson County	Cu, Ni (nickel), Co (cobalt), Pt (plat- inum), Au	Freeport-McMoRan Gold Co.; drilled four holes, further work planned.
32.	Forest Creek area	—/38/3 W. Jackson County	Au	Freeport-McMoRan Gold Co.; reconnaissance on large claim block; seven holes drilled, then option dropped.
33.	Jones Marble	31/38/5 W. Josephine County	White marble	North Lilly Mining Co.; drilling on adjacent claims held by Morris.
34.	Mount Emily area	8/40/12 W. Curry County	Au	Mapping, geochemistry, drilling by Mount Emily Resources.
35.	Turner-Albright Mine	15,16/41/9 W. Josephine County	Au, Cu, Zn, Co	Savanna Resources Ltd. obtained drill core samples for U.S. Bureau of Mines; metallurgical testing of massive sulfide ore.
36.	Palmer Creek area	35/39/4 W. Jackson County	Au	Westley Mines-Nerco joint venture; geochemistry, mapping, drilling.
37.	Squaw Creek area	31,32.5,6,8/40,41/3 W. Jackson County	Au, Cu	Freeport-McMoRan Gold Co.; reconnaissance of large claim block.

site 2) completed its first full year of diatomite production from its operation in Harney and Malheur Counties. Oil-Dri Production Company (active mine site 4) continued to produce diatomite for pet litter and floor sweep. Teague Mineral Products Company (active mine site 3) produced bentonite and zeolites in Malheur County. Ash Grove Cement West (active mine site 1) continued cement production near Durkee and produced crushed limestone for sugar refining. Cascade Pumice and Central Oregon Pumice (active mine site 6) produced pumice near Bend, chiefly for lightweight aggregate used in concrete blocks. Coosand Corporation (active mine site 7) continued production of glass and abrasive sands from dunes in Coos County.

## OREGON DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

The Oregon Department of Geology and Mineral Industries is studying the industrial-mineral potential of the state. An evaluation of Oregon's talc deposits will be the first to be completed and will be published later this year. Other industrial minerals currently under study by the Department include limestone, bentonite, silica sand, and zeolites.

The Department released its first complete listing of mineral producers in the state (Open-File Report O-87-03, *Directory of Mineral Producers in Oregon*), which may be purchased from the Department for \$5. □

## Oregon Geology publication schedule to change

Since the earliest days of the Oregon Department of Geology and Mineral Industries, we have published a monthly magazine. In the interest of greater variety, cost containment, and better time management, we now plan to print six double issues of *Oregon Geology* each year instead of the twelve single issues you have been accustomed to receiving.

We asked for your opinions last year in the October issue and received generally supportive comments. Most of you who responded understood the need for change in these days of vast new amounts of information, increased demands on agency staff, more data, changing priorities, fewer dollars, and rapidly changing technology.

We have the same loyalty to you that you have demonstrated to us over the years with your subscriptions to the magazine and letters and comments to us. You can rest assured that you will receive at least the same number of pages in a year's subscription that you received under the old system. Our plan is to give you a better blend of material in a single issue and occasionally to present you with interesting types of articles that space constraints precluded with the old format.

We in Oregon are surrounded by some of the most interesting geology to be found anywhere in the world. New and complicated techniques are helping geologists understand our geologic heritage to a degree that was never possible until now. We are also just star-

ting to identify new, hitherto unrecognized mineral resources that lie within our state's boundaries. Some of this information is first announced or released in *Oregon Geology*. Some of it would be lost forever if it were not printed on the pages of this magazine. It is our intention to use this bimonthly format to continue to inform you, our readers, about the best and latest news of the geology of Oregon.

Watch for the May/June issue. □

## Former Board member R.W. deWeese dies

Raymond W. "Bill" deWeese, prominent Portland businessman and member of the Governing Board of the Oregon Department of Geology and Mineral Industries from 1969 to 1977, died of a heart attack on Monday, March 7, 1988, in his office in Portland.

Until his retirement in 1970, deWeese worked for Esco Corporation, where he had been Vice President for marketing and a member of the Board for 30 years, retiring in 1970. He also founded several companies, including Odyssey Productions, Inc.; Catheter Technology Corporation; Synektron; and Asia Pacific. He was active in community affairs, serving on the Portland School Board for many years and on the boards of several companies, including Cascade Corporation, Oregon Metallurgical Corporation, and PacWest Bancorp.

DeWeese is survived by his wife Kuniko; sons Douglas, Alexander, and David; daughter Ann Thompson; and three grandchildren. □



# Murder, soil, and rocks: Geologic evidence in crime investigation

by Charles A. Tracy, Professor of Administration of Justice, Portland State University, Portland, Oregon, and Michael T. Long, Forest Engineering Geologist, Willamette National Forest, Eugene, Oregon

The battered body of Stephanie Bryan was placed in a shallow hillside grave by her murderer, who carelessly neglected to either clean his boots or dispose of them. Almost one year later, in 1957, Burton Abbott was convicted and executed for her murder, primarily as the result of the testimony of Dr. Paul L. Kirk, a pioneer American criminalist at the University of California at Berkeley, who was able to convince the jury that the tiny bits of clay and gravel on Abbott's boots came from the grave site. (For a general description of this case, see deFord, 1966).

Dr. Kirk's testimony was based on the concept of using scientific knowledge and scholarly deduction to solve crimes, an idea first expressed to Western readers a century ago by Arthur Conan Doyle's Sherlock Holmes. In his first episode, *A Study in Scarlet*, which was published in 1887, Dr. Watson lists twelve areas of knowledge used by Holmes in his practice as a consulting detective. One of these areas was geology, which permitted him to "tell at a glance different soils from each other." Forensic geology was established!

It took 17 more years, however, before this new field moved from fictional to factual murder cases. In 1904, a German chemist, Dr. Georg Popp, linked a murder suspect to the crime scene by matching crystals of hornblende and quartz found in a sample of sand on a handkerchief near the body with similar minerals taken from under the fingernails of the suspect. Dr. Popp was also able to determine that the specific variety and size distribution of quartz and hornblende crystals on the suspect's trousers corresponded to those in the loamy soil where the body of the victim was found.

Popp firmly established the value of geologic evidence in 1908, when he was able to place a murder suspect at the crime scene, as well as to destroy his alibi, by tracing his movements during the day of the murder. On the sole of one of the suspect's shoes was a small amount of layered soil. One layer consisted of red clay mixed with splintery quartz crystals and mica, comparable to the soil where the body had been found. A second layer contained carbon, brick dust, and concrete fragments—consistent with components of soil at a location where the suspect's bloody trousers had been found. The suspect claimed to have been working during the day of the crime in a field located a considerable distance from where the murder had occurred. The soil in this field was found to be largely composed of "porphyry" (sic). (Popp may have been referring to sand grains composed of two minerals, i.e., quartz and hornblende.) However, no trace of this material was found on the suspect's shoe. The suspect was convicted, again largely because of Popp's expert testimony. Later, after the murderer's death sentence was commuted to life imprisonment, he corroborated Popp's conclusions (Thorwald, 1967).

More recently, in 1983, geologic evidence played an important role in the penalty phase of a California murder trial (Rapp, 1987). Tiny rock clasts found in the defendant's automobile were identified by state geologists as being the same as rock clasts located at a gravel pit where the body of a murder victim had been found. Even though the defendant was not being tried for this particular murder, the geologic evidence was part of the prosecutor's argument to the jury that the defendant's past violent activities justified the death penalty—which he received.

The value of soil and rock fragments as physical evidence in crime investigations is based on the probability of two samples originating

from the same location. Unfortunately, few statistically valid studies on the variability of soil have been conducted. The findings from those studies that have been reported seem to support the notion that natural variations are highly probable. For example, a study during the late 1970's in southern Ontario, Canada, found that the probability was less than 1 in 50 chances of finding two soil samples that were the same in color and mineral properties, when they originated from two different locations 1,000 ft apart (Saferstein, 1977).

The natural potential for soil and rock fragments to be useful as physical evidence is limited by the ability of the forensic scientist to determine whether two samples are from the same source. Mistakes are made, however. A 1976 study of crime labs in the United States found 35 percent of 93 labs that agreed to test two samples from two different geographical locations came to the wrong conclusion of common origin (Peterson, 1983).

Nevertheless, the value of geologic evidence has been validated over the past 80 years by the work of such scientists as Popp and Kirk, and it will continue to play an important role in solving crimes and convicting criminals (Murray and Tedrow, 1975). Indeed, before his trial, Burton Abbott expressed to a cellmate fear only of Paul Kirk's expert testimony, even though he went to his death in San Quentin's gas chamber still denying that he had murdered Stephanie Bryan.

**Note:** A two-day forensic-science conference will be held in the Portland metropolitan area on June 13 and 14, 1988. Those readers who would like more information on the conference or who are interested in expanding their knowledge about forensic sciences are invited to contact Dr. Charles A. Tracy at Portland State University, PO Box 750, Portland OR 97207, phone (503) 464-4014.

## REFERENCES CITED

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- Thorwald, J., 1967, *Crime and science*: New York, Harcourt, Brace, and World, p. 235-252. □

## More USGS topographic maps now available

The U.S. Geological Survey (USGS) map catalog for the State of Oregon now lists a total of 1,911 7½-minute (scale 1:24,000) maps that will eventually be printed for the state. Over 1,400 of these maps are in print and are now available at the Portland business office of the Oregon Department of Geology and Mineral Industries (DOGAMI).  
(Continued on page 46, *Maps*)

## OIL AND GAS NEWS

### Gas storage project drilling planned

Oregon Natural Gas Development Corp. has applied for five drilling permits as part of the natural gas storage project at Mist Gas Field, where gas is injected and stored in the depleted Bruer and Flora Pools. Four of the applications are for injection-withdrawal wells, and one is for an observation-monitor well. Observation-monitor wells are generally used to monitor gas levels and pressures in the storage reservoirs, while injection-withdrawal wells are used to add gas to and remove gas from the storage reservoirs. There are currently two injection-withdrawal and six observation-monitor wells at the gas storage project.

### Recent permits

Permit no.	Operator, well, API number	Location	Status, proposed total depth (ft)
401	Oregon Nat. Gas Dev. IW 42C-10 36-009-00235	NE¼ sec. 10 T. 6. N., R. 5. W. Columbia County	Application; 2,600.
402	Oregon Nat. Gas Dev. IW 22D-10 36-009-00236	NW¼ sec. 10 T. 6. N., R. 5. W. Columbia County	Application; 2,600.
403	Oregon Nat. Gas Dev. OM 43B-10 36-009-00237	SE¼ sec. 10 T. 6. N., R. 5. W. Columbia County	Application; 3,000.
404	Oregon Nat. Gas Dev. IW 33D-3 36-009-00238	SE¼ sec. 3 T. 6. N., R. 5. W. Columbia County	Application; 2,900.
405	Oregon Nat. Gas Dev. IW 23B-3 36-009-00239	SW¼ sec. 3 T. 6. N., R. 5. W. Columbia County	Application; 2,800.

## State Map Advisory Council publishes first annual report

The State Map Advisory Council for Oregon (SMAC) has released its first annual report, a summary of its activities and accomplishments in 1987. The Council was established by Governor Neil Goldschmidt by Executive Order on July 11, 1987.

The 54-page report was produced under the chairmanship of Deputy State Geologist John D. Beaulieu and published by the Oregon Department of Geology and Mineral Industries as Open-File Report O-88-01. It lists the members of the Oregon SMAC and its committees for maps, geographic information systems, and land records. The release further contains reports on meetings of the committees of SMAC.

The Oregon SMAC is the lead governmental body in Oregon for mapping discussions. It consists of representatives from federal and state agencies, local government, and private industry. Its purpose is to focus computerized mapmaking activities in Oregon and to prevent duplication of efforts.

The new release, *First Annual Report of the State Map Advisory Council for Oregon, 1987*, is available now at the Oregon Department of Geology and Mineral Industries, 910 State Office Building, 1400 SW Fifth Avenue, Portland, OR 97201. The purchase price is \$5. Orders under \$50 require prepayment. □

## TO THE EDITOR

### AVALANCHE HAZARDS FOR CLIMBERS AT MOUNT ST. HELENS NOTED

The March article regarding the geology of the Monitor Ridge climbing route on Mount St. Helens provides a new dimension to an ascent of the mountain.

One additional item should be added to the section on climbing hazards, however. Slab avalanches can and do occur on the slopes adjacent to Monitor Ridge. On the weekend of March 12, a very large slab avalanche occurred on the Swift Glacier, starting at about 7,500 ft and traveling a mile to about 5,000 ft in elevation.

Climbers should pay close attention to snow-slab buildup and should climb on the ridge crest. Skiers are especially at risk, as the better ski descents are in bowls adjacent to the ridge. These bowls can be subject to avalanche hazard during and after snowfall or wind-driven snow deposition. At this time of year, the hazard is also increased by hot, sunny weather, making slopes with southern exposure unstable by noon.

Climbers should always call the avalanche forecast before climbing. The number is (503) 221-2400.

—Dennis L. Olmstead

*Oregon Department of Geology and Mineral Industries*

### PALEONTOLOGIST REMEMBERED

I was very interested in the article on paleontology in Oregon published in the December 1987 issue of *Oregon Geology*. In particular the paragraph about Charles E. Weaver brought back good memories. I was an undergraduate student at the University of Washington 1942-46, and Charles Weaver was the professor of paleontology.

The reason that he spurned the automobile was that he was color-blind and not allowed to drive a car. He could recognize only yellow, and when he used colored chalk on the blackboard he had to ask the class what color he was using.

His walking was legend, and we heard that he had walked the entire north and west coasts of the Olympic Peninsula and often had such a large pack that he had to lie down on the beach to slip into it and then have a couple of Indians lift him up with the pack on his back.

He seldom used a textbook, and all his lectures were dictated. He would come to class and ask a student what the last sentence was that he gave in the previous lecture and then would start out that day's lecture from the last sentence of the previous day's lecture.

Wilbert R. Danner

*Professor of Geology  
University of British Columbia*

### NOTE

The article "Paleontology in Oregon" in the December 1987 issue of *Oregon Geology* included, on the front cover of the issue, a photo of Ralph Chaney and a woman we had not been able to identify. Former Oregon State Geologist Ralph Mason tells us it is Ethel I. Sanborn, then paleobotanist at Oregon State College in Corvallis. □

### (Maps continued from page 45)

By 1991, the USGS plans to have the entire set of maps in print and will be phasing out the old 15-minute (scale 1:62,500) maps within the next ten years. A photo-revision program for existing quadrangle maps is in progress, and the newly revised maps are continuously released.

DOGAMI also sells 15-minute, 1:250,000 topographic, and other USGS geologic maps along with all DOGAMI publications at the Portland business office. The USGS map catalog is available free, over-the-counter from the Portland office and from any other map dealer who sells USGS maps. It may also be ordered by mail from the USGS, Box 25286, Federal Center, Denver, CO 80225. □

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