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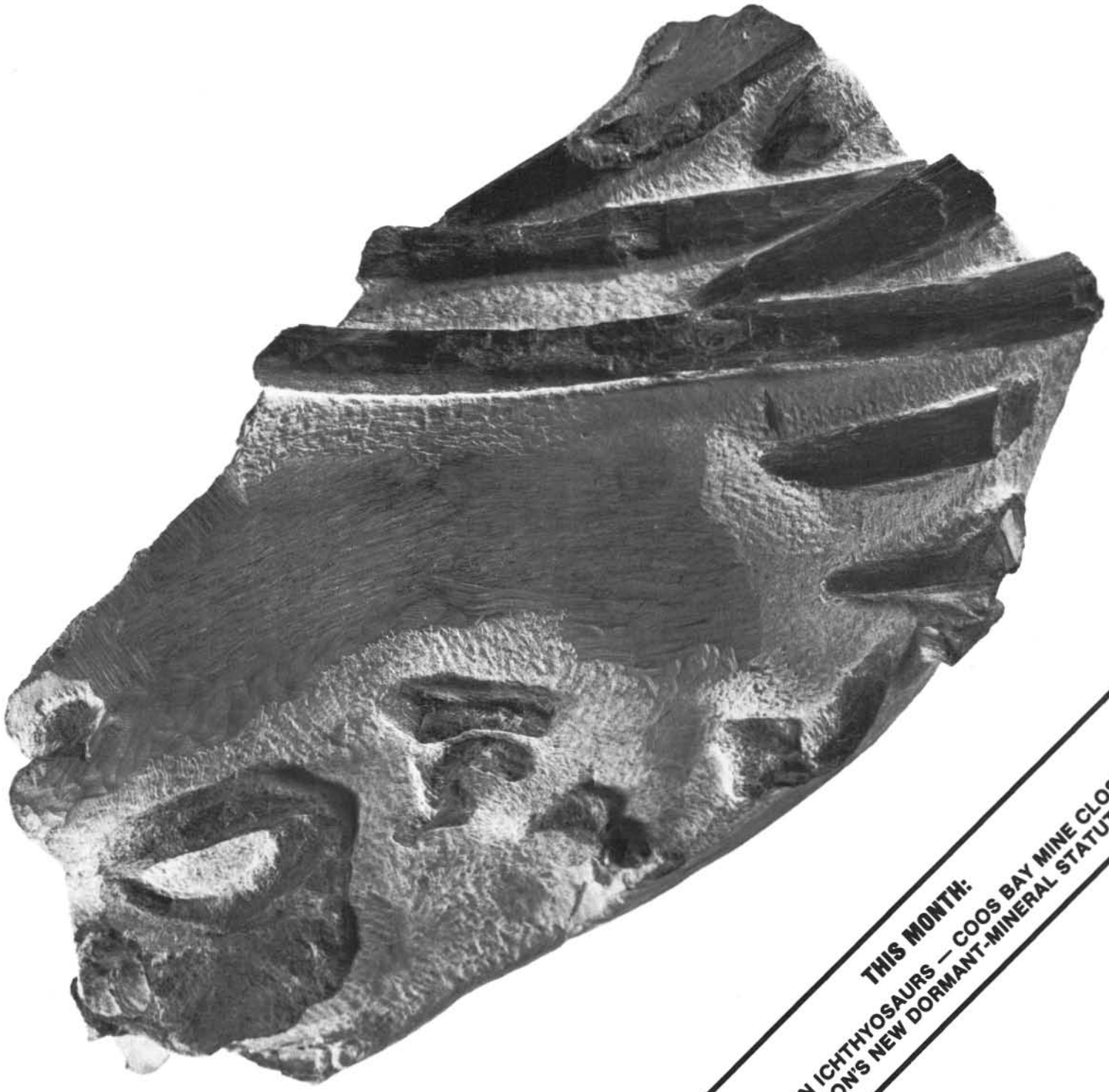

THIS MONTH:
OREGON ICHTHYOSAURS — COOS BAY MINE CLOSED
OREGON'S NEW DORMANT-MINERAL STATUTE

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. 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 their 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

Oregon's oldest fossil vertebrate is represented by these remains of a large fishlike reptile (ichthyosaur) from the Upper Triassic Martin Bridge Formation of the southern Wallowas. Characteristic grooved ribs and details of the vertebra identify it as the genus *Shastasaurus*. See article beginning on next page. (Photo by Harry Howard, Department of Biology, University of Oregon)

OIL AND GAS NEWS

Columbia County — Mist Gas Field

Reichhold Energy Corporation completed work on three of its wells: Columbia County 23-35, in sec. 35, T. 7 N., R. 5 W., was plugged and abandoned June 8, 1985. Total depth was 3,600 ft. Columbia County 33-8, in sec. 8, T. 6 N., R. 5 W., was spudded April 30, 1985, drilled to a total depth of 3,612 ft, and plugged and abandoned May 12, 1985.

Crown Zellerbach 34-26, in the extreme southeastern part of the field near Pittsburg, (sec. 26, T. 5 N., R. 4 W.), was spudded April 21, 1985, drilled to a total depth of 5,838 ft, and plugged and abandoned May 7, 1985.

*(Continued on page 82, **Oil and Gas**)*

Study sees potential of large lignite deposits in northeastern Oregon

Extensive deposits of lignite, or brown coal, may be present in northeastern Oregon. A report released by the Oregon Department of Geology and Mineral Industries (DOGAMI) concludes, on the basis of preliminary data, that the recently discovered Grande Ronde lignite field may contain nearly two billion tons of lignite in an area of approximately 240 square miles.

The Grande Ronde lignite field, located in northern Union and Wallowa Counties and extending into Asotin County, Washington, was the main focus of the report released as DOGAMI Open-File Report 0-85-2 and entitled *Preliminary Report on Northeastern Oregon Lignite and Coal Resources, Union, Wallowa, and Wheeler Counties.*

The report, partially funded by the U.S. Bureau of Land Management and authored by DOGAMI geologist M.L. Ferns, summarizes the available information on coal resources in two areas of northeastern Oregon, the Grande Ronde lignite field in northern Union and Wallowa Counties and the Mitchell area in Wheeler County. It contains two maps (scale 1:100,000) showing the known distribution of rock units that may contain deposits of coal and lignite in those areas. The 20-page text describes the geologic setting of the sediments and of the accompanying coal or lignite resources.

While the Grande Ronde lignite field is now considered Oregon's largest potential source of lignite, the known and reported coal and lignite deposits in the Mitchell area appear to have much less potential as a source of lignite.

The new Open-File Report 0-85-2 is now available at the Oregon Department of Geology and Mineral Industries, 910 State Office Building, 1400 SW Fifth Avenue, Portland, Oregon 97201. The purchase price is $6. Orders under $50 require prepayment. □

BLM and USFS honor miners

Three Pacific Northwest mining firms were honored by the Bureau of Land Management (BLM) and the U.S. Forest Service (USFS) in March for their environmentally sensitive, safe, and efficient operations on publicly owned lands. The three who received awards are Central Oregon Pumice Company, Bend, Oregon; Teague Mineral Products, Adrian, Oregon; and Vulcan Mountain, Inc., Lamona, Washington.

Central Oregon Pumice's surface pits on the Deschutes National Forest, produce a range of construction materials. The company actively reclaims the ground as it goes, restoring disturbed areas to agricultural and grazing land.

*(Continued on page 80, **BLM**)*

Oregon's oldest vertebrates [Ichthyosauria (Reptilia)]

by William N. Orr and Kurt T. Katsura, Department of Geology, University of Oregon, Eugene, Oregon 97403

ABSTRACT

A recent discovery of marine Triassic reptilian remains in Oregon has pushed back the fossil record of vertebrates in the state 40 million years. Fossils of reptiles in Oregon are rare, but several discoveries within the past decade have almost doubled their known record here.

With the progressive breakup of Pangea during the Mesozoic, the open-ocean ichthyosauria appear to become increasingly cosmopolitan. Provincial Triassic taxa such as the Oregon form reported here from the Wallowas add to the evidence for accreted terranes in northeast Oregon.

INTRODUCTION

Using reptiles as a basic structure, the evolutionary process was successful during the Mesozoic era in generating a striking array of organisms occupying terrestrial, aquatic, and even aerial habitats. Even more remarkable was the thorough environmental-niche exploitation by this legion of reptilian types. One of the most highly specialized of these reptile orders was the order of Ichthyosauria (Figure 1). This group shared the Mesozoic seas with several others including mosasaurs, plesiosaurs, placodonts, nothasaurs, geosaurs, and Chelonia. Within this suite of seven groups of marine reptiles, five bear the hallmarks of a fish predator — a long jaw and neat rows of needlelike teeth. The cobblestone dental pavement of the placodonts is remarkably convergent with modern walrus and reflects the adaptation for feeding on shelled molluscs. The horny beak of the chelonians (turtles) today, as in the Mesozoic, is that of a herbivore. From this striking array of reptiles, the ichthyosaurs alone achieved the thorough skeletal modification necessary for existence as open-ocean predators capable of high-speed pursuit.

Probably the most spectacular fossil occurrence of the latter reptiles in North America is the ichthyosaur "graveyard" of Nye County, Nevada. Described by Camp (1980), some 37 skeletons have been brought to light here. The largest of these are up to 15 m in length, and the articulated specimens on display at Nevada's Berlin-Ichthyosaur State Park are well worth the side trip to see. Skeletal remains are entombed in the Upper Triassic (Karnian stage) Luning Formation.

Oregon does not have anything quite so sensational as a bone "graveyard," but the record of fossil ichthyosaur remains here is expanding and rivals that of any other state. Beginning with the initial report by Marsh (1895), five separate occurrences in Oregon have been reported, representing all three periods of the Mesozoic (Figure 2).

Ranging in size from 1.5 to 15 m in length, the ichthyosaurs had a sleek, streamlined form convergent in shape with porpoises or the speediest open-ocean fish. Their remains are known from scattered localities in Mesozoic rocks of every continent except Antarctica and Africa, but very little has been written with respect to their global distribution in this interval. In Mesozoic food chains, ichthyosaurs doubtlessly competed with large pelagic sharks for the position at the crest of the food pyramid as top carnivores. As with similar predators, that position in the trophic scheme dictates that these reptiles display only a disjunct and low-frequency distribution in the fossil record. Profound changes in the morphology of ichthyosaurs between the Triassic and later Mesozoic may be due to a change of diet from fish to cephalopod molluscs at this horizon (Halstead, 1968). Pollard's (1968) study of the stomach contents of a beautifully preserved Jurassic specimen from Britain provided a rare opportunity to pry into the feeding habits of these extinct forms. As expected, Pollard found hundreds of thousands of tentacle hooks, sucker rings, beaks (mouth parts), and related belemnite cephalopod debris.

The molluscan diet of later Mesozoic ichthyosaurs may have contributed to the extinction of these reptiles when ammonoid and belemnoid cephalopods disappeared near the end of the Mesozoic.

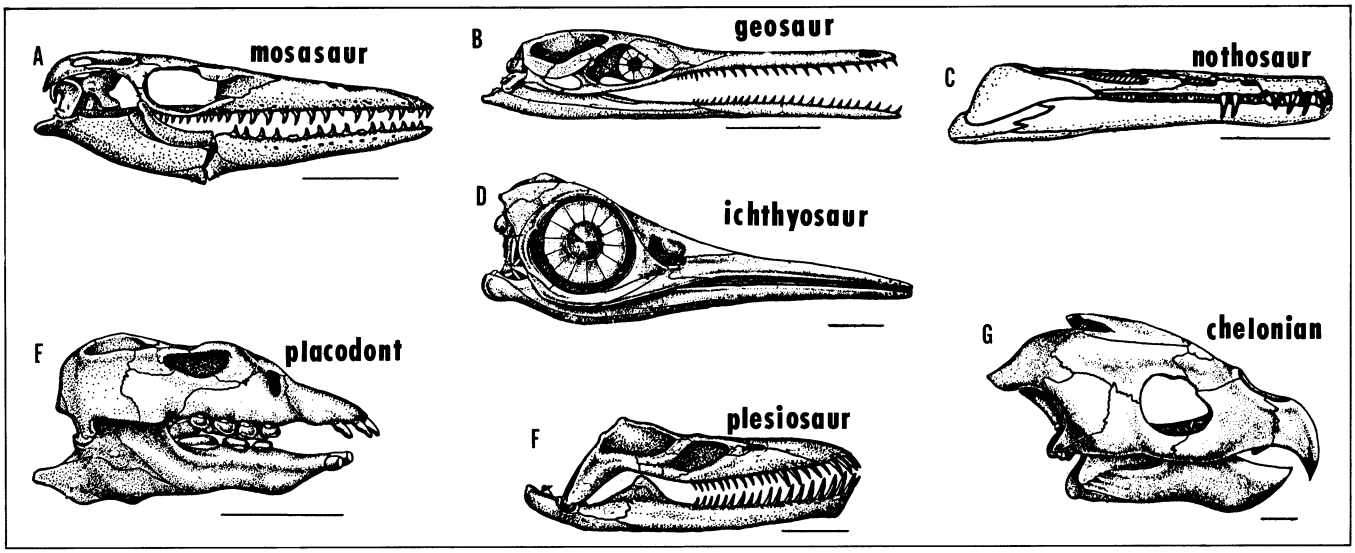

Figure 1. Representative Mesozoic marine reptiles (skulls). A. Clidastes, *Cretaceous mosasaur; B.* Geosaurus, *Jurassic crocodilian; C.* Nothosaurus, *Triassic nothosaur; D.* Ophthalmosaurus, *Jurassic ichthyosaur; E.* Placodus, Triassic placodont; F. Muraenosaurus, *Jurassic plesiosaur; G.* Archelon, *Cretaceous chelonian (turtle). Bar scale throughout is 10 cm. Illustrations after Romer (1968a) and Colbert (1980).*

KLAMATHS	BLUE MOUNTAINS	WALLOWAS	
	MERRIAM & GILMORE 1928 CERVICAL VERTEBRA ALBIAN-CENOMANIAN		CRETACEOUS
CAMP & KOCH 1966 ROSTRUM WITH TEETH ICHTHYOSAURUS CALIFORNICUS TITHONIAN STAGE	MARSH 1895 ISOLATED CENTRA MCGOWAN 1978 CENTRA ICHTHYOSAURUS PLIENSBACHIAN STAGE		JURASSIC
		ORR IN PRESS ARTICULATED DORSAL VERTEBRA WITH RIBS & NEURAL ARCHES INTACT SHASTASAURUS NORIAN STAGE	TRIASSIC

Figure 2. Distribution and character of Oregon ichthyosaurian fossils.

FOSSIL RECORD AND DISTRIBUTION

Known from the Middle Triassic to the end of the Cretaceous, remains of ichthyosaurs include several degrees of preservation. Jurassic taxa from Germany have been recovered virtually whole, having been preserved in anoxic black shales. These superb, fully articulated specimens are often unearthed complete with even a clear trace of the body outline. Premature or unborn specimens have been described where they were trapped within the body cavity of an adult. That discovery indicates that, unlike most other reptiles, ichthyosaurs were probably ovoviviparous, which means the eggs were retained within the female's body until hatched. This adaptation was extremely important, because it liberated the reptile from the task of returning to land to lay eggs. The most common ichthyosaur occurrences are isolated specimens of the spool-like centra or vertebral elements. These scattered bones along with occasional rib fragments attest to the thoroughness of marine scavengers. Between the two extremes are whole skulls and other components of the skeleton including the paddlelike limbs.

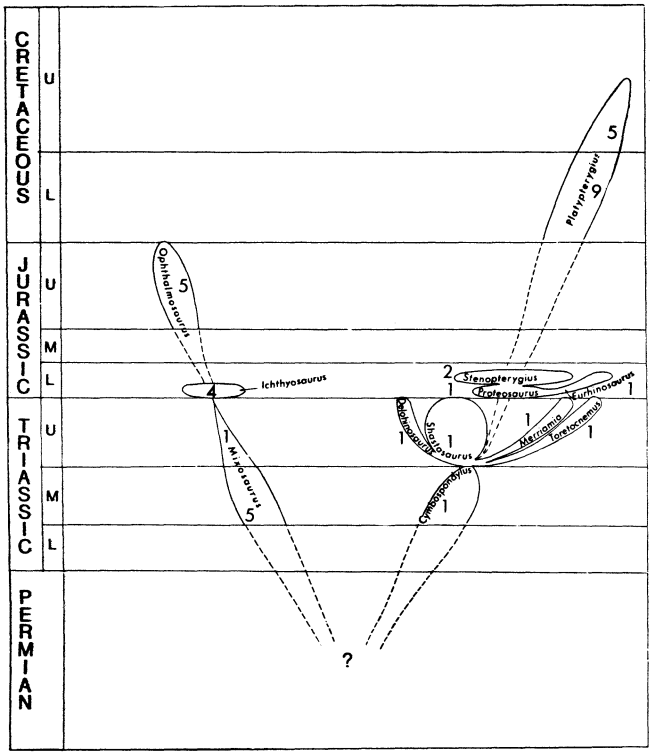

Figure 3. Evolution and occurrence of Ichthyosauria (modified from McGowan, 1972). Numbers indicate recorded occurrences (frequency).

In terms of their world distribution, the paleobiogeography of ichthyosaurs may reflect in a very general way some of the effects of global tectonics (Figure 3). Although the known fossil record is growing steadily (McGowan, 1978), at present the recorded diversity of the group appears to be inversely proportional to its distribution. Prior to the breakup of Pangea, intervals of high ichthyosaur diversity in the Late Triassic coincide with the highest frequencies of provincial taxa. That is, most of the many Triassic forms are known from only a single locality. Correspondingly, Cretaceous forms living during periods of maximum continental submergence and extensive shallow epicontinental seaways may be assigned to a total of only one or, at most, two genera. Typical in this regard is the distinctive Cretaceous genus *Platypterygius*, which appears in the fossil record of almost every continent.

One has little difficulty imagining these large, fishlike reptiles cruising effortlessly through the broad shallow Mesozoic seas hundreds of miles from land (Figure 4). Both Romer (1968a) and Colbert (1980) suggest that ichthyosaurs were in all probability quite at home in the open sea and possessed hydrodynamics similar to those of very rapid extant fish such as mackerel.

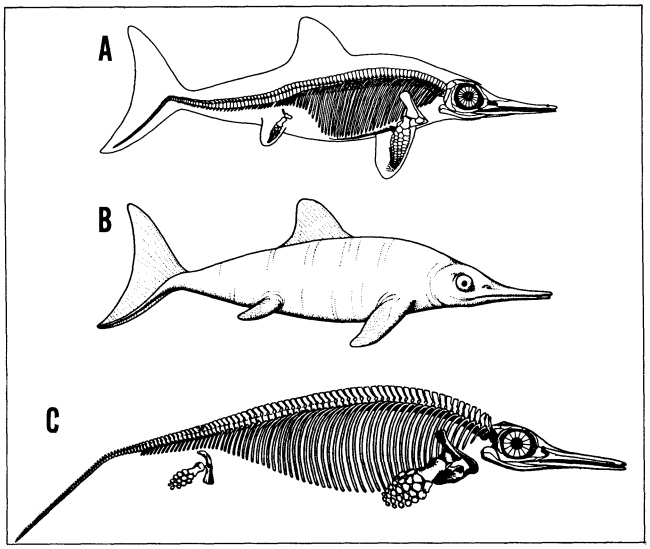

Figure 4. Skeletons and reconstructions of representative ichthyosaurs. A., B. Ichthyosaurus *(Jurassic). Length 1.5 m. C.* Ophthalmosaurus *(Jurassic). Length 4 m.*

In a slightly more quantitative vein, it is instructive to compare the reconstructed morphology of ichthyosaurs to that of modern fish from varying habitats. Fierstine and Walters (1968) have experimentally identified a series of characteristics in scombroid fish that may be used to distinguish between "lungers," such as rockfish, and "cruisers," such as tuna and skipjack. Some of these parameters, including body temperature and percent of red muscle, are unavailable to those of us confined to working with the fossil record. Others, however, including body and fin geometry, cross-sectional shape, and skeletal rigidity, lend themselves particularly well to comparison with extinct nektonic taxa. In the latter categories, the ichthyosaurs fall easily into the sustained-high-speed "cruiser" class.

OREGON ICHTHYOSAURIA

Five separate localities bearing ichthyosaurian fossils are reported in Oregon (Figure 5). Marsh (1895) recorded but did

not figure vertebrae from a Jurassic horizon in the Blue Mountains. In the early 1920's, University of Oregon paleontologist Earl L. Packard collected two isolated centra from the mid-Cretaceous (Albian-Cenomanian) Hudspeth Formation in Wheeler County. Later, Packard's material was figured and described by Merriam and Gilmore (1928). The latter authors identified these as cervical (neck) vertebral elements but did not attempt to assign them to a genus. In 1961, Norman V. Peterson, then staff geologist with the Oregon Department of Geology and Mineral Industries, collected a fine specimen of the rostrum (beak) of an uppermost Jurassic (Tithonian stage) form from the Otter Point Formation in Curry County. That specimen bears well-preserved teeth and was later identified and described as the species *Ichthyosaurus californicus* by Camp and Koch (1966).

McGowan (1978) has briefly noted the occurrence of ichthyosaurian centra from the Lower Jurassic (Pliensbachian stage) Nicely Shale (also known as Nicely Formation of Dickinson and Vigrass, 1965) in east-central Oregon. He did not attempt to assign a species name to the find but noted that the material was consistent with the geographically widespread Jurassic genus *Ichthyosaurus.*

The oldest known ichthyosaurs in Oregon are from an Upper Triassic (Norian stage) interval of the Martin Bridge Formation in Baker County. Twenty-three articulated vertebrae with ribs and neural arches intact were collected from a single locality in the southern Wallowas by members of the 1981 University of Oregon Summer Geology Field Camp. After the tedious process of freeing the bones from several blocks of well-indurated lime-stone, it was possible to assign the remains to the genus *Shasta-saurus,* with close affinities to the species *S. osmonti* Merriam. The latter taxon was previously known only from Upper Triassic rocks in northern California (Merriam, 1902). Upper Triassic rocks in the vicinity of central Nevada bear several ichthyosaur taxa but not *Shastasaurus* (Camp, 1980). Orr (in press) has suggested that the presence of this exotic form in the suspect Seven Devils volcanic-arc terrane supplements growing evidence of an allochthonous history for parts of northeast Oregon. Merriam himself (1902) puzzled over the isolated occurrence of the several species of the distinctive genus *Shastasaurus* in the Triassic of northern California. He even remarked on the improbability that an open-ocean form such as an ichthyosaur should be confined to such a narrow geographic area but stopped short of appealing to a mechanism such as continental drift to explain the obvious anomaly. Camp (1980) also recognized and commented on the peculiarity of these altogether different assemblages of Upper Triassic ichthyosaurs between California and Nevada. He nevertheless regarded these two widely separated localities as parts of the same early Mesozoic Pacific embayment.

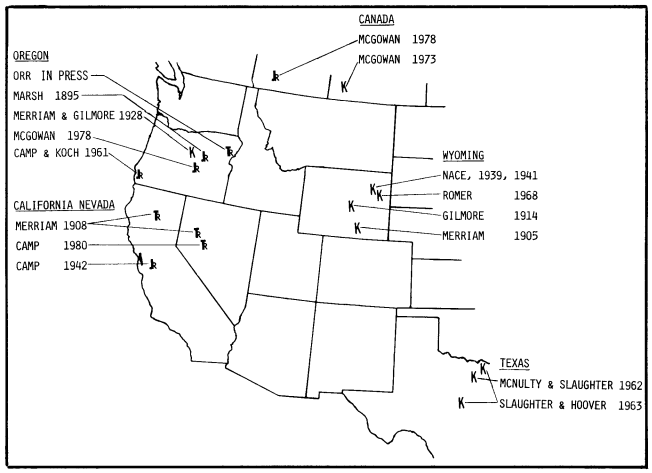

Figure 5. Distribution of Ichthyosauria in western North America. TR=Triassic; JR=Jurassic; K=Cretaceous.

CONCLUSIONS

1. Norian stage Upper Triassic marine reptile fossils from Baker County represent Oregon's oldest known vertebrate remains.

2. The Oregon fossil record of ichthyosauria is consistent with the known scattered distribution of these carnivorous marine reptiles worldwide.

3. In spite of the overall paucity of material, representative specimens of ichthyosaurian remains have been reported in Oregon from each of the Mesozoic systems.

4. Recent finds of these marine reptiles in the southern Wallowas appear to be in concert with a growing body of evidence that portions of the northeast area of the State may be an accreted terrane.

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Oregon's new dormant-mineral statute

by Jerry R. Fish; Stoel, Rives, Boley, Fraser, and Wyse; 900 SW Fifth Avenue; Portland, Oregon 97204

The 1983 Oregon Legislative Assembly passed a law giving landowners a means to extinguish "dormant" mineral interests owned by others in the same land (ORS 517.170-.180). Many lands in the state are encumbered by mineral reservations or leases made years ago to persons who can no longer be located. The Legislature determined that these old mineral interests are inhibiting development of property "in a manner which contributes to the economy and increases the state's tax base" (ORS 517.170). Discussion of the bill in legislative hearings focused on the need to facilitate mineral exploration and development. A landowner whose property is encumbered by such a mineral interest will now have a means to extinguish and take title to the mineral interest. Conversely, owners of mineral interests must follow the statute's procedures to preserve their interests.

The following paragraphs explain the key definitions and procedures contained in the new law.

1. *Definition of a Mineral Interest.* The law's definition of a mineral interest is very broad, covering interests "of any kind in coal, oil, gas, or other minerals and geothermal resources," except sand and gravel. Such mineral interests may have been granted or reserved in deeds but may also be created by leases, royalties, liens, and the effect of court judgments. The law affects "holders of mineral interests," but there is no indication in the legislative history that the word "holders" is supposed to have a meaning different from "owner."

2. *Procedure to Avoid Extinguishment of a Mineral Interest.* Under the new law, a mineral interest is considered "dormant" and subject to extinguishment unless the holder has (a) acquired the interest within the last 30 years, (b) paid taxes on the mineral interest for the previous tax year, or (c) recorded a "statement of claim" within the previous 30 years in the county Dormant Mineral Interest Record (created by the statute). Using a mineral interest will not keep it from being extinguished under the law. "Active" interests as well as "dormant" interests may be extinguished unless the holder takes one of the three steps described.

Many Oregon counties do not assess property taxes separately on mineral interests, though several mineral interests may exist in a single property. Mineral interest holders may be able to obtain separate assessments by simply asking the county assessor to add their mineral interests to the tax rolls. However, in most cases, mineral holders would probably prefer to file a "statement of claim" once each 30 years rather than pay taxes. Individuals or companies that are leasing old mineral interests should assist their lessors to comply with the new law; the fate of a mineral lease is unclear when the lessor's interest is extinguished. The lessee should file a statement of claim on the lessor's behalf if necessary.

A "statement of claim" must contain the name and address of both the current owner and the original owner of a mineral interest. The two names and addresses are the only information that the law expressly requires. When providing additional information is not burdensome, mineral holders should consider using a more complete statement of claim in the form of Exhibit A. The additional information will assist a landowner in discovering the identity of a mineral interest holder, reducing the chance that the landowner will initiate action to extinguish the mineral interest.

Each mineral interest holder will have to search the chain of title for the document that created the mineral interest to find the name and address of the original holder of that mineral interest. Frequently, the document creating a mineral interest will not show the address of the grantee. The new law does not address this problem. The county clerk is to maintain each statement of claim in a new set of books called the "Dormant Mineral Interest Record." In addition, when possible, the county clerk is to note the recording of each statement of claim in the margin of the recorded document that created the mineral interest. If the statement of claim contains only two names and addresses, and if the original holder owned and sold many mineral interests, it may be impossible for the county clerk to identify which document created the mineral interest for which the statement is filed. Likewise it may be impossible for a landowner who later reads the statement of claim to determine whether it covers the particular mineral interest which he would like to extinguish.

For any mineral interest created and acquired on or before October 15, 1955, a statement of claim must be recorded before October 15, 1985, and once each 30 years thereafter. For any mineral interests created and acquired after October 15, 1955, a statement of claim must be filed before the thirtieth anniversary of the creation or acquisition of the mineral interest and once each 30 years thereafter. Though the statute is not explicit, the legislative history indicates that a single statement of claim may be filed for many mineral interests in the same county.

If a statement of claim is not timely filed and if property taxes are not paid on a mineral interest, a mineral interest will be considered "dormant" under the new law and will be subject to extinguishment according to the procedures discussed below.

3. *Procedures to Extinguish Mineral Interests.* An owner of land encumbered by a "dormant" mineral interest may extinguish and take title to the mineral interest by completing the following steps:

(i) If the address of the mineral interest holder is known or can be determined by "due diligence," the landowner must mail a detailed "notice of the lapse of the mineral interest" directly to the mineral interest holder. The statute specifies the content of the notice. A suggested form for the notice of lapse is shown in Exhibit B.

(ii) Whether or not the holder's address can be found by due diligence, the notice of lapse must then be published at least once a week for three consecutive weeks in a newspaper of general circulation in the county where the lands are located.

(iii) A copy of the notice of lapse and an affidavit of publication must be submitted to the county clerk for recording within 15 days after the last publication. If the notice was not mailed directly to the holder of the mineral interest, the affidavit must contain a detailed description, including dates, of the landowner's efforts to "determine with due diligence."

If the landowner follows the steps described above, and if the mineral interest holder has not submitted a statement of claim to the county clerk within 60 days after the last publication of the notice, the mineral interest is automatically extinguished and becomes the property of the landowner. The landowner's affidavit of publication and notice of lapse are recorded in the Dormant Mineral Interest Record and are the only indications in that record that the mineral interest may have been

EXHIBIT A

STATEMENT OF CLAIM
FOR A MINERAL INTEREST IN PROPERTY
LOCATED IN _____ COUNTY, OREGON

1. Current owner of the mineral interest:

Name: _____
Address: _____

2. Original owner of the mineral interest:

Name: _____
Address: _____
_____

*3. Recording information for the document creating the mineral interest:

County: _____
Name of Record: _____
Book: _____
Page: _____
Date: _____
Type of Document: _____
(Deed, Lease, Assignment, Etc.)

*4. Description of property in which the mineral interest is held:

*5. Description of mineral interest (here quote the original document creating the interest):

The undersigned currently holds and claims ownership of the mineral interests described above.*

_____
Type Name: _____

*STATE OF OREGON)
) ss.
County of _____)

The foregoing instrument was acknowledged before me this _____ day of _____, 19____ by _____.

_____
Notary Public for Oregon
My commission expires:

*This information is not required by the statute. (ORS 517.180(3)), but may assist surface owners in identifying and locating mineral interest holders, preventing unnecessary extinguishment proceedings.

EXHIBIT B

NOTICE OF LAPSE

FOR A DORMANT MINERAL INTEREST
LOCATED IN _____ COUNTY, OREGON,
TO ORS 517.180

1. Current holder of the mineral interest as shown of record:

Name: _____
Address: _____

2. Recording information for the document creating the mineral interest:

County: _____
Name of Record: _____
Book: _____
Page: _____
Date of Recording: _____
Type of Document: _____
(Deed, Lease, Assignment, etc.)

3. Description of the lands affected by the mineral interest:

4. The person giving this notice:

Name: _____
Address: _____

5. The date of first publication of this notice: _____

6. Statement to the current holder of the above-described mineral interest:

YOU MUST SUBMIT A STATEMENT OF CLAIM FOR THE ABOVE-DESCRIBED MINERAL INTEREST, PURSUANT TO ORS 517.180, WITHIN 60 DAYS AFTER THE DATE OF THE LAST PUBLICATION OF THIS NOTICE PURSUANT TO ORS 517.180(4), OR ELSE YOUR MINERAL INTEREST MAY BE EXTINGUISHED AND MAY BECOME THE PROPERTY OF THE PERSON SENDING THIS NOTICE, BY OPERATION OF LAW.

Please notify the person sending this notice of all pertinent details within 30 days if you have taken any of the following actions:*

(a) If you have recorded a statement of claim for the mineral interest within the last 30 years;

(b) If you have paid property taxes on the mineral interest for the previous tax year; or

(c) If you acquired the interest within the past 30 years.

Your prompt response to this notice may prevent the extinguishment of the mineral interest.

Signature of the Person sending this Notice:
_____

STATE OF OREGON)
) ss.
County of)

The foregoing instrument was acknowledged before me this _____ day of _____, 19____ by _____.

_____
Notary Public for Oregon
My commission expires:

*This request for information is not required by the statute nor is the recipient of the notice required to respond to the request. The information, if provided, may prevent unnecessary extinguishment actions.

extinguished. The recording of the notice of lapse may also be noted on the margin of the instrument creating the mineral interest.

4. *Problems with the New Dormant Mineral Law.* The dormant mineral law is intended primarily to clear land titles and to facilitate mineral development. However, weaknesses in the law may create new problems.

(a) *Interests believed extinguished may not be.* Landowners who attempt to extinguish dormant mineral interests under the new law cannot be confident that they have succeeded. If the landowner fails to use due diligence in searching for the current mineral interest owner, the extinguishment may be challenged in court and invalidated. The legislative history indicates that the courts will be relied upon to police the landowner's due diligence efforts. Courts generally abhor forfeitures of land and will probably refuse to enforce an extinguishment if an unnotified mineral interest holder could have been located through diligent efforts. A mineral developer who would rely on an extinguishment should review the landowner's due diligence

efforts, bearing in mind that those efforts may be scrutinized by a court with 20/20 hindsight.

Even more unsettling is the possibility that a mineral interest believed extinguished was actually transferred during the relevant 30-year period and thus was immune from extinguishment. Extinguishment begins with the landowner's publication of a "notice of the lapse" of a mineral interest. Presumably landowners will take this step after finding no record of tax payments and no statement of claim with respect to a particular interest. The landowner may not know that the interest has been transferred if the transferring document has not been recorded. The new law does not address the relative rights of a transferee who has not recorded and a landowner who has attempted to extinguish a mineral interest. Because the statue results in forfeiture of property rights, a court may strictly construe the statute and hold that the unrecorded transfer protects the mineral interest from extinguishment.

(b) *The term "owner of land" is ambiguous.* The new law was intended to benefit surface owners. But instead of using the term "surface owner," the Legislature used "owner of land" which "includes a vested fee simple owner or a contract purchaser." By implication, certain other types of landowners exist that are also "included," but no further explanation is given in the legislative history. This definition apparently uses the term "fee simple" incorrectly. It is possible to own a mineral interest in fee simple. It is also possible to own an undivided interest in the minerals, or in the surface *and* the minerals, in fee simple. These "owners of land" may attempt to extinguish each other's interests under the new law. After reviewing the legislative history of the statute, a court might conclude that the sponsors of the bill meant "surface owners." Whether or not courts will limit extinguishment actions to surface owners remains to be seen.

(c) *The term "mineral interest" is overbroad.* The Legislature may have had *severed* mineral interests in mind when it passed the new law. However, the word "severed" does not appear in the statute, and the term "mineral interest" is defined broadly enough to include mineral interests that are not "severed" from the surface. Long-term mortgages and security interests in minerals may now have to be reflected in the Dormant Mineral Interest Record, as may undivided interests in land owned by tenants in common. Mining claims on federal minerals beneath private surface patented under the Stock Raising Homestead Act of 1916 vest a mineral interest in the claimant (ORS 517.080). If these mining claims are not also recorded in the Dormant Mineral Interest Record, the surface owners may attempt to extinguish old claims. However, the Dormant Minerals Law would probably be invalid if applied in that manner, since federal law governing the abandonment of mining claims is generally preemptive. □

New roster of registered geologists available

The State Board of Geologist Examiners issues an annual roster of geologists who are registered with the State Board, a division of the Department of Commerce. The listing distinguishes between geologists, engineering geologists, and geologists-in-training. The 46-page booklet also contains the state laws and administrative rules pertaining to geologists, their certification, and their code of professional conduct.

The newly issued 1984 list includes all those registered as of November 30, 1984, and is available to the public for $1.25 from the State Board of Geologist Examiners, 403 Labor and Industries Building, Salem, OR 97310. □

BOOK REVIEW

by Allen F. Agnew, Geological Consultant, Corvallis, Oregon

Hazardous waste: Issues and answers, by Benton M. Wilmoth and 20 others, 24 p.
Radioactive waste: Issues and answers, by A.M. LaSala, Jr., and 6 others, 26 p.
Ground Water: Issues and answers, by George Davis and 8 others, 24 p.

All three titles, released between November 1984 and January 1985, were published by and are available from the American Institute of Professional Geologists (AIPG), 7878 Vance Drive, Suite 103, Arvada, CO 80003, phone (303) 431-0831. The price for each title is $3.

These three booklets, 8½x11 in. in size, were prepared for policy makers, legislators, and the general public, so they could better understand these important issues and the related questions of our use or misuse of resources. All three hit their mark, and copies should be in the hands of all geologists to help their communication with the various public groups that geologists deal with.

Excellent line drawings (many are cartoons) and well-selected color photos make these publications visually attractive. Their tasteful covers, also in color, will enable them to endure in office magazine racks as well as on coffeetables at home, where people will see them and be able to pick them up and thumb through them, even if they have only a few minutes.

The text is spare, and the words are well chosen: the reader not only receives the message and understands, but also enjoys doing it. Much credit goes to science-writer Fred Schroyer and artists Dan Barker (ground water), Ron Candelaria (radioactive waste), and Ron Galleria (hazardous waste), all of them outside consultants.

AIPG cautions that the material furnished in the booklets "is introductory and not intended to provide detailed information or professional advice. Because each situation is unique, [the material in the brochures] cannot be used in solving specific problems. The direct advice of professionals . . . is essential."

Published by AIPG "in the spirit of developing enlightened management policy," the three booklets do their job admirably. They are also available at the reduced price of $2.25 in quantities of 100 or more and may be reproduced without charge for educational purposes, provided that acknowledgment to AIPG is given. □

*(**BLM**, continued from page 74)*

Teague Mineral Products has produced bentonite since 1972 from its open-cut mine. The firm routinely stockpiles the topsoil from areas to be mined in a way that maximizes moisture retention and reclaims the ground concurrently for quality grazing. Some areas produce more forage for livestock and wildlife after mining than they did before mining.

The Gold Dike Mine operated by Vulcan Mountain, Inc., is in the active development stage, but it already shows the care and attention to site stabilization, and containment of leaching operations to prevent impacts on surrounding land.

William G. Leavell, BLM Oregon-Washington State Director, stated, "These operators exemplify Federal policy to develop public land resources in a manner that satisfies national and local needs and provides for economically and environmentally sound exploration, extraction, and reclamation practices. In all cases, these operators have distinguished themselves by their attention to regulations and permit requirements, their cooperation with the public, and their willingness to mitigate the effects of mining." □

Coos Bay mines finally closed

by Allen H. Throop, Field Representative, Mined Land Reclamation Program, Oregon Department of Geology and Mineral Industries.

As a safety measure, the U.S. Office of Surface Mining (OSM) has completed a $40,000 project to seal potentially dangerous shafts and portals of three coal mines near Coos Bay. The mine openings were either left open when the mines were abandoned or have been reopened over the many years since the mines closed.

Historically, the largest coal mining center in Oregon was around Coos Bay. The area produced over 2 million tons of coal from 1880 to 1920. Although the major producer was the Libby Mine, coal was produced from numerous small mines in the area. As part of a nationwide search for potentially dangerous conditions resulting from abandoned coal mines, OSM identified three sites in Coos Bay that warranted immediate action.

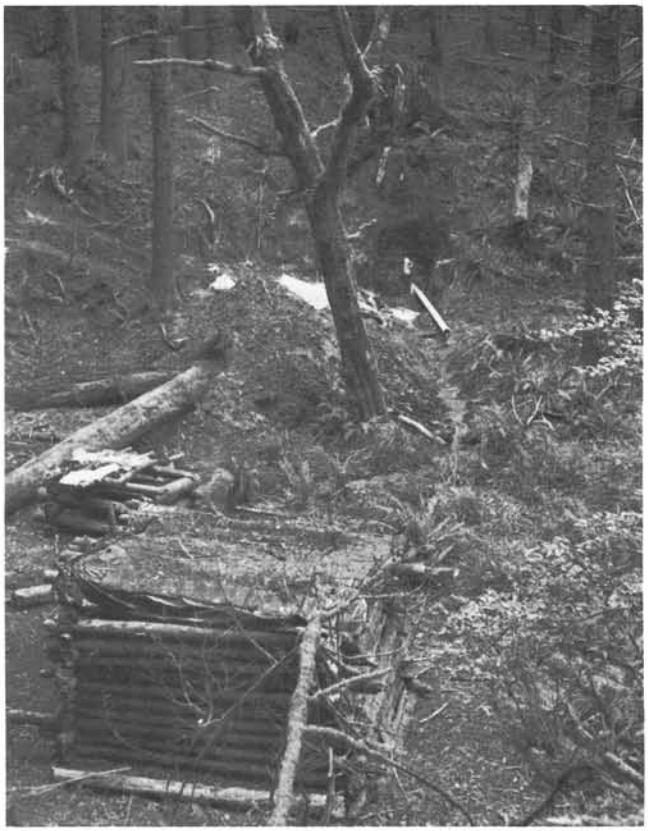
The three sites are the Southport Mine, located near the Coos County Animal Shelter; the Empire Mine, located near Upper Pony Creek Reservoir; and the Wilcox Mine, located near Roosevelt School.

At Southport, a series of horizontal mine entries (portals) were found exposed along with two vertical air shafts. For years they had been well hidden; however, they became easily accessible when the trees were logged and the undergrowth was burned off last year. The portals were sealed by OSM with concrete blocks that were strengthened with grout and rebar. After installation of adequate water drains, the openings were covered with soil to blend into the hillside. The shafts were similarly sealed with a reinforced concrete cap and then covered with soil. Fill was also placed over some building foundations.

Within a few hundred feet of the open Empire portals, children had built a play "fort." The portals were open and in clear view of the "fort." Fortunately there are no records of anyone entering the mine and encountering lethal gasses or rockfalls. Seals similar to those at Southport were constructed.

The final completed project was at the Wilcox Mine. A subsidence depression had formed above an old inclined portal.

Empire portal 1 prior to sealing by OSM.



Children's "fort" in foreground, with sealed Empire 1 portal in background. Sealed portal was later covered with overburden.

Normally, a hole of perhaps 5 cubic yards hidden in thick undergrowth would be inconsequential. However, this one was along a path to the school and was obviously used by the children as a hideout. Further opening of the portal would have created a dangerous condition. With a half day of work, the depression was filled.

An opening of the Reservoir Mine may be sealed this summer.

The OSM money for the project was the first spent in Oregon for the abandoned mined lands program. The primary purpose of the program is to eliminate safety hazards associated with coal mines abandoned prior to the implementation of the current strict federal reclamation requirements for coal mines. Funding comes from a reclamation fee of $0.35 for every ton of coal mined from surface mines, $0.15 per ton of coal mined by underground methods, and $0.10 per ton of lignite. Some of the money is earmarked for reclamation of abandoned coal mines.

Total cost for this project was approximately $40,000. The work was done by Johnson Rock Products of Coos Bay. Supervision of the on-site work was handled by HGE Engineering, also of Coos Bay.

Anyone who knows of any other abandoned coal mines that are hazardous should contact Dwight Araki, Office of Surface Mining, Brooks Towers, 1020 15th Street, Denver, CO 80202, phone (303) 844-5918. Non-coal mines in Oregon are not covered by this program. □

Northwest Mining Association announces coming events

The Northwest Mining Association (NWMA) announces the upcoming short courses, conventions, and shows. Dates and locations are listed with each event. For additional information, contact NWMA, 633 Peyton Building, Spokane, WA 99201, phone (509) 624-1158.

Mine Feasibility; Concept to Completion
Regency Hotel, Denver, Colorado
October 2-4, 1985

Micro-Computer Applications for the Mineral Industry
Sheraton Hotel, Spokane, Washington
December 2-4, 1985

Northwest Mining Association 91st Annual Convention
Sheraton Hotel, Spokane, Washington
December 5-7, 1985

Northwest Mining Association/Pacific Intermountain Mining Show
Convention Center, Spokane, Washington
December 5-7, 1985 □

Earth science agencies listed

The latest edition (1984) of the worldwide directory of more than 900 national earth-science agencies and more than 80 related major international organizations has been compiled by the U.S. Geological Survey (USGS).

The 102-page directory provides the name, address, and, if available, the name of the chief administrator of the major governmental earth-science agencies that have functions similar to those of the USGS in more than 160 countries around the world. The information is arranged in alphabetical order by country. The entry for each country provides a small index map showing the capital city and neighboring countries; larger regional maps are located at the front of the directory. A coded description indicates the principal functions and operations of each agency.

Many of the listed agencies have cooperated at one time or another with one or more of the operating divisions of the USGS. Thus the directory is a useful tool within the USGS as well as in other federal bureaus and is also helpful to U.S. industry, commerce, and educational organizations.

The directory also lists the major international organizations that are concerned with some phase of activities in the earth sciences. The organizations are listed alphabetically, and the same code is used to designate their major earth-science function.

Copies of the directory will be available at all U.S. Embassies and USGS counterpart organizations. This 1984 edition, *Worldwide Directory of National Earth-Science Agencies and Related Major International Organizations,* has been published as USGS Circular 934 and is available from the Branch of Distribution, USGS, 604 South Pickett St., Alexandria, VA 22304. It is also available at many regional USGS Public Inquiries Offices (PIO), such as the Northwest regional PIO at 678 U.S. Courthouse, West 920 Riverside Ave., Spokane, WA 99201.

— *USGS news release*

*(**Oil and Gas,** continued from page 74)*

Recent permits

Permit no.	Operator, well, API number	Location	Status, proposed total depth (ft)
298	Tenneco Oil Company Columbia County 11-28 009-00144	NW¼ sec. 28 T. 6 N., R. 5 W. Columbia County	Application; 3,500.
299	Tenneco Oil Company Columbia County 14-28 009-00145	SW¼ sec. 28 T. 6 N., R. 5 W. Columbia County	Application; 3,500.
300	Tenneco Oil Company Columbia County 33-28 009-00146	SE¼ sec. 28 T. 6 N., R. 5 W. Columbia County	Application; 3,000.
301	Tenneco Oil Company Columbia County 41-28 009-00147	NE¼ sec. 28 T. 6 N., R. 5 W. Columbia County	Application; 3,000±
302	Tenneco Oil Company Columbia County 42-28 009-00148	NE¼ sec. 28 T. 6 N., R. 5 W. Columbia County	Application; 3,000.
303	ARCO Columbia County 11-31 009-00149	NW¼ sec. 31 T. 6 N., R. 3 W. Columbia County	Location; 12,000.
304	ARCO Columbia County 33-28 009-00150	SE¼ sec. 28 T. 5 N., R. 5 W. Columbia County	Location; 5,500.
305	ARCO Columbia County 41-14 009-00151	NE¼ sec. 14 T. 4 N., R. 3 W. Columbia County	Location; 12,000.
306	ARCO Columbia County 43-3 009-00152	SE¼ sec. 3 T. 4 N., R. 3 W. Columbia County	Location; 12,000.
307	Reichhold Energy Crown Zellerbach 41-16 009-00153	NE¼ sec. 16 T. 5 N., R. 4 W. Columbia County	Application; 3,300.
308	Exxon Corporation Columbia County 1 009-00154	NE¼ sec. 29 T. 5 N., R. 3 W. Columbia County	Application; 4,000.
309	Exxon Corporation GPE Federal 1 009-00155	SW¼ sec. 3 T. 4 N., R. 3 W. Columbia County	Application; 10,000.
310	Exxon Corporation GPE Federal 2 009-00156	SE¼ sec. 3 T. 4 N., R. 3 W. Columbia County	Application; 6,000.
311	Exxon Corporation Crown Zellerbach 1 009-00157	NE¼ sec. 28 T. 5 N., R. 3 W. Columbia County	Application; 4,000.
312	Exxon Corporation GPE Federal 3 009-00158	SW¼ sec. 35 T. 5 N., R. 3 W. Columbia County	Application; 4,000.
313	ARCO Columbia County 22-19 009-00159	NW¼ sec. 19 T. 6 N., R. 5 W. Columbia County	Application; 3,500.
314	ARCO Scherf 41-21 009-00160	NE¼ sec. 21 T. 6 N., R. 5 W. Columbia County	Application; 3,200.
315	Leavitt's Exploration Falk 3 039-00010	NE¼ sec. 13 T. 16 S., R. 5 W. Lane County	Application; 2,500.
316	Leavitt's Exploration Jessie 1 039-00011	SW¼ sec. 13 T. 16 S., R. 5 W. Lane County	Application; 2,500.
317	Leavitt's Exploration Merle 1 039-00012	NE¼ sec. 25 T. 16 S., R. 5 W. Lane County	Application; 2,500. □

AVAILABLE DEPARTMENT PUBLICATIONS

GEOLOGICAL MAP SERIES	Price	No. copies	Amount
GMS-4: Oregon gravity maps, onshore and offshore. 1967	$ 3.00	_____	_____
GMS-5: Geologic map, Powers 15-minute quadrangle, Coos and Curry Counties. 1971	3.00	_____	_____
GMS-6: Preliminary report on geology of part of Snake River canyon. 1974	6.50	_____	_____
GMS-8: Complete Bouguer gravity anomaly map, central Cascade Mountain Range, Oregon. 1978	3.00	_____	_____
GMS-9: Total-field aeromagnetic anomaly map, central Cascade Mountain Range, Oregon. 1978	3.00	_____	_____
GMS-10: Low- to intermediate-temperature thermal springs and wells in Oregon. 1978	3.00	_____	_____
GMS-12: Geologic map of the Oregon part of the Mineral 15-minute quadrangle, Baker County. 1978	3.00	_____	_____
GMS-13: Geologic map, Huntington and part of Olds Ferry 15-min. quadrangles, Baker and Malheur Counties. 1979	3.00	_____	_____
GMS-14: Index to published geologic mapping in Oregon, 1898-1979. 1981	7.00	_____	_____
GMS-15: Free-air gravity anomaly map and complete Bouguer gravity anomaly map, north Cascades, Oregon. 1981	3.00	_____	_____
GMS-16: Free-air gravity anomaly map and complete Bouguer gravity anomaly map, south Cascades, Oregon. 1981	3.00	_____	_____
GMS-17: Total-field aeromagnetic anomaly map, south Cascades, Oregon. 1981	3.00	_____	_____
GMS-18: Geology of Rickreall, Salem West, Monmouth, and Sidney 7½-min. quads., Marion/Polk Counties. 1981	5.00	_____	_____
GMS-19: Geology and gold deposits map, Bourne 7½-minute quadrangle, Baker County. 1982	5.00	_____	_____
GMS-20: Map showing geology and geothermal resources, southern half, Burns 15-min. quad., Harney County. 1982	5.00	_____	_____
GMS-21: Geology and geothermal resources map, Vale East 7½-minute quadrangle, Malheur County. 1982	5.00	_____	_____
GMS-22: Geology and mineral resources map. Mount Ireland 7½-minute quadrangle, Baker/Grant Counties. 1982	5.00	_____	_____
GMS-23: Geologic map, Sheridan 7½-minute quadrangle, Polk/Yamhill Counties. 1982	5.00	_____	_____
GMS-24: Geologic map, Grand Ronde 7½-minute quadrangle, Polk/Yamhill Counties. 1982	5.00	_____	_____
GMS-25: Geology and gold deposits map, Granite 7½-minute quadrangle, Grant County. 1982	5.00	_____	_____
GMS-26: Residual gravity maps, northern, central, and southern Oregon Cascades. 1982	5.00	_____	_____
GMS-27: Geologic and neotectonic evaluation of north-central Oregon: The Dalles 1°x2° quadrangle. 1982	6.00	_____	_____
GMS-28: Geology and gold deposits map, Greenhorn 7½-minute quadrangle, Baker/Grant Counties. 1983	5.00	_____	_____
GMS-29: Geology and gold deposits map, NE¼ Bates 15-minute quadrangle, Baker/Grant Counties. 1983	5.00	_____	_____
GMS-30: Geologic map, SE¼ Pearsoll Peak 15-minute quadrangle, Curry/Josephine Counties. 1984	8.00	_____	_____
GMS-31: Geology and gold deposits map, NW¼ Bates 15-minute quadrangle, Grant County. 1984	5.00	_____	_____
GMS-32: Geologic map, Wilhoit 7½-minute quadrangle, Clackamas/Marion Counties. 1984	4.00	_____	_____
GMS-33: Geologic map, Scotts Mills 7½-minute quadrangle, Clackamas/Marion Counties. 1984	4.00	_____	_____
GMS-34 Geologic map, Stayton NE 7½-minute quadrangle, Marion County. 1984	4.00	_____	_____
GMS-35: Geology and gold deposits map, SW¼ Bates 15-minute quadrangle, Grant County. 1984	5.00	_____	_____
GMS-36: Mineral resources map of Oregon. 1984	8.00	_____	_____
OTHER MAPS			
Reconnaissance geologic map, Lebanon 15-minute quadrangle, Linn/Marion Counties. 1956	3.00	_____	_____
Geologic map, Bend 30-minute quad., and reconnaissance geologic map, central Oregon High Cascades. 1957	3.00	_____	_____
Geologic map of Oregon west of 121st meridian (U.S. Geological Survey Map I-325). 1961	6.10	_____	_____
Geologic map of Oregon east of 121st meridian (U.S. Geological Survey Map I-902). 1977	6.10	_____	_____
Landforms of Oregon (relief map, 17x12 in.)	1.00	_____	_____
Oregon Landsat mosaic map (published by ERSAL, OSU). 1983	$8.00 over the counter; $11.00 mailed	_____	_____
Geothermal resources of Oregon (map published by NOAA). 1982	3.00	_____	_____
Geological highway map, Pacific Northwest region, Oregon/Washington/part of Idaho (published by AAPG). 1973	5.00	_____	_____
Mist Gas Field Map, showing well locations, revised 4/85 (DOGAMI Open-File Report 0-84-2, ozalid print)	5.00	_____	_____
Northwest Oregon, Correlation Section 24. Bruer & others, 1984 (published by AAPG)	5.00	_____	_____
BULLETINS			
33. Bibliography of geology and mineral resources of Oregon (1st supplement, 1937-45). 1947	3.00	_____	_____
35. Geology of the Dallas and Valsetz 15-minute quadrangles, Polk County (map only). Revised 1964	3.00	_____	_____
36. Papers on Foraminifera from the Tertiary (v.2 [parts VI-VIII] only). 1949	3.00	_____	_____
44. Bibliography of geology and mineral resources of Oregon (2nd supplement, 1946-50). 1953	3.00	_____	_____
46. Ferruginous bauxite deposits, Salem Hills, Marion County. 1956	3.00	_____	_____
53. Bibliography of geology and mineral resources of Oregon (3rd supplement, 1951-55). 1962	3.00	_____	_____
61. Gold and silver in Oregon. 1968	17.50	_____	_____
62. Andesite Conference guidebook. 1968	3.50	_____	_____
65. Proceedings of the Andesite Conference. 1969	10.00	_____	_____
67. Bibliography of geology and mineral resources of Oregon (4th supplement, 1956-60). 1970	3.00	_____	_____
71. Geology of selected lava tubes, Bend area, Deschutes County. 1971	5.00	_____	_____
77. Geologic field trips in northern Oregon and southern Washington. 1973	5.00	_____	_____
78. Bibliography of geology and mineral resources of Oregon (5th supplement, 1961-70). 1973	3.00	_____	_____
81. Environmental geology of Lincoln County. 1973	9.00	_____	_____
82. Geologic hazards of Bull Run Watershed, Multnomah and Clackamas Counties. 1974	6.50	_____	_____
83. Eocene stratigraphy of southwestern Oregon. 1974	4.00	_____	_____
84. Environmental geology of western Linn County. 1974	9.00	_____	_____
85. Environmental geology of coastal Lane County. 1974	9.00	_____	_____
87. Environmental geology of western Coos and Douglas Counties. 1975	9.00	_____	_____
88. Geology and mineral resources, upper Chetco River drainage, Curry and Josephine Counties. 1975	4.00	_____	_____
89. Geology and mineral resources of Deschutes County. 1976	6.50	_____	_____
90. Land use geology of western Curry County. 1976	9.00	_____	_____
91. Geologic hazards of parts of northern Hood River, Wasco, and Sherman Counties. 1977	8.00	_____	_____
92. Fossils in Oregon. A collection of reprints from the *Ore Bin*. 1977	4.00	_____	_____
93. Geology, mineral resources, and rock material of Curry County. 1977	7.00	_____	_____
94. Land use geology of central Jackson County. 1977	9.00	_____	_____
95. North American ophiolites (IGCP project). 1977	7.00	_____	_____
96. Magma genesis. AGU Chapman Conference on Partial Melting. 1977	12.50	_____	_____
97. Bibliography of geology and mineral resources of Oregon (6th supplement, 1971-75). 1978	3.00	_____	_____
98. Geologic hazards of eastern Benton County. 1979	9.00	_____	_____
99. Geologic hazards of northwestern Clackamas County. 1979	10.00	_____	_____
100. Geology and mineral resources of Josephine County. 1979	9.00	_____	_____
101. Geologic field trips in western Oregon and southwestern Washington. 1980	9.00	_____	_____
102. Bibliography of geology and mineral resources of Oregon (7th supplement, 1976-79). 1981	4.00	_____	_____
SHORT PAPERS			
21. Lightweight aggregate industry in Oregon. 1951	1.00	_____	_____
24. The Almeda Mine, Josephine County. 1967	3.00	_____	_____
25. Petrography of Rattlesnake Formation at type area, central Oregon. 1976	3.00	_____	_____
27. Rock material resources of Benton County. 1978	4.00	_____	_____

AVAILABLE DEPARTMENT PUBLICATIONS (continued)

MISCELLANEOUS PAPERS	Prices	No. copies	Amount
1. A description of some Oregon rocks and minerals. 1950	$ 1.00		
5. Oregon's gold placers. 1954	1.00		
8. Available well records of oil and gas exploration in Oregon. Revised 1982	4.00		
11. Collection of articles on meteorites (reprints from *Ore Bin*). 1968	3.00		
15. Quicksilver deposits in Oregon. 1971	3.00		
18. Proceedings of Citizens' Forum on Potential Future Sources of Energy. 1975	3.00		
19. Geothermal exploration studies in Oregon. 1976. 1977	3.00		
20. Investigations of nickel in Oregon. 1978	5.00		
SPECIAL PAPERS			
1. Mission, goals, and programs of the Oregon Department of Geology and Mineral Industries. 1978	3.00		
2. Field geology, SW Broken Top quadrangle. 1978	3.50		
3. Rock material resources, Clackamas, Columbia, Multnomah, and Washington Counties. 1978	7.00		
4. Heat flow of Oregon. 1978	3.00		
5. Analysis and forecasts of the demand for rock materials in Oregon. 1979	3.00		
6. Geology of the La Grande area. 1980	5.00		
7. Pluvial Fort Rock Lake, Lake County. 1979	4.00		
8. Geology and geochemistry of the Mount Hood volcano. 1980	3.00		
9. Geology of the Breitenbush Hot Springs quadrangle. 1980	4.00		
10. Tectonic rotation of the Oregon Western Cascades. 1980	3.00		
11. Theses and dissertations on geology of Oregon: Bibliography and index, 1899-1982. 1982	6.00		
12. Geologic linears of the northern part of the Cascade Range, Oregon. 1980	3.00		
13. Faults and lineaments of the southern Cascades, Oregon. 1981	4.00		
14. Geology and geothermal resources of the Mount Hood area. 1982	7.00		
15. Geology and geothermal resources of the central Oregon Cascade Range. 1983	11.00		
16. Index to the *Ore Bin* (1939-1978) and *Oregon Geology* (1979-1982). 1983	4.00		
17. Bibliography of Oregon paleontology, 1792-1983. 1984	6.00		
OIL AND GAS INVESTIGATIONS			
3. Preliminary identifications of Foraminifera, General Petroleum Long Bell #1 well. 1973	3.00		
4. Preliminary identifications of Foraminifera, E.M. Warren Coos County 1-7 well. 1973	3.00		
5. Prospects for natural gas, upper Nehalem River basin. 1976	5.00		
6. Prospects for oil and gas, Coos Basin. 1980	9.00		
7. Correlation of Cenozoic stratigraphic units of western Oregon and Washington. 1983	8.00		
8. Subsurface stratigraphy of the Ochoco Basin, Oregon. 1984	7.00		
9. Subsurface biostratigraphy, east Nehalem Basin. 1983	6.00		
11. Biostratigraphy of exploratory wells, western Coos, Douglas, and Lane Counties. 1984	6.00		
12. Biostratigraphy of exploratory wells, northern Willamette Basin. 1984	6.00		
13. Biostratigraphy of exploratory wells, southern Willamette Basin. 1985	6.00		
MISCELLANEOUS PUBLICATIONS			
Mining claims (State laws governing quartz and placer claims)	1.00		
Back issues of *Ore Bin*	50¢ over the counter; $1.00 mailed		
Back issues of *Oregon Geology*	75¢ over the counter; $1.00 mailed		
Colored postcard: Geology of Oregon	0.10		

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