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THE FOSSILS CALLED "BUGS"\*  
by  
R. E. Stewart\*\*

Many-celled Invertebrates

The remainder of the invertebrates listed on page 69 belong to various major groups or phyla of the animal kingdom, but all have one feature in common which distinguishes them from the Protozoa: the animal body in each case is multicellular (made up of many cells), whereas the protozoan is always a single-celled animal.

Sponges

The sponges comprise a group of multicellular, chiefly marine animals, the body form

of which tends to be vase-like. Most modern sponges secrete skeletons of fibrous, horny material frequently reinforced by hollow siliceous or solid calcareous spicules of various shapes. In many of the older extinct species the spicules were thicker and united to form a solid trellis or framework. Sponges are sessile (attached) bottom-dwellers. Calcareous sponges predominate in shallow coastal waters; many of the siliceous forms inhabit moderately deep to deep water. Due to their usual poor state of preservation and the difficulty of identifying them accurately, sponges are somewhat limited in value as index fossils.

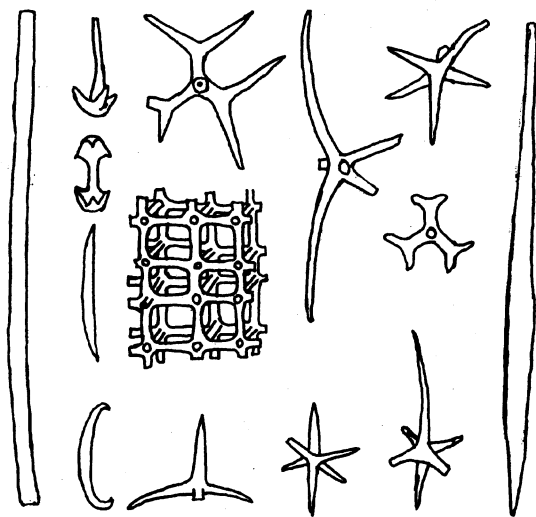


Fig. 6. Sponge spicules. Magnifications range from x12 to x36.

Corals

In the sense that magnification is frequently required in the study of their internal structure, corals should perhaps be included in any list of microfossils. However, since determinable minute individuals or parts are not commonly encountered or dealt with in microfossil studies, they are given only passing mention here.

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\*Continued from October issue.

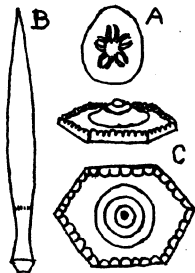
\*\*Geologist, State Department of Geology and Mineral Industries.

Echinoderma

Similar mention should be given to the fact that crinoids (sea lilies) and several other groups belonging to the phylum Echinoderma (spiny-skinned animals) may eventually come to have important application in micropaleontology. Crinoid, echinoid and holothurian fragments have already received some attention. Whether any of the Echinoderma will become important microfossils in other than fragmental form remains to be seen. At present we know them primarily as megafossils.

Echinoids

Echinoids (sea urchins) are marine animals with hollow, subglobular to discoidal shells or tests composed of numerous thin, closely joined calcareous plates to which are attached superficial spines. A species with which most people are familiar is the "sand dollar" so commonly found on our present-day beaches. Unlike sponges, corals, and crinoids, which remain attached throughout their lives, echinoids are unattached and free to move about in and upon the sand, silt and mud of the ocean bottom. The depth range of living echinoids is from low water to nearly 18,000 feet.



Fossil echinoids range from Ordovician to Recent, but they are of importance as index fossils only since the Cretaceous. Only the plates, spines and a few separate skeletal parts are small enough to be classed as microfossils.

Fig. 7. A, Very small echinoid. Natural size. Most echinoids are much larger than this. B, Echinoid spine. Some are as large as this; many much smaller. C, Ambulacral plate from a large echinoid. Some plates are larger than this; many much smaller.

Holothurians

Croneis and McCormack<sup>9</sup> have given a good general description of holothurians, a portion of which is here quoted.

"The holothurians (sea cucumbers) are stubby, worm- or cucumber-like creatures, varying in length from less than an inch to more than three feet. ... They constitute a fairly sharply defined group of marine invertebrates that is represented in modern seas by about 750 known species. They are especially abundant in tropical waters, but occur in temperate and polar seas as well; many of them form a part of the benthos, some indeed, being found as high as high water mark, but others have been dredged from depths as great as 2900 fathoms.

"... Their future potential importance to the paleontologist results chiefly from the fact that their body wall is generally beset with calcareous particles, which have been found (though heretofore quite generally unrecognized or disregarded) in strata of several geologic periods.

"The calcareous bodies of the Holothuroidea are usually microscopic, but plates several millimeters across occur. Their shapes and sizes differ to such an extraordinary degree in the various genera and species that they constitute one of the fundamental bases for classification in the group. Indeed, the plates assume such unusual forms that we are convinced that many of them, although observed by the micropaleontologist, have been looked upon as indeterminate objects."

<sup>9</sup>Croneis, C. and McCormack, J., Fossil Holothuroidea, Jour. Pal., Vol. 6, No. 2, pp. 112-114, June 1932.

A number of the different calcareous parts are then noted, their names depending partly upon their locations and functions and partly upon their general shapes; military granules, supporting rods, rosettes, plates, tables, anchors, baskets, cups, wheels, hooks, and others.

Fossil holothurians are rather sparsely scattered through the geologic column from Cambrian to Recent.

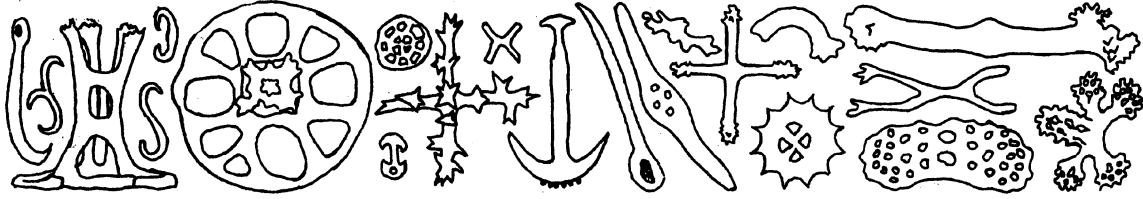


Fig. 8. Holothurian elements. Magnifications approximately x250.

#### Annelid worm jaws (scolecodonts), plates and tubes

Annelid worms are elongated, segmented, bilaterally symmetrical animals, some of which are marine and some non-marine. The non-marine forms are unknown as fossils, and therefore do not concern the paleontologist.

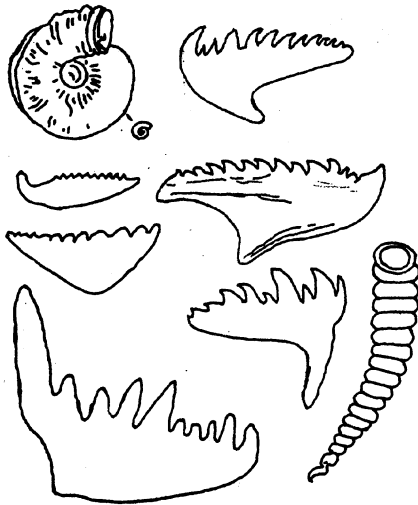


Fig. 9. Scolecodonts and annelid tubes. Magnifications x16 to x45, except tube at lower right which is about x3.

Marine annelids are equipped with small silico-chitinous jaws and denticulated plates called scolecodonts which are frequently preserved as lustrous black fossils, and are unaffected by ordinary weak acids. Chitinous, scalelike surface plates and agglutinated chitinous or arenaceous tubes are also occasionally preserved, but their occurrence as fossils is rather rare. However, the small shiny black jaws may appear in rocks of all ages from Cambrian to Recent, and are especially common at many horizons in the Middle Paleozoic. The marine annelids have a questionable fossil record in the pre-Cambrian.

#### Conodonts

Conodonts, which comprise another group of toothlike microfossils, appear in marked abundance in the rocks of certain parts of the geologic column, and, within their restricted range, are very valuable tools in micropaleontology. Important differences between conodonts and scolecodonts are: (1) conodonts are composed of calcium phosphate, whereas the material of scolecodonts is chitin and silica; (2) although unaffected by acetic acid, conodonts are quickly destroyed by weak hydrochloric acid, whereas scolecodonts are unaffected by ordinary acids; (3) conodonts, although usually shiny, are translucent or nearly transparent and range in color from pale amber to light brown, as distinguished from the opaque, highly lustrous blackness of scolecodonts; (4) the known geologic range of the conodonts is confined to the Paleozoic, while that of the scolecodonts extends from the Cambrian, possibly pre-Cambrian, to the present time; (5) the derivation of conodonts is uncertain, but scolecodonts are known to be the jaws of annelid worms.

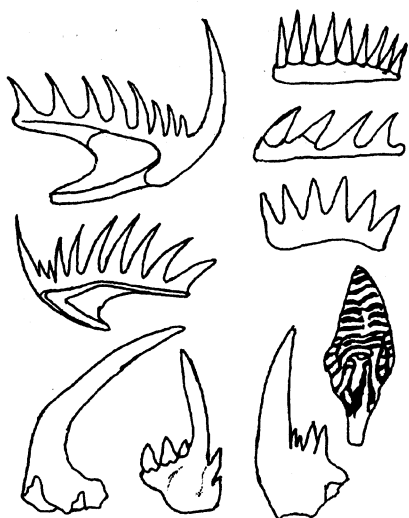


Fig. 10. Conodonts. Magnifications in the order of about x25 to x35.

Conodonts have been variously attributed to vertebrates, annelids, gastropods, cephalopods, and crustaceans, but they are now rather generally assumed to represent the jaw armor of an extinct group of primitive fishes. The fact of the matter is, however, that nobody knows for sure just what they really are.

Their native environment appears to have been in moderately shallow water near shore, possibly near the mouths of inflowing streams.

#### Bryozoa

The Bryozoa, whose name is derived from the Greek meaning moss animals, fall into somewhat the same category as the corals in the sense that magnification is more frequently applied to the study of the internal structure of their megascopic remains than to the study of separate microscopic individuals. The difference here, however, is that with the Bryozoa what appear to be megafossils are in reality colonies composed of many microscopic individuals variously grouped or linked

together, whereas with the corals the megascopic forms frequently represent single individuals of very considerable size. With few exceptions, Bryozoa live associated in colonies, and the few that do not are minute in size. Bryozoan megafossils are colonies of Bryozoan microfossils.

The colonies display infinite variety of form. Of common occurrence are plantlike tufts and branching stems and fronds of various types, the branches at times forming regular and beautiful open-mesh lacework. Other forms spread over shells and various foreign bodies in the form of delicate interwoven threads, crusts of exquisite pattern, and nodular, globular and hemispherical masses of considerable size.

Most Bryozoa are marine and are attached throughout the greater part of their lives to the bottom and to various extraneous objects at all oceanic depths. A few genera live in fresh water. Their food consists chiefly of diatoms, infusorians and larvae. Their geologic range is from earliest Ordovician to the present time.

#### Brachiopoda

The Brachiopoda comprise a group of exclusively marine animals whose shells consist of two parts or valves so fastened together as to open and close like those of a clam. Clams, however, are not brachiopods. Brachiopods are found at all oceanic depths and are usually attached to various objects by extending muscles or by cementation. Their known geologic range is from lowermost Cambrian to the present, with maximum development in the Silurian and Devonian, and they have furnished many important index fossils. Microbrachiopods have not as yet received much study, but it is not improbable that the future will see many of them added to the already long list of important larger forms.

#### Mollusca (Pelecypoda, Gastropoda, Scaphopoda)

The major group or phylum, Mollusca, contains five subgroups or classes, all of which are best known from their megascopic forms. Three of these, however, the Pelecypoda, Gastropoda, and Scaphopoda, frequently appear in microfossil material and are therefore included here.

Pelecypoda

Pelecypoda are clams and similar animals with bivalve shells, many of which have common occurrence on our present-day beaches. They live in both fresh and salt waters in all parts of the earth, at all depths, and under all ordinary temperatures. Their known stratigraphic range is from the Ordovician to the present, with questionable occurrence in the Cambrian. Although micropelecypods have as yet received but minor attention in paleontologic literature, future study will doubtless show that they have some value in stratigraphic paleontology.

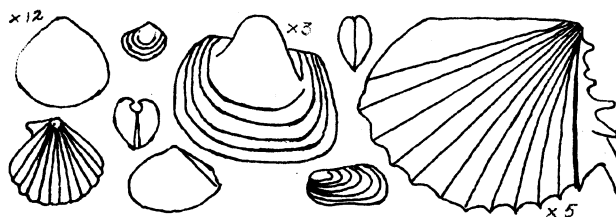


Fig. 11. Pelecypoda.

Gastropoda

The Gastropoda or snails have a worldwide distribution as both fossil and living land, marine and fresh-water animals. Of all the mollusos they exhibit the most manifold variety. Their record begins in the Cambrian and they are today at the height of their development and vigor. Literature on the megascopic fossil and living forms is voluminous. The microscopic forms have received considerable attention, but they merit and will doubtless receive much more study in the future.

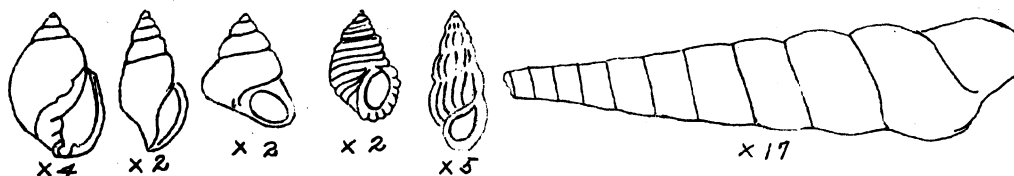


Fig. 12. Gastropoda.

Scaphopoda

The scaphopod shell is tubular, generally somewhat curved (toothlike), and open at both ends. Scaphopods are exclusively marine dwellers, and for the most part inhabit deep water. They range from the Ordovician to the present time, but are of minor importance as stratigraphic horizon markers.

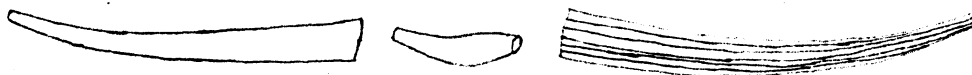


Fig. 13. Scaphopoda. Magnifications about x3.

Arthropoda (Trilobita, Archaeostraca, Branchiopoda, Ostracoda)

The phylum Arthropoda contains five classes, one of which, the Crustacea, contains four subclasses from which microfossils are known. Another of these classes is the Insecta. Among the Arthropoda, therefore, we find a possible source of suggestion for the term "bugs" as applied to microfossils, since a dictionary definition for "bug" is, "In popular language ... any animal resembling an insect, such as a spider or small crustacean ... A micro organism ..."

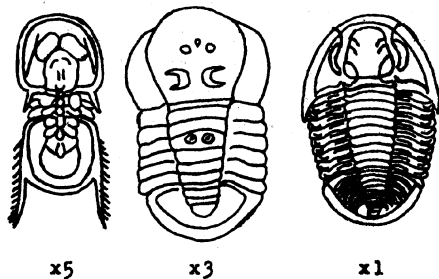
Trilobita

Fig. 14. Trilobita.

No Trilobites are known to have lived since Permian time. From their fossil remains, however, it appears that they were marine dwellers inhabiting relatively shallow to deep waters, where they swam, crawled, and sometimes lived practically buried in the soft bottom mud. Their distribution was world-wide.

Trilobites had their origin in the pre-Cambrian, attained maximum development in the Cambrian and Ordovician, then waned in both numbers and variety to become extinct in the Permian. They constitute

one of our most important fossil groups, but to date owe their importance primarily to megafossil forms. Microtrilobites should, and doubtless will receive further study.

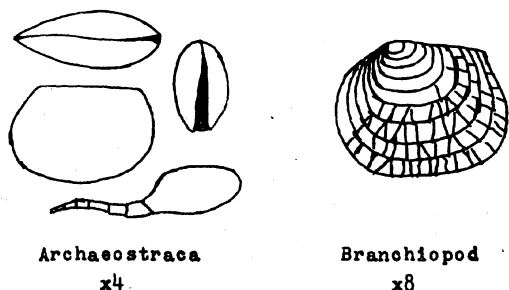
Archaeostraca and Branchiopoda

Fig. 15.

The Archaeostraca and Branchiopoda are of minor importance in paleontology, but many of them have small bivalve shells or carapaces much like those of ostracods and micropod. Distinguishing features have to do largely with the animal body; sometimes with the material, shape, or ornamentation of the test. The Archaeostraca are extinct. The Branchiopoda range from Cambrian to Recent, their present day forms living mostly in fresh water and salt lakes.

Ostracoda

The ostracods constitute one of our most important microfossil groups, and in some

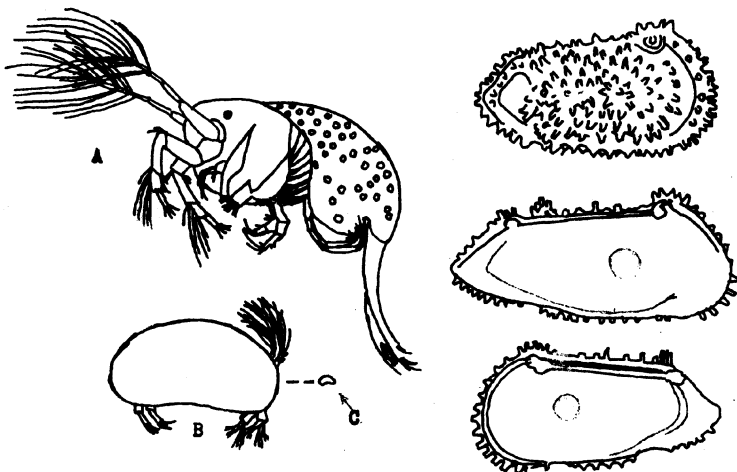


Fig. 16. Ostracoda. Magnifications of 3 figures at right about x40.

areas and some parts of the geologic section rank with the foraminifera as index fossils. They occur abundantly in fresh, brackish, and salt waters from strand line down to depths of about 500 feet. Some occur at greater depths, but for the most part ostracods are not deep-water animals. Some are very active free swimmers while others crawl about on the bottom or on weeds and various other objects in the water. From the accompanying figures it is evident that it is a far cry from the simple, single-celled protozoan to the complex little animal that occupies the bivalve shell of the ostracod.

Figure 16-A is an enlargement of the animal that occupies the shell of figure 16-B, and figure 16-C shows the approximate actual size of the shell represented by figure 16-B. The geologic range of the Ostracoda is from Ordovician to Recent.

### Plant Microfossils

The fossil record of plants extends back into geologic history as far as that of animals. For the most part plants are less commonly encountered than animals, however, and they are but sparsely represented in strata older than the Pennsylvanian.

#### Diatoms

Most important among the microfossil plant forms are the diatoms. They are single-celled, largely pelagic, fresh-water and marine plants whose fossil record dates back to the Cretaceous where they are found so highly developed as to indicate an earlier period of evolution. They are important rock builders and are believed to have been the source of most of the petroleum in California. Their siliceous skeletons display an infinite variety of forms, and within their known geologic range are excellent horizon markers. In places they have accumulated in very extensive deposits which are mined for a variety of industrial uses.

#### Algae and miscellaneous forms

Calcareous algae are very important rock builders on present day "coral" reefs and probably were of equal importance in the construction of ancient reefs. Their fossil record extends from the pre-Cambrian to the present. They give promise of being useful in correlation and as indicators of environmental conditions, but need much more study than they have received to date to develop their full possibilities along these lines.

Various other plant forms such as seeds, spores, and pollen are found as microfossils, and have some correlative importance in geological work.

The reader who desires further information on microfossils is referred to the following two publications, both of which contain extensive bibliographies as well as much authentic information and many excellent illustrations.

Cushman, Joseph A., Foraminifera, Their Classification and Economic Use, 3d ed., VIII + 480 pages, 78 plates, 8 text figs. Harvard University Press, 1940.

Shimer, Harvey W. and Shrock, Robert R., Index Fossils of North America, IX + 837 pages, 303 plates, 5 text figs. The Technology Press, Massachusetts Inst. of Technology, 1944.

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### COLUMBIA COUNTY GEOLOGY DESCRIBED

The geology of the St. Helens quadrangle is described in Bulletin No. 31 which has just been issued by the Oregon Department of Geology and Mineral Industries. The area covered is from 25 to 40 miles north of Portland in Columbia County and extends about 10 miles west of the Columbia River. The extreme northeastern part of the quadrangle is in Washington.

The area is important economically because it contains limonite iron ore and ferruginous bauxite deposits. Both structural geology and the stratigraphy outlined in the bulletin are important in the studies of oil and gas possibilities.

Bulletin No. 31 was prepared to supplement and accompany the geologic quadrangle map issued by the Department last spring. Joint authors of both the bulletin and the map are W.D. Wilkinson, Oregon State College, and W.D. Lowry and E.M. Baldwin of the Oregon Department of Geology and Mineral Industries.

Both the bulletin and the map may be obtained from the Department at 702 Woodlark Building, Portland, and from the field offices at Baker and Grants Pass. Price of the bulletin including the map is 45 cents postpaid.

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## OREGON GOLD PRODUCTION

According to a release of the Metals Economics Division of the U.S. Bureau of Mines, dated November 5, 1946, production of gold in Oregon during September 1946 was 1,800 ounces. Total production for the first 9 months of the year was 12,981 ounces.

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MELTING GLACIER UNCOVERS SILVER

(From the Oregonian, Portland, November 9, 1946)

Hot weather on the west coast of Canada recently melted the blueish-white blanket of ice at the foot of a glacier in British Columbia. As a result the Dominion has a new silver mine.

The new find - at a time when silver prices have zoomed to better than 90 cents an ounce, causing a rush among prospectors - is said by the Financial Post to contain one 800-foot vein of rich ore. (Editor's note: There is no thought of attempting to connect this news item with the article in the September Ore.-Bin on "Mount Hood's Vanishing Glaciers")

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ALUMINUM PREFABS

Assembly line methods may soon be applied to the production of aluminum houses in order to ease the present housing shortage in southern California. Harry Woodhead, president of Consolidated Vultee Aircraft Corp., said his company has under construction at the Vultee Field Division, Downey, California, a prototype of the aluminum home. The two-bedroom house and lot are expected to sell in the \$7000 to \$8000 range. When the program gets fully underway next spring, Convair expects to turn out 80 to 100 houses a day. Douglas Aircraft Company is reported as also considering the possibilities of building a prefabricated aluminum house. (From West Coast Edition of the Iron Age, October 24, 1946.)

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CLEARING HOUSE

CH-88: For sale or lease, diatomaceous earth deposit in Del Norte County, California, located on Redwood Highway, 44 miles southwest of Grants Pass. Information and samples may be obtained from Philip L. Swager, 1245 W. 74th Street, Los Angeles 44, California.

CH-89: Mr. I. N. Shults, P.O. Box 127, Medford, Oregon, wishes to buy a 25-ton rotary quick-silver furnace.

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SUMPTER VALLEY NARROW GAUGE ABANDONED

(From The Record-Courier, Baker, Oregon, November 7, 1946)

The Sumpter Valley Railroad company, according to a report from Washington, received authority from the Interstate Commerce commission to abandon the 57-mile rail line from South Baker to Bates and to substitute truck service over a different route. The yard switching and interchange facilities will be retained at Baker to serve the local mills.

Application for abandonment of the 57-mile railroad was filed April 10, 1946, on the grounds that operation of the Oregon Lumber company mill at Bates, with production severely out under the sustained yield program of the forest service, could not provide for the expenses of railroad operation and maintenance.

The march of progress will remove one of the few and famous narrow gauge railroads left in the United States. The Sumpter Valley line construction started in 1890 was an important early day venture to tap the rich timber and mining resources of southwestern Baker county and adjacent areas in Grant county. The section from Baker to McEwen was completed in the spring of 1892, the line being extended to Sumpter during the years 1895 to 1897. The line was completed to Whitney in 1901, to Tipton in 1904 and to Austin the following year. In 1910 the railroad reached on to Prairie City and carried both passenger and freight until the line from mile post No. 62 to Prairie City was abandoned in January, 1933. Passenger service on the Sumpter Valley has been negligible in recent years and was discontinued in 1937.

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