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RELATION OF THE ELLENSBURG FORMATION TO EXTENSIONS OF THE DALLES FORMATION IN THE AREA OF ARLINGTON AND SHUTLER FLAT, NORTH CENTRAL OREGON

by R. C. Newcomb
Consulting Geologist, Portland, Oregon

The Columbia Plateaus physiographic province in the area of this report is characterized by the general basinal situation of the large east-west Dalles-Umatilla syncline. Within this broad downwarp, the local plateaus of about 1,000 feet altitude are bounded by the 200- to 700-foot declivities of the Columbia River Gorge and the canyons of the rivers and creeks that drain north to the Columbia River (see Fig. 1).

The bedrock belongs to the Columbia River Group, a 3,000-foot thick aggregation of accordantly layered basaltic lava flows. Only the top 1,000 feet or so of these lavas crop out in the study area. They have been designated as part of the Yakima Basalt. Interlayered below each of the upper two flows of the Yakima Basalt, and extending beyond the end of each, is a sedimentary member of the lower part of the Ellensburg Formation. Overlying both the basalt and the Ellensburg members are Pliocene gravels and tuffs, referred to as eastward extensions of the Dalles Formation (Newcomb, 1966). Pliocene and Quaternary loess, as well as Pleistocene and Holocene glaciofluvial deposits, colluvium, talus, and alluvium incompletely mantle the Tertiary rocks.

Except for some reconnaissance work, geologic studies have reached this area only from the north. Schmincke (1967) and Laval (1966) extended the members of the Yakima Basalt and the Ellensburg Formation to the north side of the Columbia River. As part of the investigations for the Chem-Nuclear Services, Inc.,* at their disposal site ten miles southwest of

*Thanks are due the Chem-Nuclear Services, Inc., for their contribution of the information obtained during the investigation of their site.

Arlington, the writer mapped the members of the Tertiary rocks and extended them northward to tie in with Schmincke's (1967) stratigraphic section. The mapping showed that the Ellensburg Formation plays a much more important part in the surface and near-surface geology of the area than had been reported previously (see Fig. 2).

Extension of the Ellensburg Members to Shutler Flat

The Rattlesnake Ridge member, the top member of the lower part of the Ellensburg Formation, crops out at intervals along the south wall of the Columbia River Gorge northeast of Arlington. The member is 40 to 60 feet thick and consists of lenticular beds of siltstone, sand, fine gravel, and several types of tuff and volcanic ash. It is overlain by the westward-thinning Elephant Mountain flow, the top flow of the Yakima Basalt. This basalt capping tapers to its western limit 3 miles northeast of Arlington. Both the Rattlesnake member and the Elephant Mountain basalt can be examined at intervals westward from the mouth of Willow Creek.

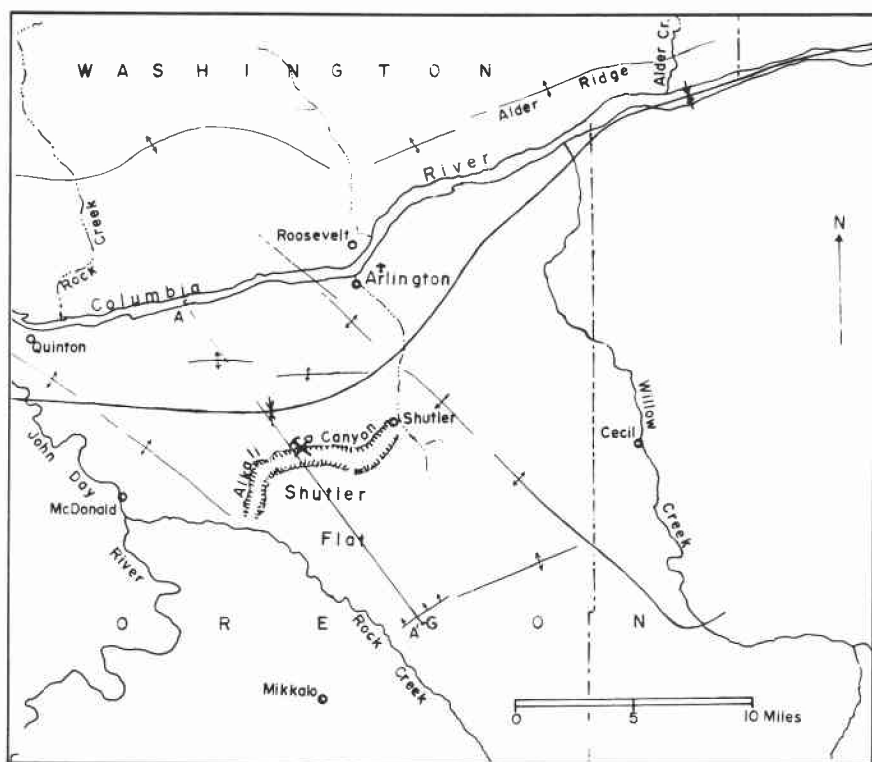


Figure 1. Map of the Arlington-Shutler area, Oregon.

Westward from the end of its basalt cap, the eroded remnants of the Rattlesnake Ridge member have few outcroppings and appear to be overlain, with erosional unconformity, by gravelly members of the Dalles Formation. In places, such as at the Gorge rim north of the Arlington Airport, the Rattlesnake Ridge member is entirely missing and Dalles conglomerate lies on the Pomona Basalt flow. It is believed that the Rattlesnake Ridge member occurs in places beneath the Dalles Formation southwest of Arlington. Its presence is indicated by the thickness of the Tertiary sedimentary section overlying the Pomona Basalt flow. This thickness exceeds the 70-foot maximum of the Dalles Formation observed elsewhere in the area.

In many places in south-central Washington, the Rattlesnake Ridge member contains much fluvial material, though at other places it is entirely fine-grained air-fall tuff. In the Yakima Valley it contains many, if not all, of the Columbia River-type of quartzitic gravels that occur in the Ellensburg Formation. No Columbia River-type gravels were seen within the member in this area. In general, the Rattlesnake Ridge member contains more fluvial materials than does the Selah member. This fluvial nature of the Rattlesnake Ridge member makes difficult its field distinction from the sedimentary facies of the Dalles Formation.

The Selah member of the Ellensburg Formation was traced by Schmincke (1967) from its type locality north of Yakima to its outcroppings in the Columbia River Gorge north of Arlington. Beneath the Pomona Basalt flow, the Selah member can be followed south from Arlington to Shutler where the Pomona flow tapers out along a general east-west line. South of the end of the Pomona flow, the slightly eroded top of the Selah member is overlain by the Dalles Formation in the few places where the Selah top can be observed (see Fig. 3).

Within this general north-south area through Arlington and Shutler Flat, the Selah member ranges from 130 to 300 feet in thickness, much greater than the 50 to 100-foot thickness common to other parts of its widespread occurrence in south central Washington. It is essentially all tuff composed of silt, clay- and sand-sized grains of volcanic glass, glass with crystallites, and crystalline fragments. A variable component of the mass has been altered to clay minerals. Most of the member is massive and coarsely bedded, but finely-bedded strata near its base have been logged in wells at Alkali Canyon. The tuff is compact but lacks cementation or welding of the grains. It has a high porosity, low permeability, and low specific gravity.

Basalt Below the Selah Member

Basalt flows below the Selah member include only a few thin sedimentary separations. A one-foot thick clay bed, beneath the first flow below the Selah at Arlington, may be an equivalent to the Mabton member of the

SOUTH CENTRAL WASHINGTON

Schmincke (1967)

ARLINGTON

ALKALI CANYON- SHUTLER FLAT

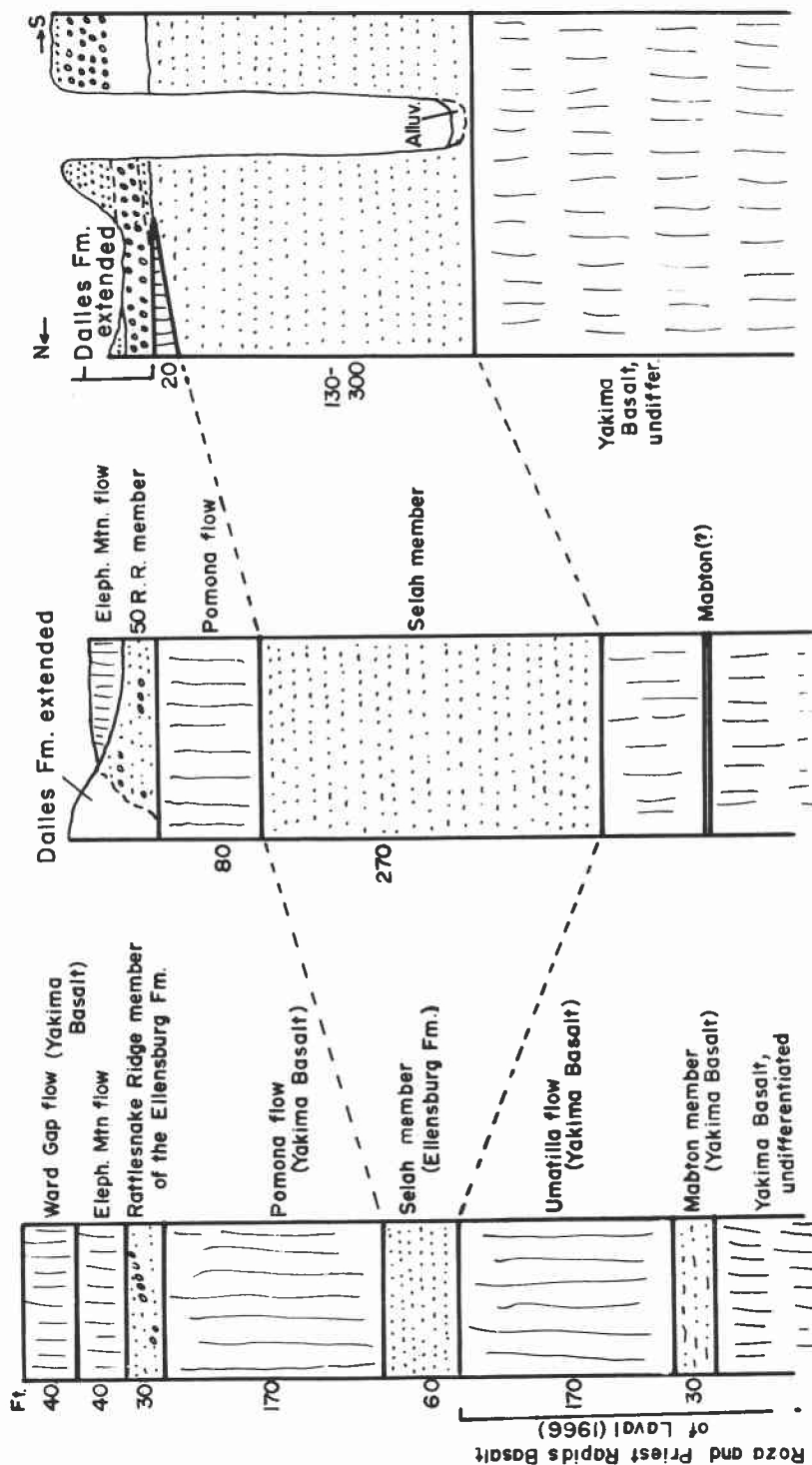


Figure 2. Type stratigraphic columns in south-central Washington and north-central Oregon.

Yakima Basalt that Schmincke (1967) observed farther north. This one-foot clay bed is not present either in surface exposures or in the drilling records of wells south of Arlington.

The first flows below the Selah member in the eastern end of Alder Ridge, 14 miles northeast of Roosevelt, were called the Priest Rapids Basalt by Laval (1966). A porphyritic basalt like that of the Roza flow, which underlies the Priest Rapids basalt of Laval (1966), was observed in railroad and highway cuts at 300 feet altitude $3\frac{1}{2}$ miles northeast of Roosevelt. Thus the exposed basalt below the Selah member in the Arlington area apparently includes equivalents of the Priest Rapids and Roza Flows.

Dalles Formation as Extended to This Area

In the face of the pozzuolana quarry, in the north bluff of Alkali Canyon, the Dalles Formation lies with erosional unconformity on the Selah member of the Ellensburg Formation. From the base upward the Dalles Formation consists of: 1) 10 to 20 feet of vitric rhyodacitic tuff, a lenticular and local occurrence; 2) 20 to 50 feet of pebble and cobble weakly-bonded conglomerate of Blue Mountains rock types; and 3) 30 feet of tan-brown silty tuff (see Fig. 4).

The local member of vitric tuff, the pozzuolana, lies between the Selah member and the conglomerate of the Dalles Formation; it is herein described with the Dalles Formation, though later work may prove that it belongs under another stratigraphic designation. A small outlying lens of the pozzuolana occurs on top of the Pomona flow at the head of Jones Canyon $1\frac{1}{2}$ miles northwest of the quarry exposure.

The basal part of the conglomerate in the quarry contains 4 to 8 feet of buff, silty, unbedded clay that is apparently a former loessal soil lying atop the pozzuolana.

The top (tuff) unit of the Dalles Formation has some indurated calcified zones, but on the whole it is poorly consolidated and has been extensively eroded by the wind.

In the south bluff of Alkali Canyon the conglomerate underlies the soils of Shutler Flat and lies upon the Selah tuff which continues downward 200 feet to the top of the basalt. Most of the soils of Shutler Flat are loessal; they are generally 10 to 15 feet thick beneath the upland parts of the area. If any significant amount of the light-brown tuff unit of the Dalles Formation remains upon the conglomerate beneath Shutler Flat, it has not been observed nor recorded in well logs.

In the sides of the shallow depressions of the plateau just north of the quarry the Dalles Formation lies on the Selah member, but half a mile north of the quarry the southern end of the Pomona flow separates the Selah member from the overlying Dalles Formation; in those outcrops there is no evidence of the Rattlesnake Ridge member. To the north of Alkali Canyon, the conglomerate member of the Dalles Formation, partly stripped of the

wind-vulnerable tan tuff member, underlies much of the upland surface that extends to the Columbia River Gorge.

The two principal units of the Dalles Formation in Alkali Canyon, the conglomerate and the overlying tan tuff, are lithologically and physiographically similar to units at the top of the Dalles Formation in Fifteen Mile Creek Valley 30 miles to the west. Likewise, they are similar to the sedimentary unit called Pliocene fanglomerate, 28 miles to the east, by Hogenson (1964).

To the east of Arlington the relationships of the Dalles Formation to the Rattlesnake Ridge member of the Ellensburg Formation and to the Elephant Mountain basalt flow are not yet known. The following two conditions observed by the writer suggest, however, that these units may have been contemporaneous depositions: 1) No Dalles Formation lies upon that part of the Elephant Mountain basalt examined to date; and 2) the origins and lithologies (fluvial materials and air-fall tuff) of the Rattlesnake Ridge member and the "Dalles Formation extended" are, in general, similar.

The sedimentary units described above as belonging to the Ellensburg Formation and the Dalles Formation have been designated in reconnaissance work as Arlington Lake Beds (Hodge, 1932) and Shutler Formation (Hodge, 1942). These early designations included little specific petrologic or location data. Hodge correctly interpreted his Arlington Lake Beds as being older than the Columbia River Gorge (Hodge, 1932, p. 6).

Age of the Units

A collection of camel bones for which identification was secured by Foxworthy (1962, p. 19) determined the Selah member near its type locality to be probably early Pliocene. A small collection of vertebrate fossils from the sedimentary deposits (interpreted by the writer as Selah member) near the top of the Columbia River Gorge northeast of Roosevelt, was identified by the collecting group from California Institute of Technology as Barstovian (Arnold Shotwell, personal communication 1966). The radioisotope dates so far obtained for the Pomona flow place it in the range 12.3 to 13.3 million years, and an additional 68 per cent confidence interval expands the total range to 10.1 to 14.3 million years (Holmgren, 1969, p. 193). Thus the early Pliocene age of the Selah member as obtained by Foxworthy seems to be allowed by the subsequent determinations.

Discrepancies in the ages of sedimentary deposits assigned to the Dalles Formation were pointed out by Newcomb (1966). The early Pliocene age, generally accepted for paleobotanical and vertebrate fossils near the type area at The Dalles, was in conflict with a middle Pliocene (Hemphillian) age obtained on vertebrate fossils from what appear to be correlative deposits ("Dalles Formation extended") near Arlington and near McKay Reservoir 60 miles further east. Additional vertebrate specimens from the Dalles Formation near The Dalles reviewed since 1966, have been

interpreted as substantiating the early Pliocene age in the type area (Arnold Shotwell, personal communication 1967). Discrepancies still exist in the age (middle Pliocene) and in the stratigraphic assignment of the "Dalles Formation extended" in north central Oregon.

Conclusions

1. The top two flows of the Yakima Basalt taper out southward into the Ellensburg Formation near Arlington much as they do westward in the Yakima Valley.
2. The extension of the Selah member, and possibly of the Rattlesnake Ridge member, for many miles beyond the end of its capping basalt flows requires that large areas be mapped as Ellensburg Formation, a new experience for mappers in Oregon.
3. The relation of the lower part of the sedimentary facies of the "Dalles Formation extended" to the Rattlesnake Ridge member is not yet clear and the possibility that the two are in part contemporaneous has not been ruled out.
4. The Ellensburg Formation and the "Dalles Formation extended" comprise the materials that have been referred to in reconnaissance studies as "Arlington Lake Beds" and "Shutler Formation," terms that are no longer needed.
5. The discrepancies still exist between early Pliocene age in the type area of the Dalles Formation and middle Pliocene age for the supposed correlative strata ("Dalles Formation extended") in the Arlington area.

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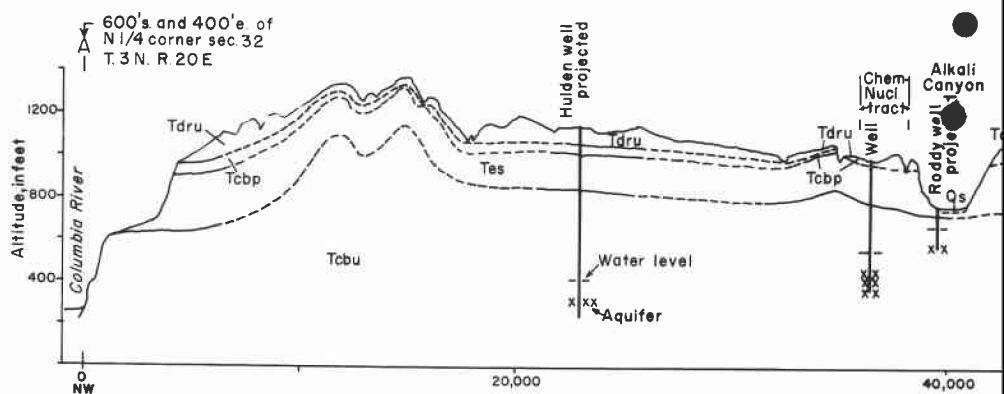


Figure 3. Section from the Columbia River to the south end of Shutler Flat. member of the Ellensburg Formation, undifferentiated. Tdru, Dalles Formation, undifferentiated. Tcbp, Pomona flow of the Yakima Basalt of the Tcbu, basalt of the Columbia River Group, undifferentiated.)

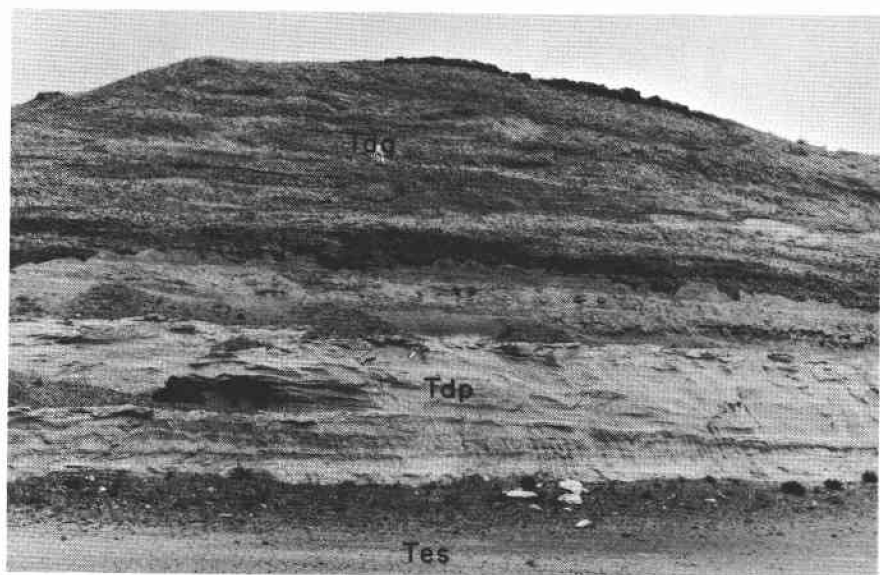
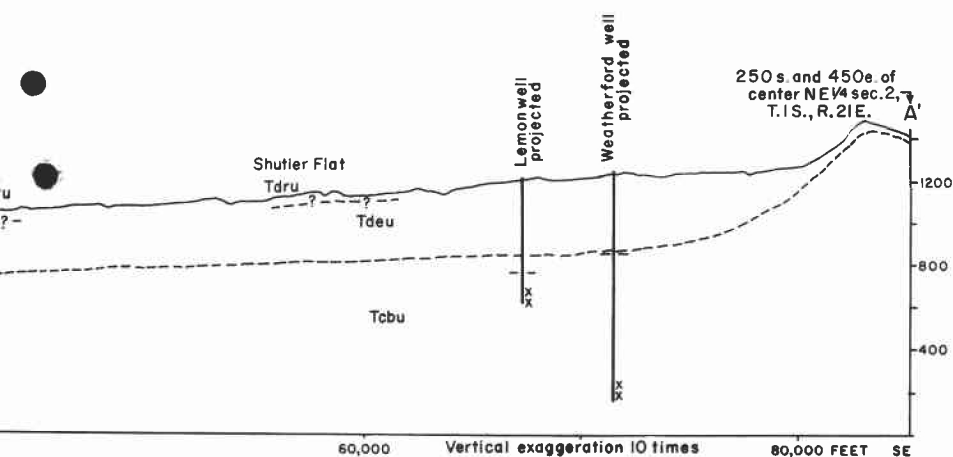


Figure 4a. Quarry face exposing 40-foot section of the Dalles Formation above the Selah member of the Ellensburg Formation, the top of which forms the quarry floor.



(Qa, Quaternary alluvium. Tdru, Dalles Formation and Rattlesnake Ridge Formation and Rattlesnake Ridge and Selah members of the Ellensburg Formation-Columbia River Group. Tes, Selah member of the Ellensburg Formation.

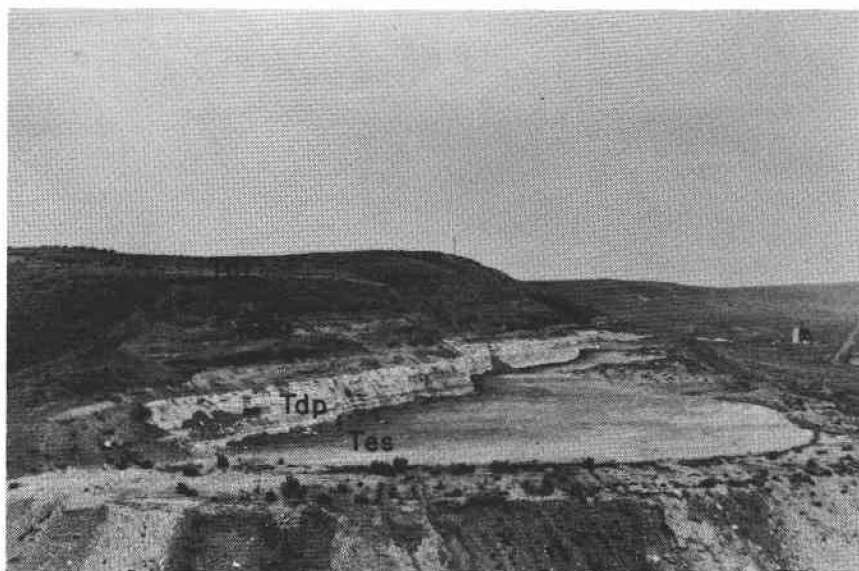


Figure 4b. View east across the quarry and along the north bluff of Alkali Canyon. (Tes, Selah member of the Ellensburg Formation. Tdp, pozzuolana lens; Tdg, conglomerate member; and Tdt, tan tuff member of the Dalles Formation.)

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* * * * *

RALPH WORKS CHANEY

By Jane Gray

Paleoecology Laboratory
Museum of Natural History
University of Oregon, Eugene, Oregon

On March 3, 1971, at the age of 80, famed paleobotanist, Ralph Works Chaney died in Berkeley, California where he had made his home since 1931. Dr. Chaney, until the late 1950's Professor of Paleontology at the University of California, enjoyed a long career yielding a rich harvest in the fields of education, paleontological research and conservation.

Chaney spent his first field season in Oregon in 1916, and received his doctorate in 1919 from the University of Chicago with a dissertation based on studies of the Middle Tertiary Eagle Creek flora of the Columbia River Gorge. Thus began a long, intense association with Tertiary floras of the Pacific Northwest in which he used the State of Oregon as his most valuable laboratory to develop and test many of the innovative, analytical techniques that have contributed to an understanding of Tertiary floras throughout the world. His work established Oregon as a classic area in Tertiary paleobotany.

Among Chaney's significant contributions to the study of fossil floras are the following: the recognition that taxonomic considerations of a flora cannot be separated from its ecological considerations, thereby treating fossil plant assemblages as representatives of vegetation rather than as collections of isolated specimens; the handling of large numbers of specimens in the field to permit an accurate idea of morphological variations within fossil species that enabled detailed comparison with the leaf characters of designated living equivalent species; the use of leaf characters (such as

length, organization, nervation, margin, texture) and of morphological life form as an aid to determining the climatic conditions of a region or of a geological period; quantitative study of fossil floras in an attempt to arrive at some estimate of species dominance; the application, where appropriate, of corrective factors derived from studies of the comparative representation of plant remains in contemporary sediments, together with data on numerical representation of fossil species and the habitats of the equivalent living species to serve as guides in the reconstruction of the physical environment, including topography and climate, of fossil floras; the thesis that migrations of major vegetational units (termed geofloras) through Cenozoic time are the basis not only for the reconstruction of topographic and climatic changes, but since such migrations result from progressive physical changes, particularly in climate, which are a function of time, that the successive geographic positions of geofloras may serve to determine the age of sedimentary rocks with occurrences of plant fossils.

Although much of Chaney's professional work was concerned with the paleobotany of the Pacific Northwest, his scientific efforts ranged far afield from that area. He carried out field work intermittently in Central and South America and widely for many years in Asia; as a young man he was a member of the Central Asiatic Expedition of the American Museum of Natural History under the leadership of Roy Chapman Andrews. One of Chaney's most significant publications dealt with a revision of fossil *Sequoia* and *Taxodium* which was completed after his visit in 1948 to the only natural occurrence of *Metasequoia* in central China. Through his efforts in obtaining seeds and cuttings of *Metasequoia*, this conifer again thrives in many parts of the world where it once lived naturally.

In addition to his scholarly activities, Dr. Chaney was active in conservation as a long-time member and past President of the Save-the-Redwoods-League, and as a member of the Advisory Board of the National Park Service. During World War II, he served in an administrative capacity as Assistant Director of the University of California's Lawrence Radiation Laboratory.

During his lifetime, Dr. Chaney received many honors and awards; he was a member of the National Academy of Sciences, the American Philosophical Society, a Fellow and past Vice President of the Geological Society of America and a past President of the Paleontological Society of America. In recent years, he was an Honorary Vice President of the XI International Botanical Congress, where he was honored with a Congress Medal, he received the U. S. Department of the Interior Conservation Service Award and shortly before his death he was the recipient of the 5th Paleontological Society Medal, the first and only paleobotanist so honored.

* * * * *

METAL NEWS*

Silver

The price of silver continues "sluggish" and is presently quoted at \$1.633 per ounce. A number of silver investors have brought suit against Engelhard Industries, the Silver Users Association and certain of their officials for remarks made at the May 20 silver and gold forum sponsored by the American Metal Market. The suit was in response to comments made at the forum by Engelhard Industries president Richard C. Glogau, which discounted the importance of the deficit between silver production and consumption, and by Silver Users Association executive director Walter L. Frankland, who also spoke bearishly at the AMM forum. Although silver did go down on the day of the meeting and has performed sluggishly ever since, few traders are blaming Glogau or Frankland as silver has been sloppy of late anyway and the whole meeting was filled with depressing news.

Silver coin trading was started on the new West Coast Exchange on May 17, following the lead set by the New York Mercantile Exchange, which commenced coin futures on April 1. The Los Angeles-based exchange offers "half-size" contracts, with a \$5,000 face value, consisting of 5 bags of dimes, quarters, or half dollars minted before 1965.

Mexico, which has blamed the slumping silver market on speculators who dominate the commodity exchanges, has invited representatives from Canada, Peru, Australia, the U.S., and India to a meeting later this month to examine prospects for setting up a world producer silver price. It has been reported that U.S. participation will be limited to government observers. Mexico produces more than 40-million troy ounces of silver per year, most of which is as "prime" product. Canada is a larger producer, but there, as almost everywhere else, production is mostly byproduct output from base metal mining. While the upcoming meeting is preliminary and no attempt to set up a producer price in the future is expected, the possibility of a producer price somewhere down the line has stirred considerable conversation.

Gold

On June 9, London gold prices fell below \$40 a troy ounce for the first time since May 11 and gold is presently selling for \$39.49. Although trading and investing in gold per se has been denied to U.S. citizens since the Gold Reserve Act of 1934, they are stepping up the pressure to seek ways to buy gold, which include proposed legislation to revitalize the U.S. gold industry and to legalize bullion investment, as well as plans being formulated by major commodity exchanges to offer gold trading. California Congressmen H. T. Johnson and Don H. Clausen maintain that U.S. output of gold falls far short of the

* From News Letter, Nevada Mining Association, June 15, 1971.

nation's strategic needs, much less its normal industrial and consumer requirements. Domestic production totaled some 1.6-million troy ounces in 1969 while gold use hit about 7-million, of which nearly 40% or 2.7-million ounces went to space and defense. The U.S. Bureau of Mines estimated U.S. known reserves at about 400-million ounces, but startup costs for new mines can be prohibitive.

Earlier legislation to permit U.S. citizens to hold gold bullion was introduced by Illinois Representative Philipp M. Crane, who claims that interest among Americans has been substantial and that individuals should have the right to hold their wealth in tangible commodities as currency values continue to decline. Presently, Americans can hold gold only in the form of jewelry or coinage. The United Kingdom lifted restrictions on British citizens holding gold on April 1. Meanwhile, the West Coast Commodity Exchange is ready for any change in the federal rules as it has prepared complete contract specifications for trading in gold bullion as a futures contract if the current restrictions are lifted by Rep. Crane's legislation. Specifications of the contract, should it be permitted, call for trading units of 400 troy ounces in a bar of at least 99.95% pure gold. Delivery months would be in January, March, May, July, September, and December.

A strong demand for British gold sovereigns is reported by dealers. Frederick S. Bogart, manager of Republic National Bank's gold department, told a group at the recent American Metal Market silver and gold forum that these coins, which contain about $\frac{1}{4}$ ounce of gold and are worth £1 (\$2.40) face value, have risen sharply in price to about \$13 a piece.

Copper

Simon D. Strauss, executive vice president of American Smelting and Refining Company, told the Financial Analysts Federation at Cleveland, "If the geographical concentration of copper production becomes more diverse, the price should be less volatile." He said it is the dependence of Western European copper consumers on the CIPEC (Congo, Chile, Peru and Zambia) countries for supplies that has "accentuated the volatile fluctuations in the price of copper" in recent years. The flow of copper from CIPEC countries to Free World consumers has been well maintained, Strauss noted, "But this fails to quiet the fears of uneasy consumers who do not know what to expect next." The Asarco executive sees this situation changing, however. Strauss said, "There is no shortage of known copper reserves," but it is of "considerable significance that much of the new tonnage is being developed outside the CIPEC area. Capital is, in fact, showing considerable reluctance to invest in new CIPEC projects. Five or 10 years hence, the relative importance of the CIPEC countries seems likely to be less than it is today." He noted that the U.S. and Canada will maintain their production rank in the world while production from "other countries" may show proportionately the

greatest increase. Substantial new production is expected from the South Pacific basin (Indonesia, the Philippines, and Bougainville) while Australia is increasing its production by at least 50% within the next 2 years.

During a recent meeting of CIPEC mining ministers, it has been reported, other copper-exporting countries in the world were invited to join the group. Also, CIPEC issued its usual call for "price stabilization." Meanwhile, increased outputs were announced - Congo by 5%; Zambia by 4.5%, and both Chile and Peru talked about 12% increases. This would amount to 91,000 tons per year for Chile; 27,000 tons per year for Peru; and 36,000 tons per year for Zambia, and 18,000 tons per year for the Congo.

Mercury

Mercury is currently being quoted at \$265-270 per 76-pound flask. The U.S. Bureau of Mines states, "Domestic mine production in the first quarter of 1971 was 4480 flasks, down 20% from the preceding quarter. Eleven mines producing over 100 flasks each during the quarter accounted for 87% of the production. The three top producers were the New Idria and Mt. Jackson mines in California, and the Ruja mine in Nevada. Several mines became inactive, including the Buena Vista mine. Secondary mercury totaled 4058 flasks, which included 2700 flasks released from GSA, reducing their stock to about 10,800 flasks. GSA did not resume offerings for commercial sale during the quarter.

"Consumption was 12,720 flasks, about the same as the previous quarter, but down substantially from the 19,555 flasks recorded for the first quarter of 1970. Increases were noted in agriculture, catalysts, electrical apparatus, general laboratory use, industrial and control instruments, and mildew proofing for paint. Use in electrolytic preparation of chlorine and caustic soda declined to under 3000 flasks. No mercury was consumed for amalgamation of pulp and paper.

"The March 31 issue of the Federal Register contained a list, published pursuant to the Clean Air Act of 1970, in which mercury was designated one of the hazardous air pollutants."

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BURTON W. SILCOCK APPOINTED BLM DIRECTOR

The appointment of Burton W. Silcock as Director of the Bureau of Land Management has been announced by Interior Secretary Rogers C. B. Morton. Mr. Silcock succeeds Boyd L. Rasmussen, who has been named an Assistant to the Secretary of the Interior. Silcock, a native of Burley, Idaho, and a graduate of Utah State University, joined the Bureau of Land Management in 1948 and has held successively responsible posts in public lands management in various areas of the West. Since 1965 he has been BLM Alaska Director.

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GEOLOGY OF THE POWERS QUADRANGLE PUBLISHED

The Department has just issued, as the fifth in its Geological Map Series, "Geology of the Powers Quadrangle, Oregon," by Ewart M. Baldwin and Paul D. Hess, of the University of Oregon. The publication consists of a 21 by 26 inch sheet with a multicolored geologic map and cross sections on one side and text on the other. The map scale is 1:62,500.

The Powers quadrangle is situated along the northern edge of the Klamath Mountains in Coos and Curry Counties in a region underlain by pre-Tertiary and Tertiary rocks. The older pre-Tertiary units have a complex tectonic history involving development of schists, serpentinite, and melange facies.

GMS 5 is for sale by the Department of Geology and Mineral Industries at its Portland, Baker, and Grants Pass offices. The price is \$1.50.

* * * * *

STATE MINERALS RESEARCH CENTERS NEEDED

Senate Bill S.635 to amend the Mining and Minerals Policy Act of 1970 proposes to establish a minerals research and training center in each state. With reference to S.635 Dr. Vernon E. Scheid, Dean of the Mackay School of Mines, University of Nevada, writes:

"A moment's reflection is sufficient to convince a person that there are but two basic and fundamental industries and that all other human economic activity depends upon the satisfactory operation of: 1) the industry involved with living resources, that is, agriculture (including forestry, fishing, etc.); and 2) the industry involved with non-living resources, that is, the mineral industry. Without either of these industries, which compose the first level of human economic activity the world as we know it ceases to exist and man becomes a wandering animal. Thus it is folly to debate which is more important, agriculture or mineral industry. Other levels of human economic activity are important to the life of our nation but they cannot exist without the first level!

"Some hundred years ago, Congress recognized that a healthy agricultural industry was necessary to our nation's well-being and by means of the Morrill and other Acts created agricultural research and training institutes throughout America. The results are world famous. Regrettably, research and training institutes for the non-living (earth and mineral) resources were not established at that time. Thus, America, although well-supplied by nature with mineral materials, has paid a heavy price through lack of research and training. The nation that does not consider the economic condition of each of its two basic industries may soon lose its right of free choice in guiding its own future in the world!

"The time has come for America to think about its earth and mineral

(non-living) resources. The education and research necessary for these resources to be properly extracted and used must be supported and encouraged. Then, and only then, will America know that both of its basic and fundamental industries will be healthy and will contribute to our Nation's safety and well-being.

"As Dean of one of America's few remaining mineral industry colleges and as Director of one of our most active state bureaus of mines, I sincerely urge you to support the passage of S.635 which calls for the establishment of mineral resources research and training institutes throughout America." (News Letter, Nevada Mining Association, June 15, 1971)

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PRESIDENT DELIVERS ENERGY MESSAGE

In a special energy message to Congress, President Nixon outlined a program which included: (1) additional funding of a program to develop and demonstrate, in partnership with industry, the technology for removing sulfur from the stack gases of power plants and industrial plants burning coal and oil; (2) a commitment to complete the successful demonstration of the liquid metal, fast-breeder reactor by 1980; (3) an expanded cooperative pilot plant program aimed at making coal gasification a commercial reality; (4) funding of a broad range of other energy research and development such as coal mine health and safety, fusion power, magnetohydrodynamics and underground electric transmissions; (5) the increasing of oil and gas lease offerings on the Outer Continental Shelf; (6) expediting development of an orderly oil shale leasing program with emphasis on environmental protection and recovery of a fair return to the government; and (7) expediting of the scheduling of a competitive geothermal lease program this fall under recently enacted legislation, provided environmental concerns can be satisfied.

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NEW U. S. CHIEF GEOLOGIST NAMED

Dr. Vincent E. McKelvey has been appointed Chief Geologist to head the Geologic Division of the U. S. Geological Survey, Department of the Interior. Dr. McKelvey succeeds Dr. Harold L. James, who occupied the post since 1965, and who will return to his research on the geology and ore deposits of ancient rocks in the Northern Rocky Mountains.

McKelvey, who joined the Geological Survey in 1941, is internationally recognized for his studies of phosphate deposits, for his investigations into problems related to long-range energy and mineral resource needs, and particularly, in recent years, for his analyses and assessments of seabed resources of the world.

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AVAILABLE PUBLICATIONS

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

BULLETINS

8.	Feasibility of steel plant in lower Columbia River area, rev. 1940: Miller	0.40
26.	Soil: Its origin, destruction, preservation, 1944: Twenhofel	0.45
33.	Bibliography (1st supplement) of geology and mineral resources of Oregon, 1947: Allen	1.00
35.	Geology of Dallas and Valsetz quadrangles, Oregon, rev. 1963: Baldwin	3.00
36.	Vol. 1. Five papers on western Oregon Tertiary foraminifera, 1947: Cushman, Stewart, and Stewart	1.00
	Vol. 2. Two papers on foraminifera by Cushman, Stewart, and Stewart, and one paper on mollusca and microfauna by Stewart and Stewart, 1949	1.25
37.	Geology of the Albany quadrangle, Oregon, 1953: Allison	0.75
39.	Geology and mineralization of Morning mine region, Grant County, Oregon 1948: R. M. Allen & T. P. Thayer.	1.00
46.	Ferruginous bauxite deposits, Salem Hills, Marion County, Oregon, 1956: Corcoran and Libbey	1.25
49.	Lode mines, Granite mining dist., Grant County, Ore., 1959: Koch . .	1.00
52.	Chromite in southwestern Oregon, 1961: Ramp	3.50
53.	Bibliography (3rd supplement) of the geology and mineral resources of Oregon, 1962: Steere and Owen	1.50
57.	Lunar Geological Field Conference guide book, 1965: Peterson and Groh, editors	3.50
58.	Geology of the Suplee-Izee area, Oregon, 1965: Dickinson and Vigrass .	5.00
60.	Engineering geology of the Tualatin Valley region, Oregon, 1967: Schlicker and Deacon	5.00
62.	Andesite Conference Guidebook, 1968: Dole,	3.50
63.	Sixteenth Biennial Report of the State Geologist, 1966-68.	Free
64.	Geology, mineral, and water resources of Oregon, 1969	1.50
66.	Reconnaissance geology and mineral resources, eastern Klamath County & western Lake County, Oregon, 1970: Peterson & McIntyre . .	3.75
67.	Bibliography (4th supplement) geology & mineral industries, 1970: Roberts	2.00
68.	The Seventeenth Biennial Report of the State Geologist, 1968-1970 . .	Free
69.	Geology of the Southwestern Oregon Coast W. of 124th Meridian, 1971: R. H. Dott, Jr.	3.75
70.	Geologic formations of Western Oregon, 1971: Beaulieu	2.00
71.	Geology of selected lava tubes in the Bend area, 1971: Greeley . . .	in press

GEOLOGIC MAPS

Geologic map of Oregon west of 121st meridian, 1961: (over the counter) . . .		2.00
folded in envelope, \$2.15; rolled in map tube, \$2.50		
Geologic map of Oregon (12" x 9"), 1969: Walker and King		0.25
Preliminary geologic map of Sumpter quadrangle, 1941: Pardee and others . .		0.40
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GMS-1: Geologic map of the Sparta quadrangle, Oregon, 1962: Prostka		1.50
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GMS-3: Preliminary geologic map, Durkee quad., Oregon, 1967: Prostka . . .		1.50
GMS-4: Gravity maps of Oregon, onshore & offshore, 1967: [Sold only in set] flat, \$2.00; folded in envelope, \$2.25; rolled in map tube		2.50
GMS-5: Geology of the Powers quadrangle, 1971: Baldwin and Hess		1.50

[Continued on back cover]

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| | Oregon mineral deposits map (22" x 34"), rev. 1958 (see M. P. 2 for key) | 0.30 |
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