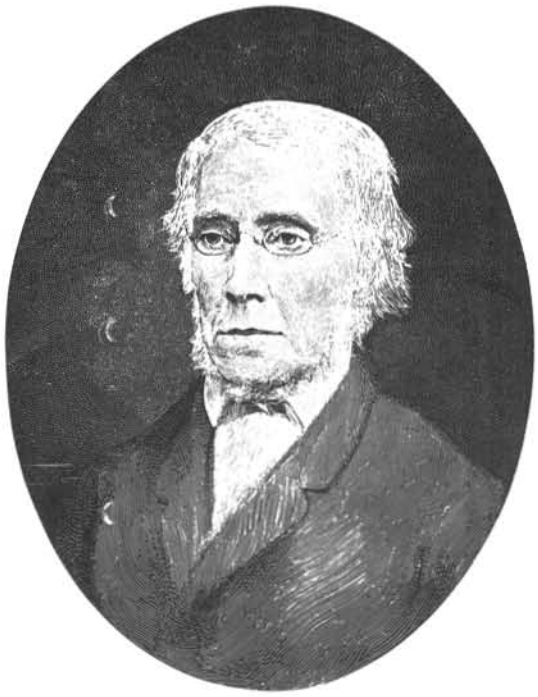
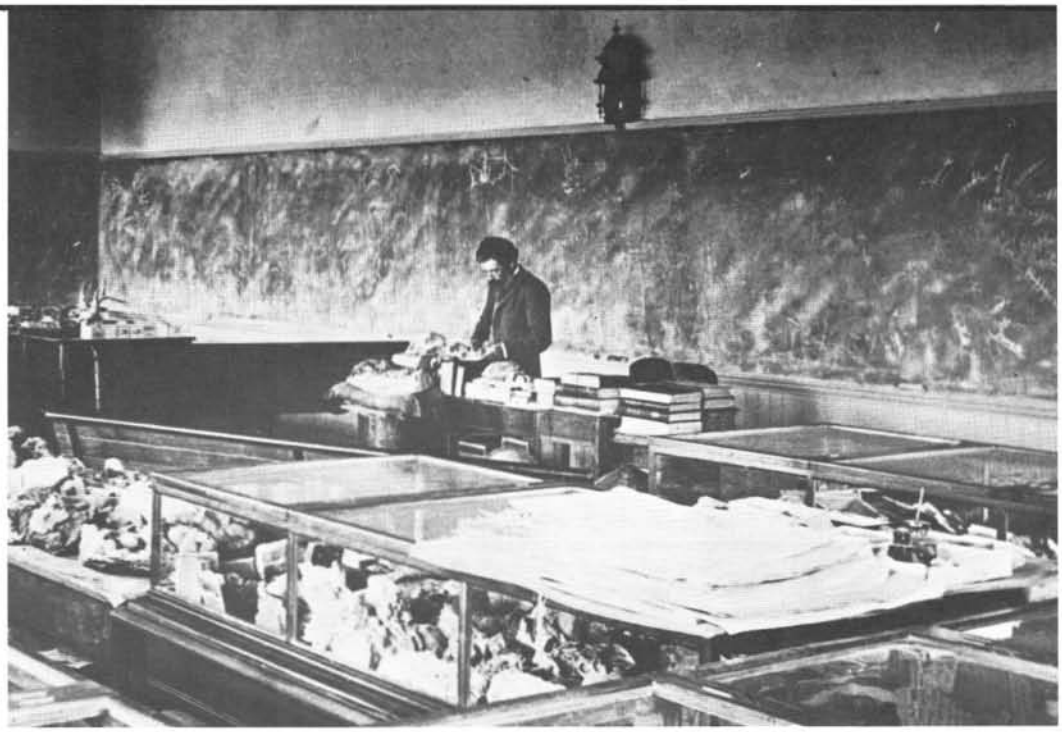
OREGON GEOLOGY

published by the

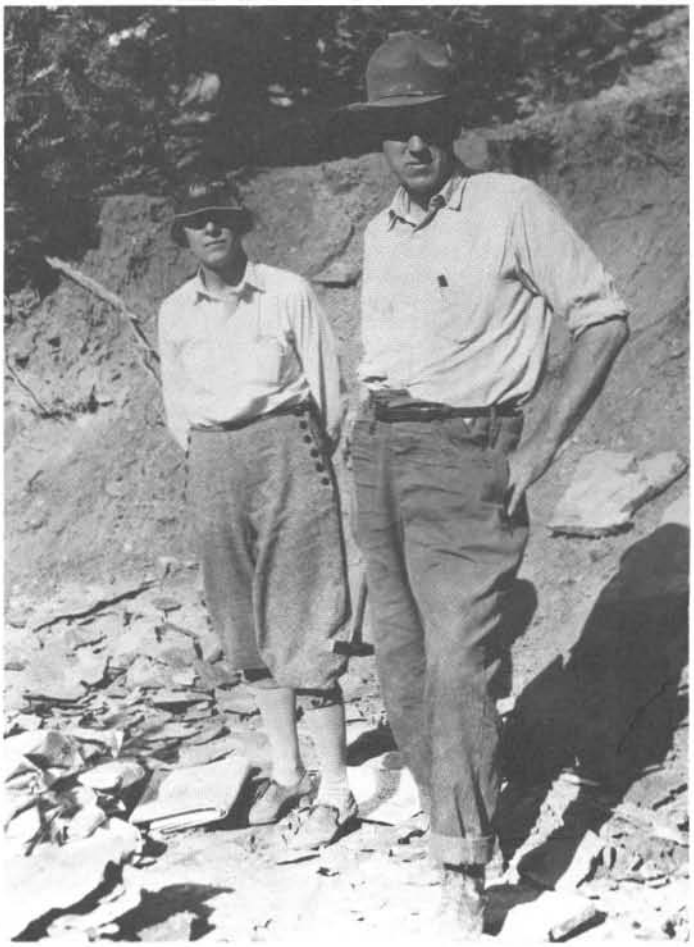
Oregon Department of Geology and Mineral Industries

VOLUME 49, NUMBER 12 DECEMBER 1987





Paleontology in Oregon: Workers of the past



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(ISSN 0164-3304)

VOLUME 49, NUMBER 12 DECEMBER 1987

Published monthly by the Oregon Department of Geology and Mineral Industries (Volumes 1 through 40 were entitled *The Ore Bin*).

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Second class postage paid at Portland, Oregon. Subscription rates: 1 year $6; 3 years, $15. Single issues, $.75 at counter, $1 mailed. Available back issues of *Ore Bin*: $.50 at counter, $1 mailed. Address subscription orders, renewals, and changes of address to *Oregon Geology*, 910 State Office Building, Portland, OR 97201. Permission is granted to reprint information contained herein. Credit given to the Oregon Department of Geology and Mineral Industries for compiling this information will be appreciated. POSTMASTER: Send address changes to *Oregon Geology*, 910 State Office Building, Portland, OR 97201.

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 the bibliographic references. Names of reviewers should be included in the "Acknowledgments."

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

COVER PHOTO

Some of the early paleontologists who worked in Oregon and are discussed in article beginning on next page (clockwise, beginning at top left): Timothy Conrad (photo courtesy Ellen J. Moore, USGS). Thomas Condon in his classroom-laboratory at the University of Oregon (photo courtesy University of Oregon Archives). Ralph Chaney collecting fossil leaves, probably at the West Branch of Bridge Creek locality near Mitchell; the woman is not identified (photo courtesy University of Oregon Archives, Phil Brogan Collection). Jacob L. Wortman standing before some of his fossil dinosaur finds at the American Museum of Natural History (photo courtesy Dorothy Gunness, McMinnville, Oregon).

OIL AND GAS NEWS

Mist Gas Field

ARCO has drilled the well Columbia County 34-4-65 to a total depth of 3,382 ft and has run production casing. The well is currently suspended, awaiting completion. ARCO drilled the Columbia County 42-9-65 to a depth of 2,850 ft and, after abandoning the well, redrilled to a depth of 2,840 ft and plugged and abandoned the well. This is the first dry hole of the year for ARCO after five successful wells. ARCO next plans to drill the Columbia County 21-35-65, which has a proposed total depth of 1,900 ft.

Completion tests were done by ARCO on the Columbia County 31-27-65 and Columbia County 31-34-65 wells, and they are currently suspended, awaiting connection to gas pipeline. Production rates have not yet been released. □

New report provides detailed geology of Broken Top area

A new report published by the Oregon Department of Geology and Mineral Industries (DOGAMI) provides detailed geologic descriptions of an area near the Three Sisters and Broken Top in the Cascade Range for both general interest in the geology of the central High Cascades and specialized study of the many challenging geologic problems of the region.

Field Geology of the Northwest Quarter of the Broken Top 15' Quadrangle, Deschutes County, Oregon, by E.M. Taylor of the Department of Geology at Oregon State University, has been published as DOGAMI Special Paper 21. This section of the Broken Top quadrangle covers a portion of the area east of the Three Sisters and north of Broken Top, on the east side of the High Cascade crest in the Deschutes National Forest. The publication includes a 20-page text and a geologic map at the scale of 1:24,000.

This report is the second publication of the author's many years of intensive work in the area. The first results were published by DOGAMI in 1978 as Special Paper 2, *Field Geology of S.W. Broken Top Quadrangle, Oregon*, covering the adjacent area of Broken Top itself.

The text discusses the general geology of the study area in the context of the geologic history of the High Cascades. It then describes the mapped rock units, of which the volcanic units have been differentiated to such detail that the author had to go beyond the established system of geologic map symbols to identify them properly. Thus, for instance, 22 units of Pleistocene basaltic andesite were found in the study area—out of over 40 units identified by the author in his work so far. An appendix lists chemical analyses of over 100 rock samples from the study area.

The separate geologic map sheet shows, along with the rock units, the approximate boundaries of volcanic ash lobes, of Pleistocene glaciers, and of crests of recessional moraines. It also identifies number and location of each analyzed sample.

The new report, DOGAMI Special Paper 21, is now available at the Oregon Department of Geology and Mineral Industries, 910 State Office Building, 1400 SW Fifth Avenue, Portland, OR 97201. The purchase price is $5. Orders under $50 require prepayment. □

REMEMBER TO RENEW

Many of you will find that the code number on your address label ends in "1287," which means your subscription expires with the December issue of 1987. If so, or if your expiration date is anywhere near this, please use the renewal form on the last page to make sure you will continue receiving *Oregon Geology*. And while you are at it—why not consider a gift subscription for a friend?

Paleontology in Oregon: Workers of the past

by Melvin S. Ashwill, Amateur Paleobotanist, 940 SW Dover Lane, Madras, Oregon 97741

During the past year, we have printed several short articles about the history of the Oregon Department of Geology and Mineral Industries. This paper delves deeper into the history of the study of geology in Oregon, as it presents biographical information about early-day paleontologists in the state. Oregon is rich in fossils, and the early-day scientists who were first on the scene had a rare opportunity to make exciting discoveries. Later paleontologists carved out their own special areas of interest, but all contributed to the still-unfolding story of Oregon's geologic history. Space does not permit a more detailed discussion of the scientists presented herein, but we hope that even this brief introduction will breathe life into names often cited in the literature. Publications by the individual paleontologists are not cited in this paper, but information about them appears in the *Bibliography of Oregon Paleontology: 1792-1983,* by Elizabeth L. Orr and William N. Orr, which was published by the Oregon Department of Geology and Mineral Industries in 1984. *—Editor*

INTRODUCTION

"As he came down from the quarry one day carrying his geologist's pick and hammer and a large specimen of rock, he found a stone mason at work preparing a large block from the quarry for building purposes. He stopped suddenly and holding up his own specimen said, 'Gaylor, what would you think if I should give this piece of rock a blow with my hammer and find a spray of leaves inside?' Gaylor stared with incredulity as Mr. Condon placed his piece of rock on a solid foundation, carefully studied its probable line of cleavage, struck a sharp blow, and the two sides fell apart, revealing a beautiful spray of leaves. He himself was delighted with the result, but when he looked up with a smile into the face of the stonecutter, he found him white with fear and astonishment, for to him, it was nothing short of a miracle. No explanation seemed to relieve the poor man's superstition, and he could never quite forgive the minister who he believed was in league with the spirits."

This incident in the life of Thomas Condon, as related by his daughter, Ellen Condon McCornack (McCornack, 1928), exemplifies the kind of excitement at the moment of discovery that has led paleontologists to spend countless hours, often wet, hot, or cold, in almost inaccessible places, doing their chosen work. The thrill of becoming—in the split second it takes to break open a rock—the first person ever to have viewed this image of life that had been imprisoned thousands or millions of years ago never pales for those who enjoy the study of ancient life.

Few realize it, but we in Oregon are surrounded by a veritable gold mine of fossil treasures that can be found in almost every corner of the state by those who trouble themselves to learn how. This is not true in all parts of the world. In many places, past conditions have worked against the preservation of life's evidence in layers of rock. Really old rocks, such as those deposited during the Precambrian, have few fossils, because life forms were much less common then. Also, most organisms during that time were soft bodied and therefore seldom preserved. In addition, many older rocks have been so altered, deformed, or changed in some way that any fossils that they may have contained have been destroyed or are not recognizable.

As Condon and others recognized early on, Oregon is a geologically young land. Our most ancient fossils are middle Devonian in age and are only about 370 million years old. Nevertheless, this state has a wealth of history locked in its rocks. Conditions were favorable for the preservation of fossil plant and animal remains during certain periods of Oregon's past, and uplift and erosion have fortuitously exposed these remains to us in many places—and in surprising ways. For instance, beachcombers along the central Oregon coast may not only pick up modern seashells but also pry Miocene shells from rocks at the same beaches. Furthermore, some of the fossils look so fresh that they are commonly mistaken for modern shells. Fossil hunters from all parts of the world travel to Oregon to share in our bonanza.

In this paper, we will look at some of the paleontologists who in the past literally "dug up" the facts. Wherever possible, we will include dates of birth and death of these scientists.

THE FIRST FOSSIL ENTHUSIASTS: NATIVE AMERICANS

Little is known about the first fossil hunters in Oregon. Fossils were sometimes used as ornaments and amulets by native Americans, as evidenced by the finding of occasional fossils, some pierced for stringing, preserved in old living sites and burials.

A few years ago, an archaeology research team from the Oregon Museum of Science and Industry's (OMSI) Hancock Field Station found an Indian fossil collection (Joseph Jones, personal communication, 1986). At the time, Brian Gannon, now a geologist-archaeologist in Alaska, was in charge of a dig on the Pentecost Ranch about 3 mi east of Camp Hancock, near Fossil, Oregon. At OMSI site WH357, the group excavated several house pits superimposed one over the other (est. age 11,000 years). In a corner of one of the pits, at a depth of 1 m, five rock slabs with fossil leaf impressions on them were found in a stack. The site is not far from a lower John Day Formation fossil leaf locality presently under study.

ESTABLISHING A FOUNDATION: 19TH CENTURY WORKERS

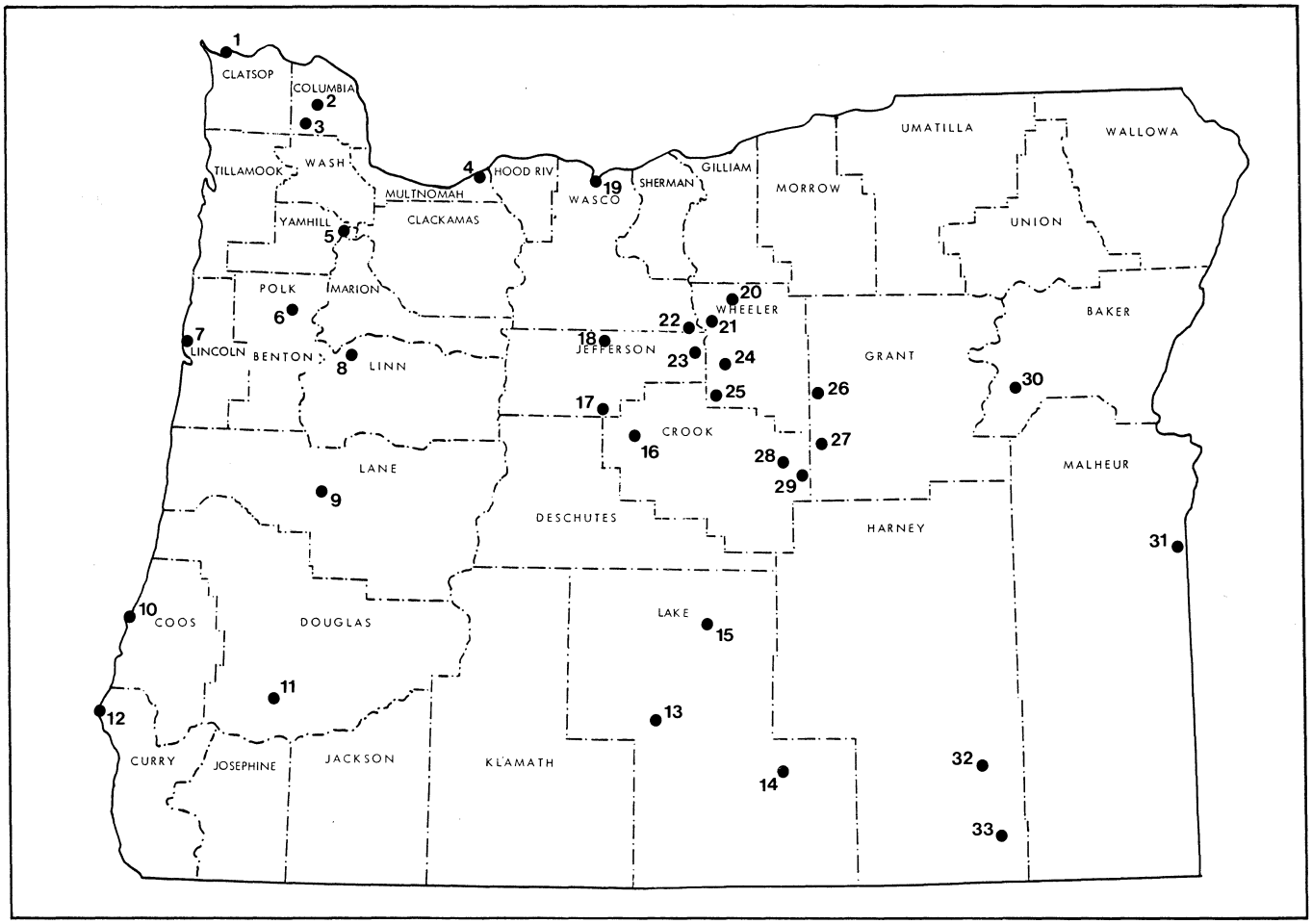
During the first half of the 19th century, Oregon was a frontier, with few permanent settlements. It was only in the 1840's that educational institutions above the elementary level were established. Fossils found by settlers or travelers were sometimes referred to eastern scientists for study.

Archibald Menzies, J.K. Townsend, H.C. Perkins, J. Hall, and J.W. Bailey

The first recorded reference to Oregon fossils seems to have been made by Archibald Menzies (see Orr and Orr, 1984), when he wrote in 1792 of invertebrate fossils that Captain Vancouver and his crew recovered from Cape Blanco. The sparse treatment of Oregon fossils in the first half of the 19th century also includes a discussion by J.K. Townsend of Astoria Formation mollusks, a description of fossil elephant bones found on the banks of the Willamette River by Ewing Young and studied by H.C. Perkins, and two papers by J. Hall (see Orr and Orr, 1984) on fossils found during Fremont's 1845 expedition. Beginning in 1845, J.W. Bailey produced a series of four papers on the diatoms of Oregon (see Orr and Orr, 1984). These reports all resulted from material brought back from reconnaissance expeditions of the United States government. By 1848, settlers were moving into the area, and this increase in population is reflected in the increase in the number of fossil studies that began to appear.

J.D.Dana (1813-1895)

Among the countless ships that have been wrecked on the Columbia Bar, the *Peacock* in 1841 carried part of Lt. Charles Wilkes' exploration expedition. On the ship was J.D. Dana, geologist and



Map showing Oregon's major fossil collection localities mentioned in this paper. Key to numbers:

1 *Astoria*
2 *Pittsburg Bluff*
3 *Keasey Formation*
4 *Moffet Creek*
5 *Newberg*
6 *Dallas*
7 *Lincoln County beaches*
8 *Scio*
9 *Goshen*
10 *Coos Bay-Cape Argo*
11 *Riddle*
12 *Cape Blanco*
13 *Summer Lake*
14 *Warner Valley*
15 *Fossil Lake*
16 *Prineville*
17 *Gray Butte*
18 *Gateway*
19 *The Dalles*
20 *Fossil*
21 *Hancock Canyon*
22 *Currant Creek*
23 *Cherry Creek*
24 *Bridge Creek*
25 *West Branch Bridge Creek*
26 *John Day Fossil Beds*
27 *Mascall-Rattlesnake Fossil Beds*
28 *Beaver Creek*
29 *Suplee*
30 *Unity Reservoir*
31 *Succor Creek*
32 *Alvord Creek*
33 *Trout Creek*

naturalist. Making his way ashore in a lifeboat, Dana made use of this unscheduled stop to collect Miocene mollusks from the Astoria Formation (see Orr and Orr, 1984).

T. Condon (1822-1907)

When the clipper ship *Trade Wind* rounded Cape Horn in 1852, it brought to the West one of the most remarkable men ever to work in Oregon paleontology. Thomas Condon, "the father of Oregon geology," and his bride Cornelia were missionaries. Rev. Condon's deep interest in the natural sciences was not unusual in an era when many other clergymen also pursued scientific avocations.

Born in Ireland, Condon grew up on Manhattan Island, New York. As a young teacher in central New York state, he collected trilobites and other marine fossils. When he and his family settled at The Dalles, then gateway to the gold fields at Canyon City, his duties with the church did not inhibit his scientific curiosity. Within a few years, he accumulated cabinets of fossils that were not only a topic of conversation for most of the populace but also of great interest to traveling officials and scientists from the East. "In talking with Captain McNulty or George Naggs, the affable purser, they would be advised to see Mr. Condon's geological collection. So about four o'clock of any pleasant day, the Condon home might be opened to a party of from two to twenty or more ladies and gentlemen who were eastern tourists" (McCornack, 1928).

It is a tribute to Condon's rare talents that he became a self-educated geologist and paleontologist through collecting, trading fossils for publications, and maintaining a stream of correspondence. In his later years, he was named Oregon's first state geologist (1872), and he finished his career as the University of Oregon's first professor of geology (1872-1905). He was well liked by students and faculty and universally regarded as an effective teacher and counselor. He was the pioneer stratigrapher of the state and was in communication with the leading geologists and paleontologists of the day (Addicott, 1981). Among the important scientists with whom Condon

Table 1. *Individuals discussed in this paper and their major fossil collection areas. Numbers are keyed to locality map.*

Anderson 11	Marsh 26,27
Bones 21	Menzies 12
Brogan 15,16,17,18,24,25	Merriam 26,27
Chaney 4,17,19,21,24,25,27	Packard 7,10,15,27,28
Condon 1,7,10,15,19,22,23,24, 26,27,28,29	Perkins 5
	Sanborn 8,9
Cope 15,28	Schenck 2,3,7,9,10
Dall 1,7,10	Sternberg 15
Dana 1	Stock 26,27,28
Diller 11	Townsend 1
Emlong 7,10	Weaver 2,3,7,10
Hancock 21,30	Whiteaker 15
Hannibal 10	Wortman 15

met or corresponded were O.C. Marsh, E.D. Cope, Joseph Leidy, S.F. Baird, Joseph Henry, Clarence King, H.S. Osborn, J.S. Newberry, F.V. Hayden, Joseph LeConte, C.H. Sternberg, W.B. Scott, J.C. Merriam, William Dall, and Jacob Wortman (one of Condon's students). Condon's primary contributions were in collecting and teaching. He wrote the first text on Oregon geology and published a few papers on fossils (see Orr and Orr, 1984). The "Dr." sometimes seen in his title probably resulted from his theological degree.

T.A. Conrad (1803-1877)

A brilliant, self-educated naturalist who never actually came to the Pacific Northwest, Timothy Conrad was the foremost authority on Tertiary paleontology in the United States during the mid-1800's (Addicott, 1981). Conrad (see Orr and Orr, 1984) described fossil mollusks from the Miocene Astoria Formation. He has been described as an enigmatic eccentric who was absentminded, moody, and often melancholy. He also has been accused of being too brief with his fossil descriptions (Moore, 1962, 1971). Conrad wrote to a friend in 1863, "I go Monday to help H. (James Hall, Director of the New York Geological Survey) ferret out my skulking species of Paleozoic shells. May the recording angel help me. God and I knew them once, and the Almighty may know them still. A man's memory is no part of his soul" (Merrill, 1924).

J.S. Newberry (1822-1892)

The explosive growth of railroads in the mid-1800's provided the side benefit of a great deal of geological information gained from the accompanying surveys and explorations. Many fossils were found in actual construction work, notably the famous "fossil fish cut" west of Rock Springs, Wyoming. John Strong Newberry, a Connecticut-born medical doctor with far-ranging scientific interests, accompanied Lt. R.S. Wilkenson's expedition on one such trip beginning in San Francisco and ending at The Dalles on the Columbia River. Although Newberry made some collections of minerals and fossils (chiefly floral) at this time, his main contribution to Oregon paleontology came later, when he supported Condon's efforts by describing his fossil plants in the literature (see Orr and Orr, 1984) and when he gave Condon some financial aid for his collecting trips.

O.C. Marsh (1831-1899) and E.D. Cope (1840-1897)

Paleontologists are frequently asked, "How much money are your fossils worth?" In truth, most fossils can be gotten merely by searching and therefore do not command high prices. Two 19th-century paleontologists were partly responsible for the popular fallacy that fossils are worth large amounts of money. O.C. Marsh of Yale University and E.D. Cope of the Philadelphia Academy of Sciences were brilliant and dedicated vertebrate paleontologists, each of whom had been endowed with large family fortunes. In their eager and highly competitive race to build complete collections, they hired professional collectors and also spent large sums of money to purchase good specimens, thus leaving a legacy of a paleontological spending spree.

Marsh collected with Condon in the Mascall beds in 1871 (McCornack, 1928), then visited The Dalles, where he examined Condon's large collection. He returned to The Dalles in 1873 to photograph and study some of the fossils. As the founder of the Peabody Museum, Marsh sent important scientific papers to Condon and bought and borrowed specimens from him. The well-publicized resentment that Condon developed when he was not able to get some of his loaned specimens returned until after Marsh's death may have been due to Marsh's avarice, as is commonly thought. It is equally possible that the specimens were held so long because of Marsh's chronic problem of having collected masses of material. He simply was never able to keep up in his studying of the fossils. In 1982, the writer was told by Bruce Tiffney, Yale paleobotanist, that to this day, occasional graduate students in need of thesis material will break open boxes of Marsh's unstudied specimens.

Starting in 1872, letters were exchanged between Cope and Condon (McCornack, 1928). Cope tried to get Condon to collect for him, but an arrangement had already been made with Marsh. Eventually Condon did send Cope packages of "duplicate" materials. Cope responded by paying for them, as well as supplying Condon with large quantities of up-to-date scientific literature. The latter was invaluable to Condon, remote as he was from any large literary collections. Two of Cope's paid collectors, C.H. Sternberg and J.L. Wortman, gathered fossils for him at Fossil Lake and the upper Crooked River. In 1879, Cope himself made a foray into Oregon. After collecting at Fossil Lake and Beaver Creek (upper Crooked River), he visited Condon (then at the University of Oregon) and examined the fossils in his collection. True to form, he immediately published his Oregon observations (see Orr and Orr, 1984).

One of Marsh's outstanding contributions was his elucidation of horse evolution in America. Some of the material crucial to this study came from Oregon (Marsh, 1874).

R.W. Shufeldt and John Whiteaker

The extensive early collections from the Fossil Lake Pleistocene, including those by O.C. Marsh, E.D. Cope, Governor John Whiteaker, C.H. Sternberg, Jacob Wortman, and Thomas Condon, have provided grist for numerous studies. Early settlers near Silver Lake, Oregon, reported that fossils were sometimes removed by the wagonload. Shufeldt alone published ten papers on fossil birds from Fossil Lake over a span of twenty years (see Orr and Orr, 1984).

W.H. Dall (1845-1927)

The first comprehensive study of the coastal Oregon invertebrates was published by Dall (see Orr and Orr, 1984). A prolific writer on mollusks during the late 19th and early 20th centuries, he worked from the Smithsonian Institution. Dall was a compulsive worker and was known to have kept fossil shells on hand at the dinner table, examining them between dinner courses (Addicott, 1981). Dall collected briefly in Oregon, but more importantly, he did valuable support work for others, including J.S. Diller.

J.S. Diller (1850-1924) and F.M. Anderson

For three decades at the turn of the century, J.S. Diller, geologist for the U.S. Geological Survey (USGS), conducted definitive studies on the stratigraphy of southwestern Oregon. He made extensive use of paleontology in his work (see Orr and Orr, 1984). Frank M. Anderson, an Ashland, Oregon, native, who for a short time was one of Diller's assistants, went on to publish several papers on the invertebrates (chiefly Cretaceous) of the same area (see Orr and Orr, 1984).

J.L. Wortman (1856-1926)

Surely, among the careers of Oregon paleontologists, that of Jacob L. Wortman must be the most curious. Born of pioneer stock and

a native of the state, Wortman determined to make himself into a good paleontologist. He left the University of Oregon in 1887 and within 10 years had made a name for himself as a collector and paleontologist and had also added a medical degree to his qualifications. He had been by then anatomist for the U.S. Medical Museum and demonstrator of anatomy at Georgetown Medical College, Washington, D.C. There is some question about the degrees attached to his name in the literature. The University of Oregon archives do not list him among those having been granted a degree (Dorothy Gunness, written communication, 1985).

A brilliant collector, anatomical reconstructionist, and writer, Wortman was named assistant curator of vertebrate paleontology at the American Museum of Natural History under Henry Osborn. He was known as a warm and highly competent teacher, having produced definitive works in paleontology (see Orr and Orr, 1984) that remain classics. Paradoxically, at the peak of his success, he closed the book on his meteoric career following a series of frustrating administrative squabbles. He then married and settled in Brownsville, Texas, where he spent the remainder of his life as a pharmacist and drug store owner. He refused to practice or even read of his former profession.

Wortman had studied under Condon at the University of Oregon and held him in high regard, saying to him, "If my efforts are in the end to be crowned with success, I will always feel that no one will be entitled to a larger measure of credit for the same than yourself....To your charming and attractive method of presenting the subject, I owe probably more than anything else the impressions which afterward led me to take it up for a life work" (McCornack, 1928).

J.C. Merriam

The Oregon that J.C. Merriam encountered on his first paleontological expedition into central and eastern Oregon definitely had a frontier flavor. In his journal of the expedition, scientist Loye Miller wrote the following on Sunday, May 28, 1899: "In the afternoon at 2:00, we passed through the little town of Antelope. Sunday was a busy day, stores doing a good business, pack horses in the streets, and saloons going full blast. The little 'burgh' has the reputation of being the toughest town in the country. As we came up the grade on this side, a drunken horseman swayed along to where we were, muttered some inarticulate babble, finally toppling off his horse by the road. We tied his horse to the fence and left him to sleep it off" (Miller, 1899). Even today, fossil hunters like to view their expeditions into central Oregon in an adventurous light. It is obvious that Miller's imagination was gripped by the frontier aspect of the freight stop on the way to Oregon's gold fields.

By the turn of the century, Merriam was well into a distinguished career as a teacher and researcher in paleontology at the University of California (UC) at Berkeley. A product of Berkeley himself, Merriam spent many years there and was responsible for the training of numerous individuals who conducted important paleontological investigations in Oregon during the first half of the 20th century. He headed many fossil collecting trips in central and eastern Oregon and published results from them over a period from 1899 to 1927 (see Orr and Orr, 1984).

FLESHING OUT THE RECORD: 20TH CENTURY WORKERS

By the beginning of the 20th century, Oregon was losing some of its pioneer flavor. With several good-sized cities, rail, sea, and highway transportation, and good mail and telegraph service, the people of the state now looked upon themselves as more a part of the mainstream of civilization. The sketchy paleontological work of the 1800's had laid a good foundation of knowledge that was now rapidly built upon by a series of capable people.

W.M. Fontaine and H. Hannibal (1889-1965)

Definitive studies of the Jurassic floras near Riddle and Port Orford were furnished by Fontaine, while Hannibal published some useful papers on invertebrates in Oregon (see Orr and Orr, 1984).

E.L. Packard

Earl Packard can be regarded as Condon's successor. He was the first paleontologist since Condon to spend a long tenure in Oregon colleges. Trained by J.C. Merriam at Berkeley, he began his Oregon career at the University of Oregon 10 years after Condon. During the depression years, when it was decided that the University of Oregon would focus on the humanities while Oregon State Agricultural College (now Oregon State University) would deal with the sciences, Packard and other science teachers moved to the Corvallis campus. Packard was very active in field work in Oregon and helped train many of today's outstanding paleontologists. His 28 references cited in the *Bibliography of Oregon Paleontology* (Orr and Orr, 1984) reflect his impact on the profession.

R.W. Chaney (1890-1971)

The person with the greatest number of references cited under his name in the Oregon paleontology bibliography (Orr and Orr, 1984) was not an Oregonian at all. Born in Illinois, Ralph Works Chaney studied at the University of Chicago. He spent 49 years of his life at Berkeley, where he did paleobotanical research and teaching. He traveled to several continents in amassing his collections and, at the close of his career, was recognized as a monumental figure internationally. Today, almost two decades after publication of his last paper, this author found Chaney's name in 11 of the first 14 recent paleobotanical publications to be picked up. He published until three years before his death at the age of 81 and prior to his death was compiling material for a paper on the Eocene West Branch flora from near Mitchell, Oregon.

Chaney's first brush with paleobotany was in 1916, when he collected plant fossils in the Columbia Gorge. This discovery encouraged him to return countless times to collect in Oregon. His last visit was in 1969, when he, along with some of his former students, made sentimental stops at some of his past collecting areas, including the Gray's Ranch (now Alaska-Pacific Ranch) locality on the Crooked River.

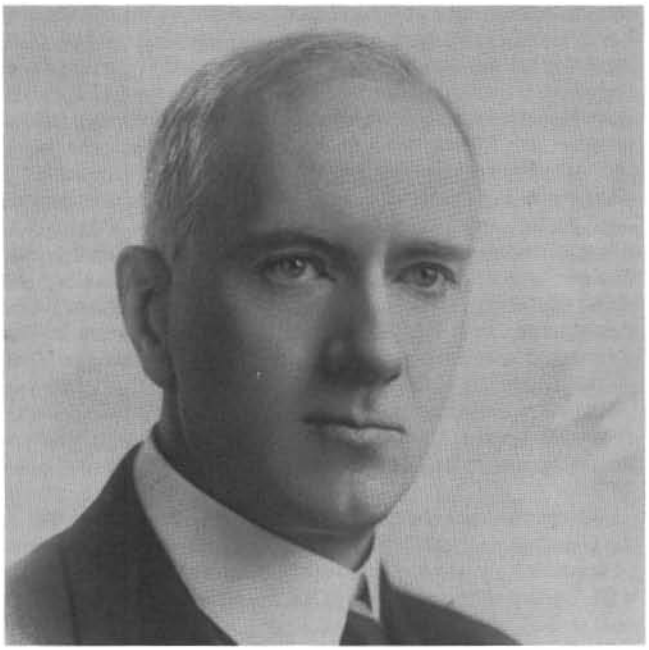
Roy Chapman Andrews took Chaney with him on his famous 1925 trip to the Gobi Desert of Mongolia. This was the first of several trips to the Orient for Chaney, the most memorable being his trip to central China to collect and verify the existence of a "living fossil," the Dawn Redwood *(Metasequoia)*.

Chaney is remembered with affection by his former students. C.J. Smiley, paleobotanist at the University of Idaho, reminisced:

"I think I may have learned more from him on field trips than at any other time. He was a funny man. By that, I mean humorous. He had a good sense of humor, and he had his quirks of personality that helped make him interesting. One was that he was a very close man with a dollar. He hated to spend money unnecessarily. On field trips, for instance, he tried in every way to economize. One of his favorite foods was bananas, and he liked them very ripe—almost squishy. Once he stopped in a small-town grocery store for provisions and found some overripe bananas. On learning the price, he talked to the owner at length about the fact that the price should have been discounted due to the condition of the fruit. When the shopkeeper was unmoved, Chaney pointed out the very short shelf life for the bananas and the likelihood that if not sold now they would spoil on the shelf. Still not gaining a better price, he stormed out of the store without his favorite food.

"Another time, he paid the going price for some fresh cherries at a store but became petulant and outraged when, just a short way down the road, he came upon an entire orchard of ripe cherries going to waste. Receiving permission from the owner, he spent an hour of effort in picking an enormous quantity of fruit. For some time after that, he was quite smug and happy about the money he had saved by not buying these additional cherries at the store."

Chaney's observations on Tertiary floral paleoecology had a tremendous impact on the direction of thought on this topic (Gray



Charles E. Weaver. Photo courtesy Warren O. Addicott, USGS.

Phil F. Brogan. Photo courtesy John Philip Brogan.

and Axelrod, 1971). His extensive collections from Oregon played a critical role in the formulation of this paleoecological synthesis. Chaney's letters, numbering well over 1,000, are housed in the rare-books section of the University of Oregon library.

J.P. Buwalda, E.W. Berry, G.D. Hanna, and E.L. Furlong

Also contributing to Oregon paleontology during the first half of the 20th century were J.P. Buwalda, who conducted studies of vertebrate fossils; E.W. Berry, who published studies of plant fossils; G.D. Hanna, who described Oregon invertebrate fossils; and E.L. Furlong, who was a vertebrate paleontologist.

C. Stock

One of J.C. Merriam's early students at U.C. Berkeley was Chester Stock. In company with Merriam, Furlong, and Chaney, as well as independently, he spent many seasons collecting and describing vertebrate fossils from the John Day and Mascall Formations (see Orr and Orr, 1984).

The pronunciation of the name "Mascall," incidentally has been a source of confusion over the past decade. Some put the accent on the first syllable, while others place it on the last. The formation was named for the owner of a ranch just southeast of Picture Gorge in the basin holding the formation. The writer talked with David Mascall of Prineville, Oregon, who is a descendant of that early rancher. Mascall states that although the name, which is of French derivation, may be accented on the final syllable in France, the traditional pronunciation in his family has always been "MASS-kl," with the accent on the first syllable.

H.G. Schenck (1897-1960)

A pioneer in micropaleontology, Hubert G. Schenck studied under Packard at the University of Oregon. His publications, both on individual localities and regional stratigraphy, were important contributions (see Orr and Orr, 1984). He taught at Stanford University and was an exceptionally impressive teacher, probably the best in his field (Addicott, written communication, 1986).

E.I. Sanborn

Ethel Sanborn, who was a former student of Chaney and at one time was a paleontologist at Oregon State Agricultural College, published significant papers on the Goshen, Comstock, and Scio floras (see Orr and Orr, 1984). These provided important data for interpretation of past climatic conditions. The study of ancient climates is enjoying a surge of interest now, and her references are essential for those workers currently involved in paleoclimatological investigations in our region.

R.W. Brown, C.A. Arnold, and G.F. Beck

Also working in Oregon during the middle of this century was R.W. Brown, then of the USGS. In addition to fossil plants, he described Oregon's only known fossil bat (see Orr and Orr, 1984). Chester A. Arnold of Michigan University, a specialist in primitive vascular plants, found tree fern fossils in Oregon (see Orr and Orr, 1984). G.F. Beck of Central Washington State University collected extensively and described fossil woody tissues from Oregon (see Orr and Orr, 1984).

C.F. Weaver (1880-1958)

When any study of natural history focuses on a given area, the scope of the study inevitably, like ripples in water, widens to include nearby areas. So it was that, when one of the giants of Pacific Northwest invertebrate paleontology, Charles F. Weaver, set out to study western Washington's fossils, he ended up contributing to Oregon paleontology as well. For all of his life a strong hiker, Weaver, like many other thorough field paleontologists and geologists of his day, spurned the automobile. He worked on foot and used public transportation only when forced to do so. He was one geologist who could never be accused of taking all his samples and making all his observations from roadside localities. Weaver's field work in the Pacific Northwest was mainly completed prior to 1920. It created a solid base upon which later workers have built.

P.F. Brogan (1896-1983)

If you had been born, as Philip F. Brogan was, around the turn of the century in remote central Oregon and had spent your youth hearing the bagpipes of Scottish shepherds echoing in the wild hills, having your name included in an article on Oregon paleontology would have seemed rather remarkable. Brogan, however, was a remarkable man. He holds a special place among Oregon's contributors to historical geology. His articles in the *Geological Socie-*

ty of the Oregon Country Newsletter (see Orr and Orr, 1984) and for decades in the Sunday edition of the *Oregonian* did much to popularize geologic and paleontological knowledge in the state. Despite an incredibly demanding work schedule as associate editor of a daily newspaper, Brogan found time to collect many Tertiary fossils. The horse, rhinoceros, and plant fossil specimens he located were often turned over to professionals or museums, and access to his collection was freely given. He tramped the hills with most of the early workers in central Oregon, including R.W. Chaney, Earl Packard, and the geologist Howel Williams. His help was sought by so many that it seemed for decades as though the first duty of anyone starting work in the area was to be introduced to Brogan. The literature is rife with acknowledgments of his help. Brogan guided R.W. Chaney to the Deschutes fossil flora locality as well as the West Branch fossil flora locality, each of which furnished critical paleobotanical data. Brogan's personal papers in the archives of the University of Oregon are a mine of historical information.

A.W. Hancock (1884-1960)

Alonzo W. "Lon" Hancock, for whom Camp Hancock and Hancock Canyon are named, was another serious amateur paleontologist who has contributed much to Oregon paleontology. As an employee of the U.S. Postal Service in Portland, he and his wife spent their spare time collecting fossils. In the 1940's, he, along with his friend Tom Bones, began to concentrate on the "nut beds" area, which includes the famous deposit of fossil seeds, nuts, and leaves adjacent to what is now Hancock Canyon. This spot is a few miles east of the old Clarno ferry (now a bridge) over the John Day River.

Hancock amassed a large fossil collection, including vertebrates and plants, which now forms the core of paleontological collections and exhibits of the Oregon Museum of Science and Industry (OMSI) in Portland, Oregon. Viola Oberson (written communication, 1986), who knew the Hancocks well and was also instrumental in the start of OMSI, says that Mrs. Hancock, following the death of her husband, insisted that a display room be provided before she would release the collection.

Hancock played a significant role in introducing paleontology to young people over a period of several decades. At first taking small groups of students camping with him, he later formalized an educational program in conjunction with OMSI. After more than 30 years of growth, OMSI's Hancock Field Station, headed presently by Director Joseph Jones, currently conducts a variety of programs for all ages, including classes and camps for school-age children and adults, four college classes, and the University of Oregon field camp, that cover a wide range of subjects including earth science, astronomy, life science, and cultural history.

Camp Hancock alumni

The "distinguished alumni" list of Camp Hancock is impressive. Among those who participated in camp studies before becoming professionals are Steven Manchester, now a paleobotanist with Indiana University; Herbert Meyer, paleobotanist associated with the paleontological museum at UC Berkeley; Jack Wolfe, paleobotanist with the USGS in Denver and a world authority on paleoclimates; Dave Taylor, paleontologist at Portland State University; Thomas McKee, presently of Portland, Oregon; Bruce Welton, former curator at the Los Angeles County Museum of Natural History, now with Standard Oil Co.; Eric Gustafson, formerly with the Museum of Natural History at the University of Oregon and the University of Nebraska; Analisa Berta, San Diego State University; John Faulhaber, Burns area; and John Armentrout, former director of Camp Hancock and now with Mobil Oil Co.

T.J. Bones

With a name like "Bones," might not one be predestined for paleontology? Hancock's friend, Thomas J. Bones of Vancouver, Washington, was one of a kind. In the early 1940's, Hancock interested Bones in the seeds and nuts fossilized by the thousands at Camp Hancock. With amazing patience, Bones acquired the skills needed to recover the tiniest of seeds from the stony matrix and over the years amassed a huge collection. Bones shared his findings widely, and references to his work appear in many studies by other paleontologists. His lifelong occupation was in the printing trade, working with photographs and engravings. He used his expertise in photography and developed unique methods that produced breathtaking color enlargements of his fossils. Major portions of his collection are now preserved in the Smithsonian Institution's National Museum of Natural History and at the Department of Geology, Indiana University. Smaller but very impressive collections are on display at the John Day Fossil Beds National Monument Visitors Center and at Whitman College in Walla Walla, Washington.

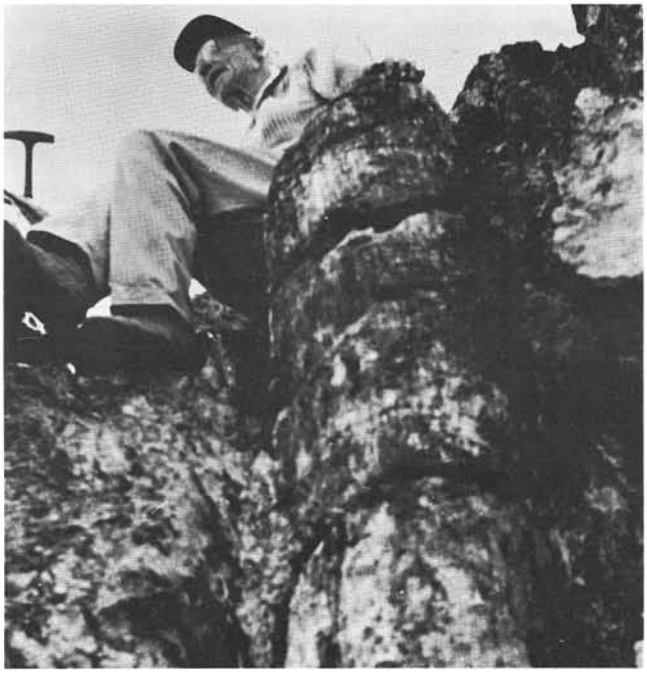
Bones told this author that the rhinoceros tooth figured by Stirton (1944) and attributed to Hancock was actually seen and collected by his wife Lorene, who subsequently gave it to Hancock. This was the first vertebrate fossil to be found in the Clarno Formation (Bones, 1979).

This author was flabbergasted when Tom Bones stated that of the countless hours he had spent collecting fossils over an interval of more than 40 years, almost all of them had been spent within a 50-ft radius. The question is "Can this record ever be matched?"

D.R. Emlong (1942-1980)

From the time that Douglas Ralph Emlong recovered his first fossil (a sea-lion vertebra) at Fogarty Creek as an eighth grade student until his tragic death in 1980 at the age of 39, he built an unparalleled assemblage of marine mammal fossils. He collected intensively for decades, most of the time unfunded, and persevered in the face of daunting adversities.

Emlong's work astounded the professional world of his speciality. Clayton E. Ray of the Smithsonian Institution, who was his major mentor, is lavish in his praise of Emlong for his impact on the field of marine mammalian paleontology. He states: "Emlong's work certainly deserves all the recognition it can get. A full biography would be warranted" (Ray, written communication, 1986). Pertinent published observations by Ray include the following: "The incom-



Lon Hancock, sitting atop the large, upright petrified tree trunk in Hancock Canyon near Fossil, Oregon. Photo courtesy University of Oregon Archives, Phil Brogan Collection.

parable 'Emlong Collection' remains a dynamic testimonial to his uncanny ability and intense dedication" (Ray, 1980). Also: "It may be confidently anticipated that the Emlong Collection will contribute substantially toward greatly improved understanding of the origin, evolution, and systematics of several major lineages of marine mammals" (Ray, 1976).

During his earlier collecting years, Doug Emlong prepared large exhibits based on his finds for agate shows, for which he won blue ribbons. As the size of his collection grew, he opened his own museum at Lincoln Beach. Emlong's collection eventually came to the attention of the Smithsonian Institution, and in 1968 he sold most of his material to that organization. The shipment of the fossils weighed 40,000 pounds and required the use of two moving vans for the cross-country trek to Washington, D.C. (Ray, 1976). The remainder of his collection contains numerous invertebrate fossils (some beautifully agatized), including examples of the chambered nautilus and similar creatures (Jennie V. Emlong, written communication, 1986). These remain at his mother's home in Tenino, Washington.

Over the last several years, more than two dozen scientists have been working with Emlong's fossils (Ray, 1980). It is estimated that it may be decades before they have all been thoroughly exhumed from their matrix and described. Emlong himself described one of his prized finds, an archaic whale, in a University of Oregon Museum of Natural History Bulletin (Emlong, 1966).

Emlong's extraordinary ability to find fossils that others might easily have overlooked is legendary. When the Smithsonian Institution brought him to Washington, D.C., he even spotted a vertebrate fossil in a Potomac River bank when crossing a bridge while entering the city. Additionally, in prospecting the Empire Formation type locality at Coos Bay (Ray, 1976), where professional paleontologists saw nothing worth collecting, Emlong recovered the skull and part of the skeleton of a gigantic seal along with other fossils. The fact that he then found himself forced to trade his heavy hammer for enough gasoline to get him home underscores his unusual dedication to his work.

Guy Pierson, who has been collecting in Emlong's home area with great success, says of Emlong's work, "His work rewrote the paleontology of marine mammals" (Pierson, personal communication, 1986). Pierson also has the feeling that everywhere he goes and in everything he does, he is walking in Emlong's footsteps.

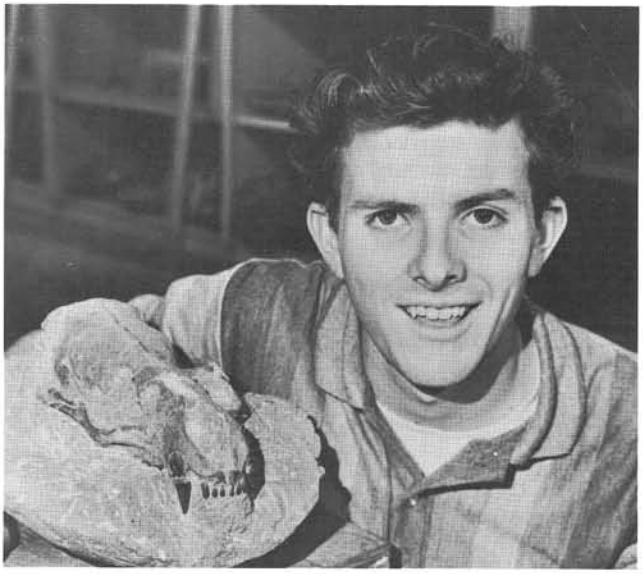
"Douglas specialized in collecting marine mammal fossils, most of which were chipped from bed rock with pick-axe, chisel, and rock hammer when the tide receded. The process often required continued work, with the tide coming in waist deep, to pry and roll out the chunks of rock before they were again covered with sand—possibly for years" (Jennie V. Emlong, written communication, 1986). Certainly Doug Emlong epitomized the dedicated collector, who is willing to persist for interminable hours in harsh weather and unfavorable terrain in anticipation of the exciting discovery.

SUMMARY

The rich stores of fossils in Oregon's rocks have piqued the curiosity of its people since well before the time of Lewis and Clark. Formal study of these fossils began with the earliest of explorations to the area.

Nineteenth-century paleontological work resulted in the discovery of now-classical coastal invertebrate localities (Dana), fossil mammal localities in the John Day Formation (Condon, Cope, and Merriam), and the Pleistocene vertebrate faunas from Fossil Lake (Shufeldt, in particular) for birds.

Major accomplishments in the 20th century include the following: (a) taxonomic description and paleoecological interpretation of Tertiary floras (Chaney); (b) descriptions of Miocene-Pliocene vertebrate faunules and pioneering quantitative mammalian paleocommunity analysis (Shotwell); (c) collection of Clarno nuts and seeds (Bones); (d) discovery of the Clarno mammal site (Hancock); and (e) fossil marine mammal collection (Emlong).



Douglas Emlong, holding the head of an ancient porpoise fossil that he collected from the Astoria Formation near Newport. Photo courtesy Oregonian.

ACKNOWLEDGMENTS

Steven Manchester, David Taylor, Warren Addicott, and William Orr reviewed the manuscript of this paper and contributed valuable information. Others who reviewed portions, added information, and furnished photographs are John Philip Brogan, Jennie V. Emlong, Viola L. Oberson, C.J. Smiley, Jane Gray, C.E. Ray, Joseph Jones, and Ellen J. Moore. Dorothy Gunness of McMinnville, Oregon, who furnished much of the information on Jacob Wortman, is a family historian with a wealth of information.

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Madin joins DOGAMI staff

Ian P. Madin has joined the staff of the Oregon Department of Geology and Mineral Industries (DOGAMI) as a geologist. A recent graduate of Oregon State University, Madin's research interests include structure, neotectonics, and collisional plate boundaries. His past work includes structural and neotectonic studies in the Pakistani Himalayas and adjacent to the Alpine Fault in New Zealand.

Ian P. Madin

Madin was engaged to coordinate neotectonic and seismic hazard research for northwestern Oregon funded by the National Earthquake Hazard Reduction Program of the U.S. Geological Survey. □

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