Memorial to Ralph Works Chaney
1890—1971

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On March 3, 1971, the eminent paleobotanist and conservationist, Ralph Works Chaney, died unexpectedly in Berkeley, California, where he had made his home since 1922, first as research associate in the Carnegie Institution of Washington and later as professor of paleontology at the University of California. His passing leaves a vacancy in the ranks of paleobotany that will not be easily filled. Chaney's influence on the field of Tertiary paleobotany was wide ranging, both through the results of his own numerous publications and through his influence on his students and paleontological colleagues throughout the world. His major contribution was the recognition that Cenozoic fossil plants could be used as significant guides to environmental interpretation. In that sense he changed the course of American Tertiary paleobotany which previously had been concerned very largely with description of fossil specimens and their stratigraphic occurrences rather than with their paleoecological interpretation.

Chaney was born August 24, 1890, in Brainerd, a suburb of Chicago now a few miles southwest of the Loop. He was the son of a long line of Americans—seven generations on his father's side and ten on his mother's, whose ancestors came from France and England, respectively. He received his primary education in Brainerd which at that time was still a largely unsettled area of open prairie. At the age of 14 his family moved to Woodlawn and Chaney continued his education at the Hyde Park High School. From an early age he was interested in natural history of all kinds, but especially in birds, and even before he was a teenager he had begun to collect birds' eggs and keep lists of birds observed. His mother especially encouraged his interest in natural history, although it was an area in which she had no formal education. After a brief post-high school stint at country school teaching in South Dakota, Chaney entered the University of Chicago in 1908. Here he became acquainted with the distinguished ornithologist Charles Otis Whitman, and during his first year retained an active interest in zoology and especially in birds. His first scientific paper published in 1910 was an article on the birds of Hamlin Lake region, Michigan, and ornithology remained an avocation with

Chaney for the rest of his life, as students and colleagues who have been on field trips with him can readily testify. As he followed his courses in zoology with others in botany and geology, he shifted his major from ornithology to botany and finally to geology.

As an undergraduate and later as a graduate student at the University of Chicago, Chaney had contact with many eminent scientists who were also excellent and influential teachers. Among these were John M. Coulter, Henry Chandler Cowles, and J. M. Greenman in botany; Rollin D. Salisbury, T. C. Chamberlin, Stephen Visher, W. W. Atwood, and R. H. Sargent in geology; and Stuart Weller in paleontology. Chaney began his graduate work with Weller, but he found that he did not especially enjoy Paleozoic stratigraphy and fossils. After two years he took a job teaching natural history at the Frances W. Parker School. In the summer of 1916, using funds largely acquired from his teaching, Chaney went, at the encouragement of J. Harlen Bretz, to the Columbia River gorge where fossil plant localities had been discovered in the Eagle Creek Formation. He was later to write, ". . . from that time on I knew I was primarily interested in Tertiary paleobotany." In December 1916 he visited the U.S. National Museum to study the extensive collections of Tertiary plant fossils from western America made by Frank Hall Knowlton, Arthur Hollick, and Edward W. Berry who were then among the pre-eminent paleobotanists in North America. He also visited Berry at Johns Hopkins, Hollick at the New York Botanical Garden, and G. R. Wieland, the eminent Mesozoic paleobotanist, at Yale. He attended his first GSA meeting the same year and met John C. Merriam, who was to figure prominently in his scientific life a few years later. It was also in 1916, during his first visit to Washington, that he became acquainted with the eminent ecologist Frederic E. Clements. Clements greatly influenced Chaney's thinking about vegetation and floral change through geologic time, which later led him to contribute the important concept that changes in the distribution of major vegetational units could be used as an index to the age of fossil floras.

Chaney received his doctorate in geology in 1919 from the University of Chicago with a dissertation based on his studies of the Miocene Eagle Creek flora of the Columbia River gorge. His committee was composed of T. C. Chamberlin, J. Harlen Bretz, and Rollin D. Salisbury in geology; Stuart Weller in paleontology; and H. C. Cowles in botany.

From 1917 to 1922, Chaney taught geology at the University of Iowa where he advanced from instructor to assistant professor. He also gave map reading courses to soldiers in preparation for their overseas tours of duty in World War I. In 1920, he was invited by John C. Merriam, whom he had met four years earlier and who was then professor of paleontology at the University of California, Berkeley, to join a group of paleontologists and geologists for coordinated paleontological and geological study of the John Day Basin of central eastern Oregon. His associates on this project included Chester Stock, Eustace Furlong, and John P. Buwalda, who remained his close friends for many years. In 1922, Merriam, who was then president of the Carnegie Institution of Washington, invited Chaney to join the staff of Carnegie Institution as research associate, to be quartered in the department of geology at the University of California, Berkeley. In 1931, he was appointed professor of paleontology at the university and curator in the Museum of Paleontology, while retaining his status as research associate with the Carnegie Institution. The same year he also assumed the chairmanship of the department of paleontology.

Chaney's contributions to the study of fossil floras are many. The most significant was that the taxonomic considerations of floras cannot be separated from ecological considerations. In Tertiary floras, if the known species suggest a temperate flora, then members of temperate forests are to be searched both for living equivalent species [morphological and (or) ecological equivalents], as well as for clues to the identity of fossil species not yet established. Fossil plant assemblages are thus regarded as representatives of vegetation rather than as collections of isolated specimens. The climatic and distributional requirements of closely similar living species are used to determine the probable nature of the fossil flora and the conditions under which it supposedly lived. This ecological method in the study of fossil floras depends on the extensive use of large herbarium collections and especially on firsthand knowledge of living vegetation gained from detailed field studies, both procedures used by Chaney in his studies of Tertiary fossil floras. By recognizing within fossil assemblages groups of fossils (designated elements) that have living equivalent species that occupy "major geographic and climatic" provinces, and subgroups within elements (designated components) that represent regional units of vegetation, Chaney helped to clarify the areal and systematic relationships of fossil floras to each other and to modern forests. By handling large numbers of specimens in the field census, he also obtained a more accurate idea of morphological variations within fossil leaf species that enabled detailed comparison with the leaf characters of the presumed equivalent living species.

Chaney also made use of leaf characters to provide ecological information that was independent of the botanical identity of the specimens. In the monograph on the early Tertiary Goshen flora of western Oregon, co-authored with Ethel Sanborn in 1933, use was made of leaf characters (such as length, organization, nervation, margin, dripping point, and texture) and of life form (tree-shrub ratio, relative abundance of vines) to substantiate that the Goshen flora was more similar to modern low-latitude subtropical forests of Mexico and Central America than to living temperate forests. From the study of leaf characters, Sanborn and Chaney concluded (1933, p. 21), "The possibility is indicated that with adequate data on fossil and modern leaf characters, the climatic conditions of a region or of a geologic period may be determined on the basis of the leaves either of fossil or of living plant assemblages. . . ."

Chaney also appears to have made the first scientific quantitative study of fossil floras in an attempt to arrive at some estimate of species dominance. Prior to his work, paleobotanical literature was replete with terms such as "common" and "rare" to describe specimen abundance. His was the first attempt to determine the relation between number of fossils of each species actually recorded in field counts, and the abundance of that species in the ancient, once living plant community. Field studies in modern representative communities again provided the foundation for quantitative description of the fossil community.

From studies of the number of different kinds of plant remains in contemporary sediments in communities which suggested relation to paleobotanical communities, Chaney attempted to quantify and to make use of depositional and other factors that influence the abundance of plant structures (leaves, seeds, and cones) in sedimentary deposits. The application, where appropriate, of corrective factors derived from such studies, together with data on the numerical representation of fossil species and the habitats of the equivalent living species, served as guides for reconstruction of the physical environment including topography and climate of fossil floras.

In 1936, Chaney developed the thesis that changes in the distribution of Cenozoic plants through time, occasioned by changes in their physical environments, enable them to be used as reliable time indicators, if the latitude of the fossil plant occurrence is taken into consideration. He wrote (1936, p. 320), ". . . with an established climatic trend, based upon a known physical history of emergence and orogeny, the position of a Cenozoic flora with reference to the equator may indicate its position in the stratigraphic column as accurately as can the stage of evolution of a mammal or a mollusc." In the method he developed of using plant fossils to date sedimentary strata, two ideas are of prime importance: (1) wide differences existed in vegetation at different latitudes at any one time, and (2) similar or essentially similar vegetational units have lived at different times over a wide range of latitude. To these major vegetational units, he applied the term Flora in 1944 and Geoflora in 1959. The migrations of geofloras through Tertiary time, according to Chaney, are the basis not only for reconstructing topographic and climatic changes, but since such migrations result from progressive physical changes (particularly in climate) which are a function of time, successive geographic positions of geofloras may serve to determine the age of fossiliferous rocks.

Chaney maintained at his home in the Berkeley Hills a viable example for students and colleagues of many of the principal plant genera represented in Tertiary geofloras. There he planted assemblages of surviving Tertiary genera that were most characteristic of each of the Tertiary epochs. The student was thus provided with a panoramic view of Tertiary vegetation and of the principal floral changes that had occurred through time.

A summation of Chaney's approach to the paleoecological and stratigraphic use of plant fossils is perhaps best expressed in his own words written in 1938 (p. 394). "A dynamic, not a static, concept of plant history must be the basis for an accurate understanding of the composition, habitat, and age of past vegetational units. The methods of an ecologically minded botanist must be followed if fossil plants are to be identified and interpreted with sufficient vision to establish an accurate record of earth history during past ages."

Although much of his early professional work when he was developing innovative ways to examine fossil floras was concerned with the paleobotany of the western American Tertiary, Chaney's scientific efforts have ranged far afield. In addition to intermittent field work from 1930 to 1940 in Central and South America to study forests similar to those of the early Tertiary of Oregon, he engaged in field programs throughout much of Asia. In 1925, he was a member of the Central Asiatic Expedition of the American Museum of Natural History to Mongolia and Manchuria under the leadership of Roy Chapman Andrews. In 1937, through the auspices of Pierre Teilhard de Chardin, he was invited to work on the rich Shangwang flora of Shantung Province, northeastern China, with H. H. Hu. In 1948, at the age of 58, he hiked into the remote hills of western Hupeh to visit the only native groves of *Metasequoia*, a deciduous conifer that had earlier been described as a new fossil genus of conifers by Professor S. Miki of Japan, and had just been found as a living tree in central China by the Chinese forester T. Wang. Through Chaney's efforts in obtaining seeds and cuttings of *Metasequoia*, this conifer once again thrives widely in cultivation in many parts of the world where it once lived naturally, though it may now be extinct in the natural forests of China. In the last ten years of his life, Chaney worked actively with a group of Japanese paleobotanists on the Tertiary floras of Japan, work supported by the National Science Foundation. He was also actively engaged in similar paleobotanical study in Taiwan.

A number of important papers have resulted from the Asiatic work including the monograph with Hu on the Shangwang flora, the revision of fossil *Sequoia* and *Taxodium* based on the discovery of *Metasequoia*, and volumes on the Oligocene and Miocene floras of Japan for which he served as editor and field consultant.

In addition to his scholarly research activities, Chaney was active for many years in the field of conservation. Chief among his interests was the Save-the-Redwoods League, which was founded in 1917 by his friend and mentor, John C. Merriam, together with Henry Fairfield Osborn and Madison Grant. His active participation in the league began in the late 1920s when he served as counselor; he became a director in the early 1940s, and from 1961 to 1971 served as president. During the decade of his presidency, the league raised $8 million to preserve more than 25,000 acres of redwood forest for parks. The naming of the Ralph Works Chaney Memorial Redwood Grove on the Avenue of the Giants, northern California, is a fitting tribute from the league to a man who had labored so long on their behalf, and on behalf of the redwood forest.

Chaney also took an interest in other California State Park projects and in the National Park Service. He served as a member of the advisory board of the latter from 1943 to 1954 and was involved with the creation of the Dinosaur National Monument and with the development of the Ranger Naturalist Program at Crater Lake and the Grand Canyon National Parks. In recognition of his service to the National Park Service, he was one of three conservationists named in 1969 to receive the U.S. Department of the Interior Conservation Service Award—the highest award for conservation given by the Department of the Interior. He was also an honorary life member of the Sierra Club.

During his lifetime Chaney was active in a number of professional and honorary societies. He was president (1939) of the Paleontological Society of America, which awarded him the Fifth Paleontological Society Medal in 1970 in recognition of his outstanding contribution to paleontology. He was a Fellow (elected, 1926) and Vice President (1940) of The Geological Society of America. In 1947 he was elected to the National Academy of Sciences and to the American Philosophical Society; he served on the council of the latter from 1951 to 1954. He was also a member of the Paleontological Society of Japan, the California Academy of Sciences, the Botanical Society of

America, and the Botanical Society of Japan. He was an honorary vice president of the XI International Botanical Congress (1969) where he was honored with a Congress Medal. In 1944, he received an honorary D.S. from the University of Oregon.

In 1944 to 1945 during World War II, Chaney served in an administrative capacity as assistant director of the Lawrence Radiation Laboratory at the University of California. He later served as consultant at the same laboratory, where he worked closely with Edward Teller.

Chaney married Marguerite Seeley of Kentucky, a fellow student whom he had met at the University of Chicago; she was his loyal supporter and intellectual companion for 54 years. Mrs. Chaney and three children, Richard of San Diego, Ellen (Mrs. Richard) Lynch of Orinda, and David of Yuba City, California, all survive him as does his sister Margaret Chaney of New London, Connecticut.

Chaney was a delightful companion and a humble traveler with men and women from all walks of life—with the meek and the powerful, with scholars and teachers of great genius, as well as with the intellectually less well endowed. To students and associates who came to him for advice and help he was always ready to give wise and thoughtful counsel. He had a keen sense of humor and frequently laughed at himself. He was always cheerful and enjoyed the society of others as well as adding to their enjoyment. But he was happiest when in the field or when recounting his numerous and varied field experiences, whether in the John Day Basin of central Oregon, in the Gobi, in the Panamanian jungle, or on his trek to see the dawn redwoods of central China.

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