NATIONAL ACADEMY OF SCIENCES

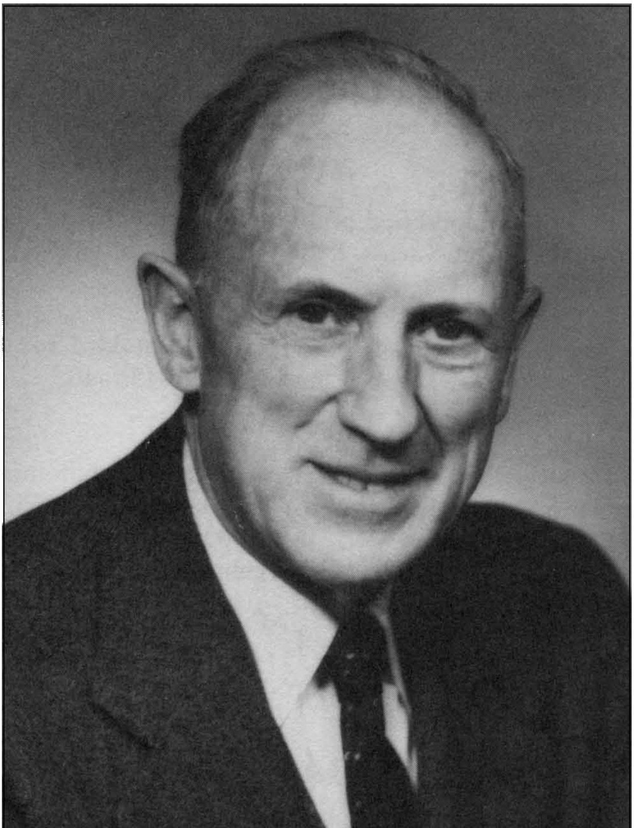
RALPH WORKS CHANEY

1890—1971

A Biographical Memoir by

JANE GRAY

Biographical Memoir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Ralph W. Chaney

RALPH WORKS CHANEY

August 24, 1890–March 3, 1971

BY JANE GRAY

RALPH WORKS CHANEY, eminent paleobotanist and conservationist, died unexpectedly on March 3, 1971 at the age of eighty in Berkeley, California, where he had made his home for forty-nine years. He had remained professionally active following his formal retirement in 1957 from the Department of Paleontology, and he was full of plans for continuing study of Tertiary floras of Southeast Asia, a project in which he was engaged along with Japanese and Taiwanese colleagues at the time of his death.

Chaney's influence on paleobotany during his lifetime was profound, the product of his own voluminous writings and the students that he attracted to the University of California during his tenure. A number of innovations currently in vogue among paleobotanists (leaf morphologic analysis, for example, as a basis for climatic interpretation) were first exploited by Chaney nearly fifty years ago. In one of his earliest papers, written in 1924, he attempted to understand the relationship between living communities of organisms and fossil assemblages, foreshadowing the now active interest in taphonomy. Chaney may have been the first paleobotanist to study modern vegetation in detail in the field, searching for living plant communities that provided counterparts to fossil assemblages. Much of earlier paleobotanical work—with its emphasis on description and stratigraphy—had provided little understanding of the nature of fossil associations. The emphasis put by Chaney on plant assemblages, both fossil and modern, provided the first real insight into the environmental interpretation of fossil floras.

Chaney was born August 24, 1890 in Brainerd, Illinois, now a suburb of Chicago but at that time a largely unsettled area of open prairie to the south of Chicago. His father and mother were of French and English stock, respectively, but both families had been in America for at least seven generations. After receiving his primary education in Brainerd, Chaney's family moved when he was fourteen to Woodlawn, Illinois, and he continued his schooling at Hyde Park High School. His initial interest in natural history focused on ornithology. At an early age, Chaney began to collect birds eggs and as a teenager to prepare bird skins, to keep a census of species observed, and to record their nesting and migratory habits. Bird watching remained an important avocation throughout his life, as students and colleagues who have been in the field with him can readily testify.

Following graduation from high school, Chaney taught briefly at a country school in South Dakota and entered the University of Chicago in the fall of 1908. Here he became acquainted with Charles Otis Whitman, the distinguished ornithologist, and during his first year at the University retained an active interest in zoology and in birds, although there was limited opportunity for field study in zoology at Chicago in 1908. His first scientific paper, published in 1910, was on the birds of the Hamlin Lake region in Michigan. With a camera purchased in 1911, he took bird pictures and ran these together with comments as a twelve-week series in the *Chicago Sunday Tribune*. But as he followed his courses in zoology with others in botany and geology, Chaney shifted his major from ornithology to botany, and finally to geology, where in paleobotany he finally found a discipline to unite his varied interests in natural history and in the history of plant and animal life. He received his bachelor of science degree from the University of Chicago in 1912.

Chaney began his graduate work in paleontology at the University of Chicago with Stuart Weller, an influential worker in the Paleozoic. After two years of study that emphasized late Paleozoic marine invertebrates and a field season in Missouri, Chaney found that he did not especially enjoy Paleozoic stratigraphy and fossils. They provided limited opportunity, in his own words, "for projecting my terrestrial experience into an interpretation of past life." Thus, in 1914, he took a job as head of the Science Department at the Frances W. Parker School in Chicago, where he remained until 1917.

In the summer of 1916, with funds accrued from his teaching position, and with the encouragement of J. Harlan Bretz, another eminent geologist at the University of Chicago, Chaney went west to the Columbia River Gorge, where fossil plant localities had been discovered in the rock unit on the Oregon side of the Gorge known as the Eagle Creek Formation. He was later to write "from that time on I knew I was primarily interested in Tertiary paleobotany." That same year, an eventful one in the life of the young naturalist, in addition to becoming acquainted with several of the preeminent North American paleobotanists (F. H. Knowlton, National Museum; E. W. Berry, Johns Hopkins; Arthur Hollick, New York Botanical Garden; G. R. Wieland, Yale), he also met John C. Merriam, who was to become his scientific mentor a few years later at the University of California. Most important, however, was his association with the ecologist Frederic C. Clements, who greatly influenced his paleobotanical thinking about vegetation and floral change through geologic time.

In 1919 Chaney received his doctorate in geology from the University of Chicago. His dissertation was based on his studies of the Miocene Eagle Creek flora from the Columbia River Gorge. This was the first of a series of largely descriptive, taxonomic studies dealing with the Tertiary floras of Western North America, which served as the foundation for the conceptional and interpretive papers to follow. His dissertation committee was composed of several of the influential scholars and teachers then at the University of Chicago, including T. C. Chamberlin, J. Harlan 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 provided map-reading courses for soldiers in preparation for their overseas tours in World War I. In 1920 he was invited by J. C. Merriam, who was then professor of paleontology at the University of California, Berkeley, to join with other paleontologists and geologists in a coordinated study of the John Day Basin of central-eastern Oregon. Among his associates in this study were the vertebrate paleontologists Chester Stock, Eustace Furlong, and John P. Buwalda, all of whom remained his close friends for many years. Two years later, Merriam, then president of the Carnegie Institution of Washington, invited Chaney to join the staff of the Institution as research associate, but to execute his duties in the Department of Geology at the University of California, Berkeley. Chaney retained this appointment until his retirement from the University. In 1931 he was also appointed professor of paleobotany at the University of California, curator of paleobotany in the Museum of Paleontology, and chairman of the Paleontology Department. He remained at the University of California until the time of his death, following his formal retirement in 1957.

Chaney's contributions to the study of Tertiary fossil floras are many. Although some of his specific interpretations have been challenged in recent years, his insightful exploitation of fossil plants as guides to past environments has greatly altered the course of Cenozoic paleobotony throughout the world. Up to the time of Chaney's studies, Cenozoic paleobotany had been concerned largely with the taxonomy and stratigraphic distribution of plant megafossils, rather than with an analysis of their ecology. Chaney was the first of the paleobotanical ecologists; for his introduction of new ways of looking at fossil plant assemblages, his place in paleobotany remains secure, despite differences in the details of interpretation. Throughout his life, he strove to understand and to reduce to manageable proportions the many variables involved in the deposition and preservation of plant megafossils, and thus to increase the precision of the interpretations of past environments made from study of plant remains. The most significant of his contributions was the concept that the taxonomic treatment of floras cannot be separated from ecological considerations. If the known species in a Tertiary flora suggest temperate vegetation, then members of living temperate forests should be searched both for "living equivalent" species (morphological and/or ecological equivalents) and clues to the identity of the unknown fossil species. Fossil plant assemblages are thus regarded as representatives of communities, rather than as collections of isolated species. Chaney was thus among the first to understand that species do not evolve in an ecologic vacuum—they evolve together.

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 lived. This ecological method depends on the extensive use of large herbarium collections, as well as firsthand knowledge of living vegetation gained from detailed field studies, both procedures used by Chaney. By recognizing within fossil assemblages groups of species (designated elements) that have living equivalents 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 vegetation. By collecting large numbers of specimens in the field census, he also obtained a more accurate idea of morphological variation within fossil leaf species that enabled detailed comparison with the leaf characters of the presumed equivalent living species.

Chaney was the first paleobotanist to develop in detail the use of morphological characters of fossil leaves to provide ecological information that was independent of the botanical identity of the specimens. The concept that leaf characters reflect major regional environmental (climatic) differences on a global basis had been developed by the botanists Sinnott and Bailey in 1916. Although they advocated the use of the information in paleobotanical studies and made some rudimentary attempts to show how such information might be applied to the study of Cretaceous and Tertiary leaf assemblages, analysis of fossil leaf morphology was not considered in detail until Chaney's monograph on the early Tertiary Goshen flora of western Oregon, coauthored with Ethel Sanborn in 1933. For this study, such leaf characters as length, organization, nervation, margin, dripping point and texture, and life form (tree-shrub ratio, relative abundance of vines, and the like) were used 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. Chaney and Sanborn 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 geological period may be determined on the basis of the leaves either of fossil or of living plant assemblages. . . . " This approach is now widely exploited by megapaleobotanists as a prime basis for making climatic deductions.

Chaney appears to have made the first quantitative study of fossil floras in an attempt to arrive at some more precise estimate of species dominance in vegetation. Earlier paleobotanical literature was replete with terms such as "common" and "rare" to describe specimen abundance. Chaney attempted 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 plant community. Field studies in modern communities that suggested relation to paleobotanical communities, aided by studies of the variety of plant remains in contemporary sediments, provided the foundation for quantitative description of fossil communities. From such contemporary studies, Chaney attempted to quantify and make use of depositional, transportational, and allied factors that influenced the abundance of plant structures (leaves, seeds, cones, and the like) in sedimentary deposits. The application of appropriate corrective factors, derived from study of modern vegetation, to tallies of fossil specimens, enabled him to better estimate species frequency in past forests. These data and information on habitats of equivalent living species, served as guides for reconstructing the physical environment, including topography and climate, of fossil floras. Chaney's seminal paper of 1924, which provided the data for much of his later thinking about the quantitative relations of fossil leaf assemblages, introduced the concept of taphonomy to paleobotanical thinking long before the term was introduced into the literature in 1942. Only now, almost sixty years following publication of that paper, are paleobotanists beginning to think in terms of some of the concepts developed by Chaney to help in understanding the distribution of plant megafossils in depositional environments.

In 1936 Chaney developed the thesis that changes in the distribution of Cenozoic plants through time, occasioned by changes in their physical environments, enabled 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." Two ideas are of prime importance to the method he developed of using plant fossils to date sedimentary strata: (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 for reconstructing topographic and climatic changes, and because such migrations result from progressive physical changes (particularly in climate) through time, successive geographic positions of Geofloras may serve to determine the age of fossiliferous rocks. At his home in the Berkeley Hills, Chaney maintained in his garden many of the principal plant genera represented in Tertiary Geofloras. Surviving Tertiary genera, now often widely segregated in Asia or eastern North America, were planted in assemblages most characteristic of each of the Tertiary epochs. Students and colleagues were thus provided with a panoramic view of Tertiary vegetation and of the principal floral changes that occurred during the Cenozoic.

Chaney himself best expressed the approach to the study of fossil plants that characterized his work and set it apart when he wrote (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."

Much of Chaney's early professional work, when he was developing innovative ways to examine fossil floras, was concerned with the paleobotany of western North America, but his scientific efforts 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 visited, in the course of field work, many areas of Asia: Mongolia, China, and the Philippine Islands in 1925; China, Manchuria, Chosen (Korea), and Japan in 1933 and 1937; China in 1948; and Japan from 1950 until the time of his death. In 1925 Chaney was a member of the Central Asiatic Expedition of the American Museum of Natural History to Mongolia 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 Shanwang flora of Shantung Province, northeastern China, with H. H. Hu. The joint Chaney-Hu monograph, published in 1940, remains the only detailed account of the fossil leaf assemblage from the Shanwang diatomites. It represents the most complete study of any of the many fossil remains, plant or animal, known from Shanwang.

In 1948, at the age of fifty-eight, Chaney traveled into the remote hills of western Hupeh and bordering Szechuan Provinces in southern China to visit the only native groves of dawn redwood (*Metasequoia*), a deciduous conifer closely related to the North American redwood (*Sequoia*) and swamp cypress (*Taxodium*), all members of the family Taxodiaceae. More than thirty years later, Chaney remains one of the few Westerners to have visited *Metasequoia* in its native habitat. *Metasequoia* enjoys the distinction, in addition to being a living fossil, of having been described as a new genus of fossil conifer by Professor S. Miki of Japan immediately prior to its discovery in 1941 as a living tree in central China by the Chinese forester T. Wang. At that time, its remains were unknown in rocks younger in age than the Miocene, and *Metasequoia* was considered to be an extinct member of the Taxodiaceae. In his important monograph revising the systematics of the taxodiaceous genera, Chaney demonstrated that most of the fossil remains found throughout the Northern Hemisphere during the Cenozoic, and attributed to the coast redwood, were in fact those of the dawn redwood. Unlike *Sequoia, Metasequoia* is deciduous, which made its distribution in high northern latitudes during the early Cenozoic ecologically more acceptable. The expedition to central China was in part to observe *Metasequoia* in its native habitat and to learn of its native associates in order to better understand the ecology and systematics of the holarctic Tertiary fossil floras that included *Metasequoia*.

Chaney also assiduously obtained seeds and cuttings of *Metasequoia*, which were distributed widely, so that this conifer now thrives in many parts of the world where it was once native. Among the seedlings that he brought with him on his return trip from China in 1948, four were planted on the campus of the University of California, where they still thrive, and some went to the University of Oregon in Eugene. Chaney's longtime interest in China and the Chinese was reflected in his hobby of collecting and studying Chinese antique pottery and jade, an avocation he pursued assiduously. The supreme compliment for a visitor was to be taken to see the "collection," then housed with proper security in the basement of his Berkeley Hills home. During the Sino-Japanese war he was also active in raising funds for Chinese war relief.

In the final twelve years of his life, Chaney worked actively as director of research with a group of Japanese paleobotanists studying the Tertiary floras of Japan, work supported by the National Science Foundation. He pursued similar paleobotanical studies in Taiwan. He was engaged in these projects at the time of his death. These studies were to have culminated his longtime interest in Asian Cenozoic paleobotany, from which a number of important papers had already resulted: the monograph on the Shanwang flora; the revision of the fossil Taxodiaceae (American Philosophical Society); and the volume on the Miocene floras of Japan published by the Geological Survey of Japan, for which he served as editor and field consultant.

Chaney was an influential teacher. It is a tribute to his boundless energy and his enthusiasm for students that he continued to accept teaching assignments following his formal retirement from the University of California. In 1957 he was visiting professor at Stanford University, and when he was beyond his seventieth year, he spent six months teaching at National Taiwan University at Taipei, where field work nearby resulted in the find of several new fossil plants. His lectures were a combination of ideas, facts, and anecdotes about his field experiences, his colleagues, and his students.

These made his classes a memorable experience. Although paleobotany has never attracted the number of students that some fields of paleontology have, Chaney and his students have trained most of those active in the study of North American Tertiary floras, and essentially all paleobotanists interested in floristic analysis.

In addition to his scholarly activities, Chaney was active for many years in the area 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. Chaney served the League in many capacities for over forty years. His active participation began in the late 1920s, when he served as counselor; he became a member of the Board of Directors in the early 1940s, he was chairman of the League's Education and Interpretation Committee, and from 1961 to 1971 he served as the League's president. During the decade of his presidency, the League raised more than eight million dollars 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 forests in California.

Chaney also took an interest in the California State Parks project (he served as a member of the Point Lobos Advisory Committee) and in the National Parks Service. He was a member of the Advisory Board of the latter from 1943 to 1954, and a collaborator from 1955 to 1971. Chaney was involved with the development of the Ranger Naturalist Program at Crater Lake and the Grand Canyon National Parks. He played a prominent part in the establishment of the Redwood National Park. In recognition of his service to the National Parks Service, he was one of three conservationists named in 1969 to receive the U.S. Department of the Interior's Distinguished Service Award—the highest award for conservation given by the Department of the Interior. Chaney was 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 contributions to paleobotany. He was the first paleobotanist honored by the Society with its medal. He was a fellow (elected 1926), vice president (1940), and counselor of The Geological Society of America, and from 1929 to 1932 served as secretary of the Cordilleran Section of The Society. He was elected chairman (1941) of the Paleobotanical Section of the Botanical Society of America, which was newly formed, with Chaney's participation, at the annual meeting of the Society at Atlantic City in December, 1936. In 1956, on the occasion of the 50th Anniversary of the Botanical Society of America, Chaney was among the first recipients of a Merit Award (certificate of Merit), the principal award of the Botanical Society, given for outstanding contributions to botanical research and teaching. In 1947 he was elected to the National Academy of Sciences, and in 1943 to The American Philosophical Society; he served on the Council of the latter from 1951 to 1954. He was a member of the Paleontological Society of Japan, the California Academy of Sciences, and the Botanical Society of Japan. He was an honorary vice president of the Eleventh International Botanical Congress (1969), where he was honored with a Congress Medal. In 1944 he received an honorary D.Sci. from the University of Oregon, Eugene. He was also a member of Theta Tau, a professional engineering and geology fraternity, Gamma Alpha, a recognition society for individuals engaged in scientific research, and Sigma Alpha Epsilon, a men's social fraternity.

During World War II, Chaney had several wartime assignments. These included University (Berkeley) representative in Selective Service matters and assistant director (for administration and personnel) of the Lawrence Radiation Laboratory at the University of California (1944–1945). He later served as consultant at the same laboratory, where he worked closely with Edward Teller.

In 1917 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 fifty-four years. She survived her husband by three years, dying in 1974. Their three children, Richard, of San Diego; Ellen (Mrs. Richard) Lynch, of Lafayette; and David of Yuba City, California, and nine grandchildren survive him, as does his sister Margaret Chaney, professor emeritus, Connecticut College, now of Menlo Park, California.

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 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. His boundless energy, enthusiasm, and agelessness were an inspiration to all who came in contact with him. 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, the Panamanian jungle, or on his trek to see the dawn redwoods of central China.

THE INFORMATION in this memoir was obtained from biographical data prepared by Chaney for the National Academy of Sciences, and supplied from the Office of the Home Secretary; from material previously incorporated in memorials prepared at the time of his death by Daniel I. Axelrod (The American Philosophical Society), and by Axelrod and the author (The Geological Society of America); from Chaney's professional correspondence and manuscripts (1917–1966, available in the Special Collections of the University of Oregon Library); and from my personal recollections as Chaney's student, friend, and colleague.

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