Memorial to Jack Albert Wolfe (1936-2005)

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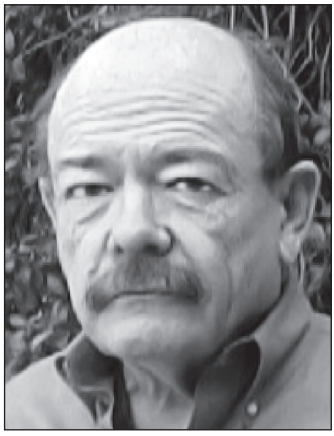

It was a great loss to the world of paleobotany when Jack Albert Wolfe passed away on 12 August 2005. He was one of the great minds in paleobotanical research in the last half of the twentieth century.

Jack Wolfe was an extraordinary systematist with an encyclopaedic knowledge of angiosperm leaf architecture. Additionally, he went where few paleobotanists dare go; he ventured into the realms of multivariate statistics in pursuit of quantifying the relationship between foliar physiognomy and climate. He went well beyond botanical observation and description into creatively using fossil leaves as tools for understanding environmental change through time, and this work has found applications in diverse fields, meteorology and crustal dynamics.

As a native of Portland, Oregon, Jack Albert Wolfe attended Franklin High School. With the encouragement of his biology teacher, Anne Bohlen, he developed an interest in paleobotany and began collecting plant fossils in the Portland area. Anne, who was the adviser to the school science club, arranged a club visit to the home and fossil collections of Lon Hancock. Lon had helped furnish localities and material to both Ralph Chaney and Chester Arnold, and was a founder of the Oregon Museum of Science and Industry (OMSI). Under the auspices of OMSI, Lon started a summer field camp in the John Day Basin of central Oregon. Attending camp that summer, Jack became fascinated with two classic paleobotanical sites near the camp: the Clarno nut bed and the Bridge Creek leaf flora. He wrote up a research project on these sites for the Westinghouse Science Talent Search, and became one of 40 finalists; he won a trip to Washington, finished in the top 10, and went to Harvard in 1953 on a full scholarship.

At Harvard, Jack conducted his undergraduate research under the direction of botanist Elso S. Barghoorn, and launched his first paleobotanical publication. It was on the Collawash flora of the upper Clackamas River Basin and appeared in the Newsletter of the Geological Society of Oregon. During summers as an undergraduate, Jack increased his field experience by working with scientists, such as Roland Brown, Dallas Peck, and J.F. Smith, at the U.S. Geological Survey. He gained a breadth of experience in helping map Cenozoic volcanic rocks of the Cascades and Paleozoic sedimentary rocks in Nevada.

Between 1957 and 1959, Jack worked on his graduate studies in paleobotany at the University of California, Berkeley, under Wayne L. Fry, A.S. Foster, and Herbert L. Mason. Jack wrote a thesis on the Tertiary Juglandaceae of western North America. At Berkeley, Jack was particularly

influenced by J. Wyatt Durham, the mollusk/echinoderm worker who had rigorous criteria for identifying Cenozoic material; this prompted Jack to try the same approach with angiosperm leaves. With the encouragement of Adriance Foster, Jack started chemically clearing leaves to reveal venation patterns, and by 1969, this had evolved into a project to survey modern dicots using cleared leaves. Eventually the USGS-cleared leaf collection (now housed at the Smithsonian Institution in Washington) represented around 15,000 species. Jack's rigorous approach was one of the foundation stones of modern leaf architectural analysis in fossil angiosperm leaf identification and comparative studies.

Jack completed his Ph.D. dissertation in 1960 on the early Miocene floras of northwest Oregon. He earned this degree while he was reporting on referred fossils for the U.S. Geological Survey under the supervision of Preston E. Cloud. In time, Jack became a research geologist with the USGS, Menlo Park, California. Jack remained with the USGS throughout much of his career, mostly at Menlo Park, but he spent some time in Washington, D.C. (1961–1965), and Denver (1982–1992).

In 1969, Jack produced his first major work on fossil floras—a synthesis of his findings on the Late Tertiary floras of the Pacific Northwest; he published this work in *Madrono* in time for it to be handed out to attendees of the International Botanical Congress in Seattle that year.

During the 1960s, Jack also began work on the Tertiary floras of Alaska. He worked on publications and fieldwork with David Hopkins, Clyde Wahrhaftig, and Estella Leopold, His first cut was on dating the younger floras of the Kenai Lowland as Late Tertiary in age. This publication was important, because before this biostratigraphic work, many prominent geologists considered the rocks of the Kenai Group to be of Paleogene age. Jack continued his efforts and produced in 1977 a monumental and thoughtful work on the Paleogene floras of Alaska and Wrangellia, a work which still stands as an exceptional monograph. One reason it is so notable is that it first established that truly subtropical floras existed as far north as 60° N. Lat.

At the USGS, Jack's primary role was to use plant megafossils for biostratigraphic and paleoenvironmental determinations. He did his own fieldwork, primarily in the western United States including Alaska, but also identified material brought to him by scores of geologists working throughout the United States. Jack retired from the USGS in 1992, and went to the University of Arizona, where he continued his research and supervised research students, most of whom have continued working in paleobotany and co-authored papers with him.

In 1979, Jack published an important monograph on the climatic analysis of the forest types in eastern China described by Wang Chi Wu in the 1960s. Based on climate records from different cities in SE Asia, Jack developed a quantitative comparison of mean annual temperature with seasonal range of temperatures in different forest types. He created nomograms that sketch out the climatic parameters of the forest types, not only for eastern China but also for eastern and western North America and Australia. These nomogram models are widely used by botanists today.

Probably Jack Wolfe's most innovative work was the quantification of the relationship between leaf form and environmental conditions, primarily climate. Building on the pioneering work of I.W. Bailey and E.W. Sinnott, Jack recognized that leaf form is related to a spectrum of environmental factors. As early as the late 1970s he realized that the best way to decode the complex leaf form and climate relationship was through multivariate analysis. He built and tested a unique database of foliar physiognomic characters from leaves of woody dicots; he used leaves growing in vegetation for which the climate (weather-station data) is quantified through long-term observation. He named the technique CLAMP (Climate Leaf Analysis Multivariate Program), and the method has found application not only in North America and Japan where the calibration datasets have their origin, but also in Russia, Europe, South America, and New Zealand.

The CLAMP technique yields data on enthalpy, a property of a parcel of air that can be used to estimate paleoelevation, which has had applications in studying the timing of mountain uplift. In recent years, this approach has been applied to the uplift of Tibet and the Andes. Jack was interested in the uplift history of the western United States, and it was here that he tested the technique, something he was still working on when he died falling from an outcrop in the eastern Sierras.

Jack had a tendency to be brusque, a trait that he sometimes resorted to in order to disguise his innate shyness, and unfortunately, this led to feuds with some colleagues. He was a critical reviewer. Nevertheless those who became his close friends discovered a man of great intellect, warmth, and generosity.

Jack Wolfe is sorely missed by his colleagues and students. We have lost a singular leader and scholar of paleobotany. We honor his life by following where he led in the study of major evolutionary and stratigraphic problems, and the relationship between plants and climate. These are areas of endeavor where Jack blazed an important trail.

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