Palynological Biostratigraphy in the Lower Tertiary of Wyoming Foreland Basins

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Biostratigraphic studies based on palynology (palynostratigraphy) in the foreland basins of Wyoming date from 1970. Currently palynostratigraphy is a major component of collaborative investigations of Paleocene and lower Eocene, coal-bearing, continental rocks in these basins. Age determinations, correlations, and paleoenvironmental interpretations based on palynological analyses are contributing to a variety of studies of depositional history, tectonic evolution, and the development of coal resources.

The prevailing biostratigraphic classification of the Paleocene and lower Eocene rocks in the Wyoming basins is founded primarily on fossil pollen of a single family of plants. The plant family is the Juglandaceae, living species of which are familiar as walnut, hickory, pecan, and others. The family was rapidly evolving and diversifying in the Paleocene, and many more species of the family were present in North America at that time than at present. Variations in the morphology of pollen of these species provide a basis for distinguishing floras of differing age within the Paleocene and Eocene. The pollen of other species of flowering plants also are used in the definition of palynostratigraphic zones for the lower Tertiary of Wyoming and adjacent parts of western North America.

In western North America, the Cretaceous-Tertiary boundary event evidently caused the extinction of a substantial part of a widespread and distinctive flora. In the Wyoming area, about one-third of the most common species of latest Cretaceous age abruptly disappeared from the stratigraphic record. This event horizon (the K-T boundary) provides a convenient base line for biostratigraphy in continental rocks in the region. Rocks of earliest Tertiary age are marked by the absence of characteristic latest Cretaceous pollen species. The extinction event and associated long-term paleoenvironmental and paleoclimatic changes provided an opportunity for the evolution of a distinctive Tertiary flora. Plant families such as the Juglandaceae that were present but obscure in the region in latest Cretaceous time progressively rose to prominence as major components of the flora during the Tertiary. Rapidly evolving species competed for ecological space in new plant communities. The pollen of these plants, preserved in the sediment that was accumulating as the foreland basins developed in response to regional tectonism, provides a detailed record of the transformation of the flora.

The stratigraphically oldest fossil pollen grains of the Juglandaceae are morphologically simple compared with their later Paleocene descendants. Especially during the middle Paleocene, new species of the family produced pollen having the same general form but distinguished by certain structural modifications. The modifications include thinned areas in the form of spots, rings, or