AN ANCIENT *ACACIA* WOOD FROM OREGON

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ABSTRACT

Well-preserved fossil wood of the genus *Acacia* collected from the Eocene Clarno Formation of Oregon has been determined to be a proposed new fossil species, *A. gregorii*.

INTRODUCTION

A SMALL, localized outcrop of tuff in central Crook County, Oregon, mapped as Eocene Clarno Formation by Waters (1968) has yielded fossil wood of both stem and roots of the genus *Acacia*.

The occurrence consists of the remnants of a single tree lying horizontally in a matrix of fine-grained tuff in an outcrop area of about 200 square feet at the summit of a low hill. Although the leaves, twigs and small branches are missing, limbs and roots 10 to 12 feet long (but segmented by earth pressures) and trunk sections are present. The prime condition of the wood, which shows no fungus rot, insect infestation, or cell-distortion from drying, indicates that the tree was literally buried alive.

Conditions of burial and preservation can only be surmised. Possibly in Clarno time the *Acacia* grew near a stream in the vicinity of an active volcano. Torrential flood waters undermined the tree, tore it loose, swept it along stripping it of its leaves and small branches, and finally left it stranded. Before the wood could deteriorate, it was buried by showers of volcanic ash and silicified. Erosion has now removed the volcanic cover and has exposed the fossilized tree, much of it still in place (Gregory, 1970).

As shown in the plate, photomicrographs of thin sections cut from the fossil wood show structural details to be so well-preserved that the diagnostic features necessary for identification are as definitive as in living wood.

ACACIAS IN THE FOSSIL RECORD

Reports of fossil *Acacia* wood are very few. Leaves are recorded chiefly from Eocene deposits of Alaska and Texas and from the Oligocene Florissant flora of Colorado. A well-preserved seed pod compared with *Acacia farnesia* (a tidal swamp species) is included in the Eocene Lower Bagshot flora of England — a tropical lowland assemblage (Chandler, 1964). Deporta (1961) found *Acacia* sp. in an Oligocene-Miocene pollen flora of Columbia which includes palms and members of several subtropical angiosperm families such as Malvaceae, Bombaceae, and Sapotaceae.

Knowlton (1902) listed *Acacia oregoniana* Lesq., consisting of a nearly perfect complete seed pod, from the upper Miocene Mascall beds in Grant County, Oregon. But on the basis of additional collections of similar seed pods from the same locality, Chaney and Axelrod (1959, p. 207) have assigned Knowlton's specimen to *Albizzia oregoniana*.

As far as the author is aware, only one other specimen of fossil wood from the Pacific Northwest has been considered to be a possible *Acacia*. Prakash and Barghoorn (1961) report on a specimen they catalog as *Leguminoxylon occidentale*, as follows: "The nearest approach to the structure of the fossil which we have been able to establish is the genus *Acacia* and within this genus, the species *A. ferruginea*. One aspect of the fossil which renders its identification more difficult is the tangential compression failure which preceded mineralization, thus exaggerating the ellipticity of the vessels as seen in transverse section. In view of these facts, it seems more desirable to designate the fossil to family rather than to genus."

SYSTEMATIC DESCRIPTION

Family — Leguminosae
Subfamily — Mimosoideae

Genus — *Acacia*, Adans.

Acacia gregorii nov. sp.[1]
Pl. 1, Figs. 1-3

Growth Rings — Indistinct and inconspicuous. Delimited by a fine line of sporadic terminal parenchyma with infrequent small

1. Named for the author's husband, James M. Gregory, for his interest in exploring for and collecting fossil woods and plants of the Pacific Northwest.

vessels embedded in it. Rings vary greatly in width.

Vessels — Medium, visible without lens, diffuse. In widest rings, those in center one-third of ring are largest. Some rings exhibit (at beginning and end of ring) a distinct zone of vessels smaller than those in rest of ring and embedded in terminal parenchyma. Evenly distributed, 4 to 11 per sq. mm., mostly solitary with a few radial rows of two (and less frequently) three cells. Occasionally, two cells are contiguous in the tangential plane. Also scattered irregular clusters or nests of mixed small and large pores not present in every ring. Perforation plates simple, somewhat oblique. Vessel segments are short (0·2-0·4 mm.), rather thick walled and forming conspicuous vermiform lines along the grain. Deposits of gum are frequently observed in the vessels. (In the fossil specimen these happen to be the same red-brown colour as in the living wood.)

Parenchyma — Abundant, vasicentric several cells wide forming a narrow halo around vessels or vessel groups. Also aliform with short wings. Sometimes confluent between two or three pores. Terminal parenchyma rather sporadic in a 3- to 4-seriate somewhat discontinuous line including or associated with a zone of small pores.

Fibers — Libriform, rounded in transverse section, thick walled, not aligned radially but arranged in tracts between rays.

Rays — Medium, visible without lens on cross-section, approximately 5 per mm., conspicuous on radial section forming a cherry-like fleck, slightly undulate around larger vessels. Homogeneous, mostly 4 to 6 cells wide, 30 to 40 cells high, sparse 1- to 2-seriate rays a few cells high.

Intercellular canals — Vertical traumatic gum ducts arranged in tangential rows, fairly frequent.

AFFINITIES

While the fossil *Acacia* described here reflects closely the typical structural details of the living woods of this genus, to which it clearly belongs, assignment to a particular species is more difficult to establish — particularly in the absence of such diagnostic plant parts as leaves or seedpods.

Among the many species of live-woods available for comparison, its structure most closely approximates that of *A. arabica*, with which it is virtually identical in all major features as listed above.

However, certain minor but clearly discernible differences in anatomy between the two may be observed; these provide the basis for separating the fossil species from the closely similar living *Acacia* for the proposed new fossil species, *A. gregorii*. These differences include: fewer pores in the fossil wood (4 to 11 per sq. mm. in the fossil species and 5 to 15 per sq. mm. in *A. arabica*); smaller pore size in the fossil species; and fewer vessels containing gum deposits in the fossil species.

DISCUSSION

The genus *Acacia* today includes more than 400 species of trees and shrubs widely distributed over the tropics and subtropics of both hemispheres. Of these, more than 300 are native to Australia and the South Pacific islands. Native *Acacia* nearest to the Crook County collecting area are those in southwestern United States and Mexico, a distance of approximately 2,000 miles.

A. arabica is indigenous to India and Arabia. It cannot withstand freezing temperatures but can adopt to a variety of environments including lake and riverbanks as well as lowland floodplains. Dr. Ralph Chaney (written communication, December, 1970) comments on this record of *Acacia* from the Eocene Clarno Formation of Oregon: "In the lowland tropical forest of Taiwan, *Acacia* is the most common tree. The megafossils of the Clarno do not indicate tropical climate in my opinion, but are surely suggestive of one largely free from frost — in other words subtropical. Your *Acacia* would have been fully at-home in the Clarno."

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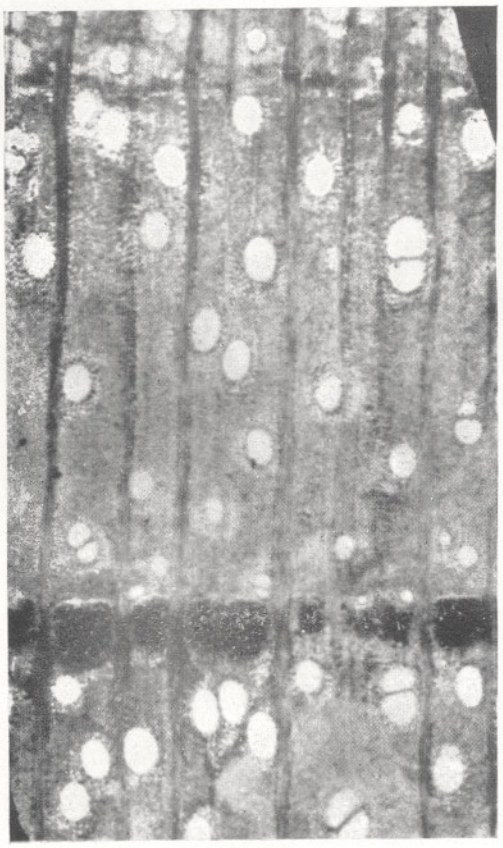

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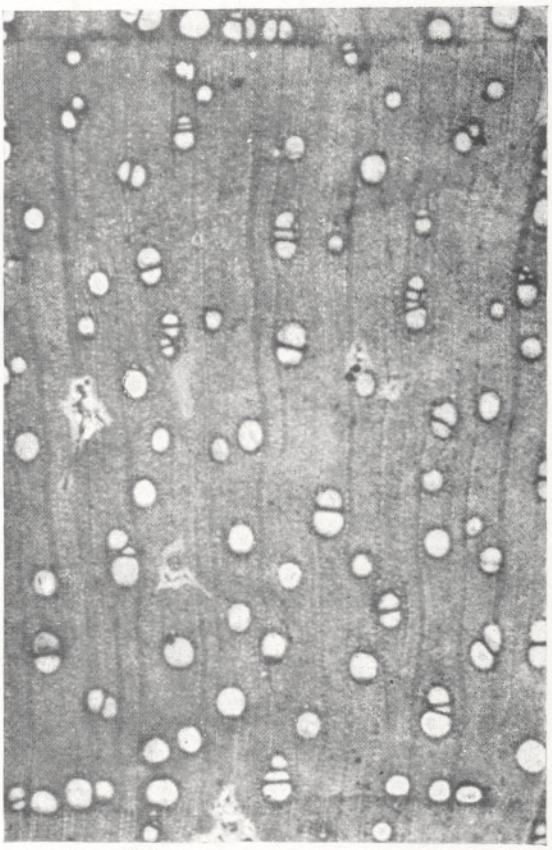

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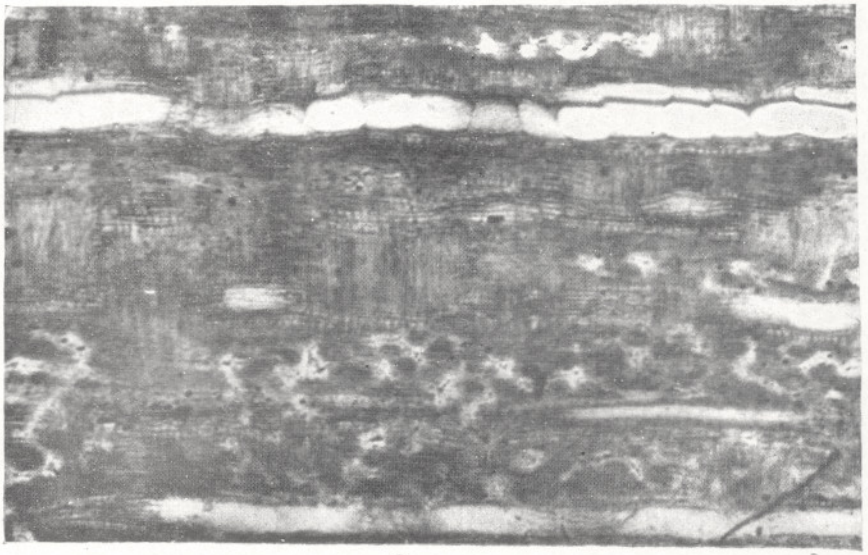

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EXPLANATION OF PLATE

1. Stem wood of *Acacia gregorii* sp. nov. Transverse section. × 30.
2. Stem wood of *A. gregorii* sp. nov. Radial section. × 30.
3. Root wood of *A. gregorii* sp. nov. Transverse section. × 30.