

NOTES ON A FEW FOSSIL PLANTS FROM THE FORT UNION  
GROUP OF MONTANA, WITH A DESCRIPTION OF ONE NEW  
SPECIES.

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(With Plates I-II.)

The material which is the basis for the following notes was obtained by exchange from the University of Minnesota through Prof. C. W. Hall, the professor of geology in that institution. It consists of a single slab which bears no less than nine beautifully preserved leaves upon its surfaces. It was collected by Prof. A. D. Meeds, also of the University of Minnesota, during the summer of 1884, and is labeled "Southern Montana;" but, from the nature of the matrix as well as from the species of plants preserved upon it, it is more than probable that it came from the Yellowstone River, not far from the town of Glendive, Mont.

The first material from this part of the country was obtained by Dr. F. V. Hayden, while attached to an expedition made by Lieut. G. K. Warren, of the U. S. Army, in the summer of 1856.\* This expedition proceeded from St. Louis to the mouth of the Yellowstone, at which point they arrived July 10, 1856. They intended navigating the Missouri River from this point to Fort Pierre in a small boat; but, as this could not be procured for some weeks, they spent the intervening time (until September 1) in exploring the Yellowstone as far up as the mouth of the Powder River.

Plants were also probably obtained during the years 1859 and 1860 by Dr. Hayden, who accompanied the exploring expedition under Capt. (later General) W. F. Raynolds to the Yellowstone and Missouri rivers.† The plants obtained at these times were described by Dr. J. S. Newberry in 1867.‡ This material had come, according to Dr. Newberry, from various points on the Missouri River, at Fort Clarke, Red Spring, Fort Berthold, and from 100 miles below old Fort Union, at

\*Preliminary report of explorations in Nebraska and Dakota in the years 1855, 1856, and 1857, by Lieut. G. K. Warren, topographical engineer U. S. Army. Reprint, Washington, 1875.

†Exploration of Yellowstone and Missonri rivers under direection of Capt. W. F. Raynolds, 1859-'60. Washington, 1869.

‡Later extinct floras of North Ameriea. Annals of the N. Y. Lyc. of Nat. Hist., vol. ix, 1868, pp. 27-76.

the mouth of the Yellowstone, and on the Yellowstone, at O'Fallon's Creek, 100 miles above where the Yellowstone joins the Missouri, and in the valley of the Yellowstone between this point and its mouth.

Much additional material from the same general region was obtained by Dr. C. A. White and Prof. Lester F. Ward, of the present Geological Survey, during the years 1881–1883. Prof. Ward's material came from the Yellowstone in the vicinity of Glendive, Mont., and the results of a preliminary examination of it are published in the Sixth Annual Report by the Director for the year 1884–'85 (pp. 542 *et seq.*) and also as a special bulletin (*Types of the Laramie Flora*, Bull. U. S. Geological Survey No. 37). Prof. Ward's material, it will be observed, is from practically, the same region as much of that obtained by Dr. Hayden, and, as shown both by the matrix and by the species represented, some of the material must have come from practically the same spot.

#### DESCRIPTION OF THE SPECIES.

##### *Thuya interrupta* Newby.

Later Extinct Floras, p. 42; Illustrations of Cret. and Tert. Plants, Pl. xi, Figs. 5, 5a.

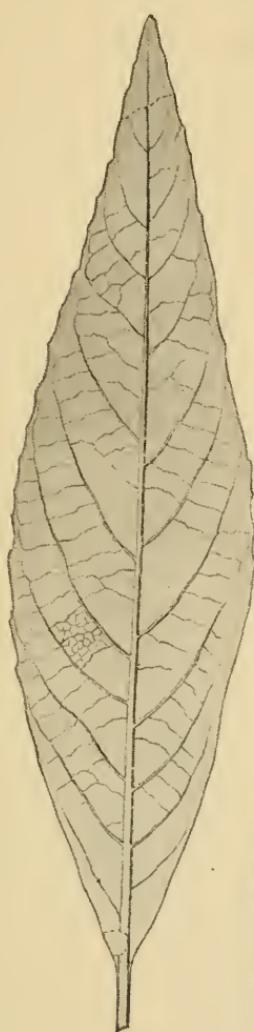
This beautiful species has not before been obtained, so far as I know, since the original specimens were collected by Dr. Hayden, near Fort Union. The slab obtained by Prof. Meeds bears a single small, but highly characteristic branch of this conifer.

##### *Populus Meedsii*, sp. nov.

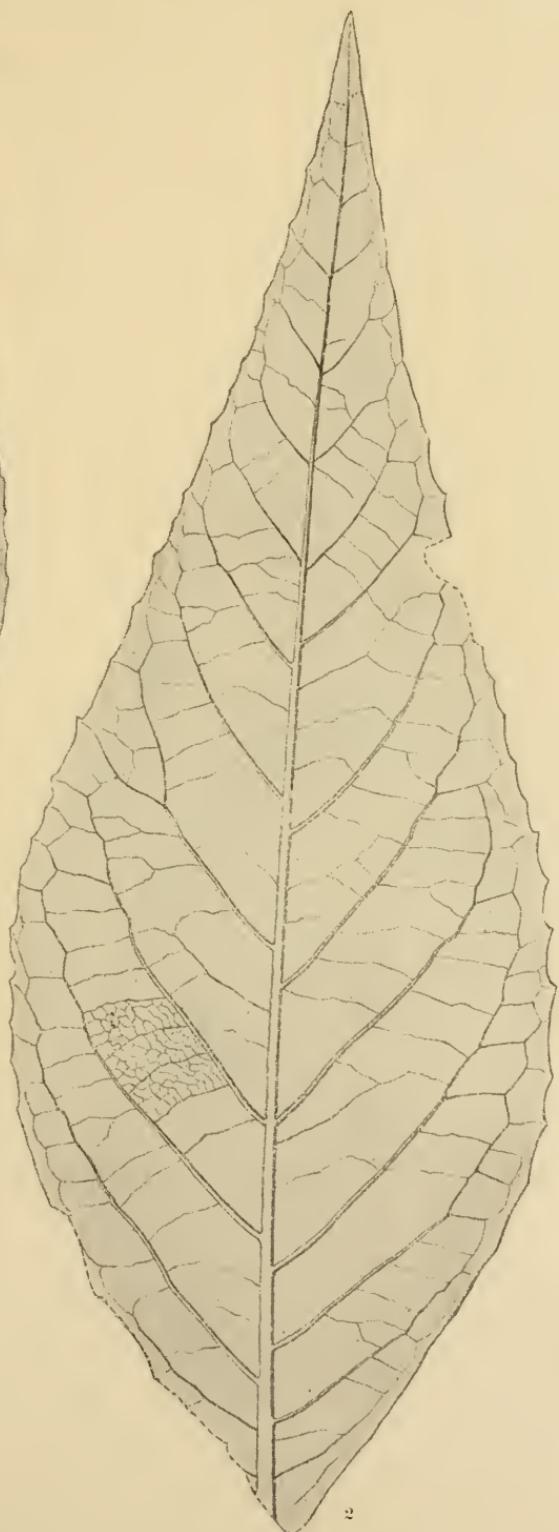
Pl. i, Figs. 1, 2.

Leaves short-petioled, 12 to 20<sup>cm</sup> long, 3 to 7<sup>cm</sup> broad, long-lanceolate, usually being broadest in the middle, from which point they taper gradually downward into a wedge-shaped base and upward into a similarly shaped, rather acute apex; lower third of margin smooth, remainder provided with very short outwardly pointing teeth separated by shallow sinuses; midrib strong, straight; secondaries, 12 to 14 pairs, alternate or subopposite, emerging at an angle of 45° or 50°, running straight toward the margin, along which they arch, forming a nearly regular series of quadrangular meshes, and from which slender branches enter the weak teeth; tertiaries strong, forming lattice-like bars nearly at right angles to the midrib or in some cases more nearly at right angles to the secondaries; ultimate nervation fine, quadrangular.

This beautiful species, which I take pleasure in naming in honor of Prof. Meeds, the collector, seems to find its nearest living analogue in *Populus angustifolia* James (*P. balsamifera* var. *angustifolia* Watson), a species still living along streams from New Mexico and Colorado to California and Washington. The living species differs merely in having the leaves more nearly ovate-lanceolate and in being erenate-serrate with numerous fine teeth. The nervation is quite similar in both, being, however, less regular and with the secondaries at a more acute angle



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*Populus meedsii*, new species.



in *P. angustifolia*. It is certainly quite remarkable that the fossil and living species should be so intimately associated, and seems to warrant the supposition that *P. Meedsii* represents an undoubted ancestral form of the living *P. angustifolia*.

*Populus Meedsii* is also evidently related to *P. Heerii* Sap.\* from the Eocene at Florissant, Colorado. This latter species has the leaves long-petioled, ranging in size from 5 to 30<sup>cm</sup> in length and 2 to 12<sup>cm</sup> in width. They differ slightly in shape, being in general broadest below the middle, and have sharp upward-pointing teeth, separated by acute sinuses. The nervation is nearly the same in both. It is probable that *P. Heerii* is even more closely related to the living *P. angustifolia* than is *P. Meedsii*, which accords well with its geological position. If this view of the relationship between them be correct, our present knowledge of the development will stand as follows:

*Populus Meedsii* sp. nov. Fort Union Group. Lower Eocene.

*Populus Heerii* Sap. Green River Group. Upper Eocene.

*Populus angustifolia* James. Living.

#### *Quercus Dentoni* Lx.

Cret. and Tert. Floras, p. 224, Pl. XLVIII, Figs. 1, 11; Ward, Types of the Laramie Flora, p. 26, Pl. x, Fig. 1.

The type specimens of this species were obtained by Prof. William Denton from the Bad Lands of Dakota, but probably not far from the mouth of the Yellowstone, therefore practically in the same region.

The single partly broken leaf on the slab obtained by Prof. Meeds differs slightly from the figures given by Lesquerewx, being broader and having the secondaries less arched. It is more like the leaf referred to this species by Prof. Ward from Point of Rocks, Wyoming.

#### *Dryophyllum*, cf. *D. aquamarum* Ward.

Types of the Laramie Flora, p. 26, Pl. x, Figs. 2-4.

The type of this species came from Point of Rocks, Wyoming. The leaf under consideration is much broken and it is impossible to make a positive identification.

#### *Pterospermites Cupanioides* Newby, sp.

Pl. II, Fig. 1.

*Phyllites Cupanioides* Newby., Later Extinct Floras, p. 74; Illustrations of Cret. and Tert. Plants, Pl. XXVI, Figs. 3, 4 (wrongly identified by Lesquerewx as *P. venosus*).

*Pterospermites Whitei* Ward, Synopsis of the Flora of the Laramie Group, p. 556, Pl. LV, Figs. 5, 6; Types of the Laramie Flora, p. 94, Pl. XVI, Figs. 5, 6.

Leaves large, 12 to 13<sup>cm</sup> long, 7 to 8<sup>cm</sup> broad, fleshy, ovate, elliptic in outline, rounded or heart-shaped at base, subacute at summit,

\* Lesquerewx: Cret. and Tert. Floras, p. 157, Pl. XXX.

margins coarsely and obtusely sinuate—toothed above, simple or waved below; petiole 4 to 6<sup>cm</sup> long, straight, very thick; nervation pinnate; very strong; midrib straight or slightly flexuous; lateral nerves about six pairs, somewhat crowded below, more remote above, alternate, basilar pair usually short and simple and uniting above with the tertiary branches of the second pair to form a marginal festoon; middle secondaries each bearing one or two, rarely three, branches near the summit, upper ones generally simple; tertiary nervation very distinct, forming lattice-like bars connecting the secondary nerves at right angles.

The above description is, with slight modification, the one given by Dr. Newberry (*loc. cit.*) for this *Phyllites Cupanioides*, the changes being simply relatively unimportant details afforded by later and in some respects more perfect material than he evidently had at his disposal. It will also be observed that this description does not differ essentially from that given by Prof. Ward for his *Pterospermites Whitei*. A comparison of the figures of the latter species with those given by Newberry and also with the ones under discussion shows that they agree essentially, the differences being insufficient to permit a generic or even a specific separation. The leaves figured by Prof. Ward are a little less strongly toothed and more markedly heart-shaped at base. The nervation is the same in both.

Dr. Newberry's specimens are labeled "Fort Union, Dakota," which is in the vicinity of the mouth of the Yellowstone; but, as the Fort Union group is exposed in practically identical material from above the mouth of the Powder River to the Missouri at the mouth of the Yellowstone, they are shown to be from similar if not identical beds. Several of Dr. Newberry's types are in the collections of the United States National Museum and are seen to agree exactly with the present and other material from the Yellowstone.

**Viburnum asperum** Newby.

Later Extinct Floras, p. 51; Illustrations of Cret. and Tert. Plants, PI. xvi, Figs. 8, 9.

A single, considerably broken leaf seems to belong to this species. The type specimens were obtained by Dr. Hayden near Fort Union.