

ART. XXX.—*A Mid-Devonian Callixylon*; by C. J.
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In the paleobotanical collections of Yale University there have long been some unstudied sections of a Devonian wood from Eighteen Mile Creek, New York. These sections were made by Dr. Wieland about 1900, from material collected by O. C. Marsh in 1860. They bear numbers 240, 241, and 242. Since this wood consists merely in siliceous fragments containing much residual carbon, and is otherwise poorly preserved, the structure is difficult to make out. Only the transverse and radial longitudinal sections are diagnostic. The tangential section failed, cutting a region of especially poor preservation, with oblique compression.

Nevertheless, a new species of Zalessky's genus *CALLIXYLON* (7)¹ is indicated, and attention to the plants rather than associated vertebrates must bring to light better material of the original stem type, supposedly a foot or more in diameter. If so, further sectioning must disclose the better conserved areas as in various other instances of petrified stems. Accordingly, it has been considered worth while to give the description which follows. The value of these notes rests in the fact also, that the fine type from the Indiana Black Shale, *CALLIXYLON OWENI* (6), is at hand for close comparison and renders less doubtful features that otherwise would be obscure. The camera lucida figures here reproduced are accurate to scale, and are not restored, but actual drawings of the areas they show.

Generic Position.

The grouping of the radial pits in discontinuous masses undoubtedly puts the wood of these sections into the genus *Callixylon*. Other characters also are those of typical Cordaitan wood, as described by Penhallow (5), or Elkins & Wieland (3). In regard to the specimens and their inclusion in Zalessky's genus, Dr. Wieland has the following to say:

¹ For Literature references see the end of this paper.

“Seward in his great textbook (vol. III p. 292) says of the reference of the Indiana black shale Cordaite to *CALLIXYLON*—‘Miss Elkins and Dr. Wieland refer some upper Devonian wood from Indiana characterized by a grouping of the circular or elliptical bordered pits in the radial walls of the tracheids similar to those in *CALLIXYLON TRIFILIEVI*, which they include together with the middle Devonian species of *CORDAITES NEWBERRYI* in Zalessky’s genus. Though these two American species are comparable in the discontinuous arrangement of the tracheal pits with the Russian type, the latter is characterized by primary xylem strands, a feature not recognized in the American stems; it would seem, then, undesirable to adopt the designation *CALLIXYLON* in preference to *DADOXYLON* unless there is evidence as to similar characteristics in the primary xylem.’

Is this either a guide to convenient usage or a logical conclusion? It is not well to lay stress on the precise position in the middle or upper Devonian for any of these forms, since their time range is only inferable. The interesting and decisive point is that in middle to later Devonian time there was a cosmopolitan group of Cordaites with the grouped pits, and such forms are known in a typical instance to have the old cryptogamic wood. The probability is that all have it. But if any of the species referred to *CALLIXYLON* with reservations well within the recognized usages of Paleobotany, were later found to lack cryptogamic wood, then a new genus would be indicated, perhaps a new family. Moreover, mere reference to *Dadoxylon* would settle nothing, where these recurrently variant forms are concerned. With or without the cryptogamic wood, there would still remain the chance that the leaf or floral characters varied strongly from the forms primarily designated as *Dadoxylon*. Like so many of the genera of Paleobotany, *Dadoxylon* is now more a group name than a genus in the purely botanical sense. And similarly *Callixylon*, in the first instance a needed generic distinction, must share the same fate of ultimate and convenient inclusiveness. Only thus may we avoid the use of over-many generic names in our descriptions and groupings of ancient plants. The other alternative must be genera of mainly one sole species.

These more or less silicified bits of lignitic wood must have attracted the attention of Marsh while searching in the limestone which thinly covers the Hamilton, and carries both fish and plant remains. They would thus be from near the close of the mid-Devonian. But the horizon might be in the Hamilton shale, or higher in the black shale of the Portage, also carrying plants. The bits were marked by Marsh as from the Hamilton group.

This Cordaite is not likely to be as old as the PALEOPITYS MILLERI of the Old Red of Scotland;² and, incidentally, even the wood-cuts of the latter given by Hugh Miller in the 'Testimony of the Rocks,' fig. 3, permit fair judgment of the main features. It is seen that the pitting is of the Dadoxylon type (2 to 3-seriate), and the rays thin (uniseriate), as Miller discerned.

'The fossil botanist on taking leave of the lower Carboniferous beds, quits the dry land and puts out to sea.' So wrote the stylist of Cromarty over seventy years ago; and while not intended in the very severest literal sense, the epigram was long justified. But new methods of study and new discoveries have broadened the paleobotanic horizon, and helped to give material once thought inadequate, high value as evidence of structure, or distribution, or both. Perhaps no further answer is needed to any question why the fossil tree type here described was not earlier taken up."

Structure.

The tracheids of the sections cited are mostly rectangular in cross-section, and vary much in size. The average is thirty-five to forty-five microns across, in this respect differing sharply from the larger tracheids of CALLIXYLON OWENI (3), which run from forty-five to sixty microns across. The walls appear thick, from three to five microns. In radial longitudinal section, the tracheids show the chief characteristic of the genus—the bordered pits of the radial walls, aligned in discontinuous groups. As in CALLIXYLON OWENI (3), the pits are circular or irregularly elliptical in outline, and occur in a varying number of vertical rows, from one to three (in rare instances, four). These vertical rows of pits are rather closely set, without compression to marked hexagonal form, in the groups as aligned in radial bands that correspond to the bands of pit groups on the neighboring tracheid. Only in a few places in the Eighteen Mile Creek material is the grouping of the pits fully visible over any great area; the best area of preservation is shown in fig. 2. These features can of course only appear to advantage where there is little compression and the section cuts closely to the true radial wood lines.

² McNab, W. R.: On the Structure of a Lignite from the Old Red Sandstone; Trans. Bot. Soc. of Edinburgh, vol. 10, p. 312.

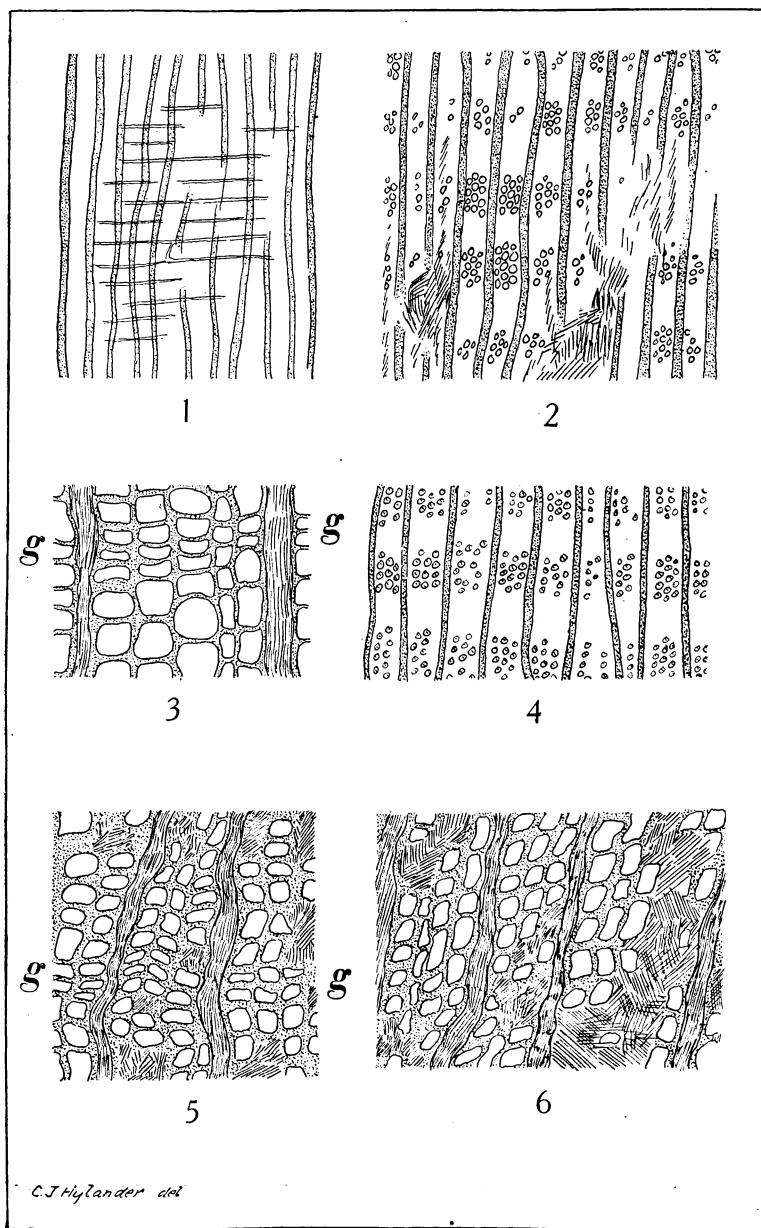


FIG. 1-6. Explanation opposite.

In the transverse section, the wood rays appear unusually wide, compared with the tracheids. They are also of considerable depth, varying from ten to fully twenty cells deep. In only one instance, in the radial longitudinal section, could the end of a ray cell be distinguished, and that is shown in fig. 1. The ray cells appear to be about the same size as those of *CALLIXYLON OWENI*. The cell-width of the rays is not visible in the imperfect tangential section, but the rays must be in part two-cells wide, as in *C. Oweni*. Wieland (6, p. 123) notes that in *Araucarioxylon* stems the wood rays are never more than two cells wide, although rays three and four cells wide are not infrequent in the older *Cordaite*s.

The growth ring (fig. 5), as also in *C. Oweni* (fig. 3), is a significant feature of this wood, which may have been widespread in the mid-Devonian. Such growth rings are not present in the Russian *Callixylon*; nevertheless it is likely that the feature is more or less general in *Callixylon*, and it occurs in various other typical American *Cordaite*s. Miss Goldring finds it in a Carboniferous *Cordaite* as far south as southern Texas (4). These ancient rings are not thought to indicate as sharp a seasonal change as the rings in Dicotyledonous plants. But on the other hand, little attention has been given to the fact that in old and simpler types of wood, growth rings do not become a feature of the wood structure. The simpler type of growth ring occurs in both Mesozoic and recent Cycads, and Chamberlain (1) has now observed it in a Monocotyl. Accentuation of growth ring is mainly correlated with the more marked tracheidal and ray differentiation of mid to later Mesozoic time.

EXPLANATION OF FIGURES 1-6. (All figures enlarged 100.)

CALLIXYLON MARSHII, sp. nov.

- FIG. 1. Radial long. section showing approximate height of wood ray.
 FIG. 2. Radial long. section showing the aligned grouping of the radial pits.
 FIG. 5. Transverse section showing growth ring and average appearance of tracheids in one of the less compressed areas.
 FIG. 6. Transverse section showing typical wood and conservation.

CALLIXYLON OWENI, Elkins & Wieland.

- FIG. 3. Transverse section, showing growth ring and larger and well preserved tracheids. [Tracheid ends probably aligned.]
 FIG. 4. Radial long. section, showing radial grouping of pits, for comparison with fig. 2.

Specific Characters.

Comparison of the type sections of *CALLIXYLON OWENI* with those of the present Eighteen Mile Creek wood sections, reveals specific variation. There are the same discontinuous pit groups and obscure growth rings, but the tracheids are of a consistently smaller size not accounted for by compression or accidental variations, and the wood rays are relatively broader. Therefore, there need be no doubt in naming it after its finder of sixty years ago, who later became so famous as an indefatigable collector and paleontologist.

CALLIXYLON MARSHII sp. nov. Tracheids $35-45\mu$ in diameter, walls $3-5\mu$ thick, radial pits of the bordered crossed slit type, arranged in from one to three vertical rows in discontinuous groups of few to 12 or 13 pits to the grouping, groupings radially aligned; wood rays few to 20 cells deep, two cells wide, conspicuously broad in cross section; growth ring of primitive type present but difficult to see. Horizon, upper mid-Devonian of New York. Type locality, Eighteen Mile Creek, New York.

The following comparison is added for convenience: TRANS. SECT.—Diameter of tracheids: *C. Marshii*, $35-40\mu$; *C. Newberryi*, $44-55\mu$; *C. Oweni*, $45-60\mu$. Thickness of walls: *C. Marshii*, $3-5\mu$; *C. Newberryi*, 6μ ; *C. Oweni*, 5μ . Growth rings absent in *C. Newberryi*, also *C. Triflievi*, present in the other two species. RADIAL LONG. SECT. Pit groups: 3-13 in *C. Marshii*, 6-13 in *C. Newberryi*, and 3-40 in *C. Oweni*. Pit diameter: 9.3μ in *C. Newberryi*, $8-10\mu$ in *C. Marshii*, and $10-11\mu$ in *C. Oweni*. TANG. SECT. Height of rays: *C. Marshii*, 1-20; *C. Newberryi*, medium height; *C. Oweni*, 1-40. Thickness of rays: *C. Marshii*, at least 2-seriate; *C. Newberryi*, 3-seriate rarely; *C. Oweni*, 2-seriate.

Thus it is seen that the *C. MARSHII* is closer to *C. NEWBERRYI* (2) than to *C. OWENI*. And this is an interesting point since the *C. NEWBERRYI* is given from the mid-Devonian of Ohio. Neither of these forms can be confused with the forms called *Dadoxylon Ouangondianum* and *D. Halli* (2), from the mid-Devonian of New York. These are distinct as forms with four and five pit rows, the adpressed pits, and broad wood rays. They are mentioned merely because figured by Dawson along with the

C. Newberryi (2). A form ORMOXYLON (2) is given with three pit rows, as having very narrow wood rays one cell thick, but this is more likely a typical *Dadoxylon*.

LITERATURE CITED.

- ¹ CHAMBERLAIN, C. J.: Growth Rings in a Monocotyl, Bot. Gaz., 72, 293-304. Text fig. 1-16, 1921.
² DAWSON, J. W.: Fossil Plants of the Devonian and Upper Silurian of Canada, 92 pp., 20 pls., Geol. Surv., Canada. Montreal, 1871.
³ ELKINS, M. G., & WIELAND, G. R.: Cordaitan Wood from the Indiana Black Shale, this Journal, 38: 65-78. pl. 1, 2, 1914.
⁴ GOLDRING, W.: Annual Rings of Growth in Carboniferous Wood, Bot. Gaz., 72, 326-330, 1921.
⁵ PENHALLOW, D. P.: Notes on the North American Species of *Dadoxylon*, Trans. Roy. Soc. Canada, 6, IV, 61, 1900.
⁶ WIELAND, G. R.: Flora Liasica de la Mixteca Alta, Inst. Geol. Mex., Bol. 31, 1914.
⁷ ZALESSKY, M. D.: Etude sur l'anatomie du *Dadoxylon* Tchihatcheffi Göppert sp. Mem. du Comite Geol. Nouvelle Ser. Liv. 68, pp. 18-29, Pls. I-IV, St. Petersburg, 1911.

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