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ON THE RADIAL PITTING IN *CALLIXYLON*[1]

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Fossil woods of *Dadoxylon* or *Araucarioxylon* affinity are recognized by the alternate-multiseriate pitting on the radial walls of the tracheids. *Cordaites*, *Mesoxylon*, *Parapitys*, *Pitys*, and *Callixylon* are a few of the best known Paleozoic forms showing this character. With the exception of *Callixylon* all the above-named genera are Carboniferous or later. *Calli-*

TEXT FIG. 1. Radial section of *Callixylon* sp. showing radial alignment of the pit groups. Material from Forbush Creek, near Mill Springs, Kentucky. × 100.

xylon, which occurs abundantly in the upper Devonian, is probably the oldest known *Dadoxylon* form of which we possess any considerable knowledge. The relationship of the middle Devonian *Paleopitys Milleri* is not well understood.

[1] Paper from the Department of Botany of the University of Michigan, no. 315.

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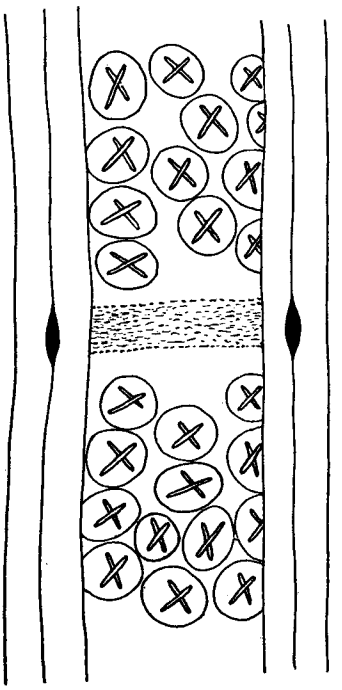
Zalessky (7) characterized *Callixylon* as a genus having mesarch primary wood bundles at the margin of the pith. These are in direct contact with the secondary wood in which the bordered pits on the radial walls of the tracheids are arranged in radially aligned groups with unpitted spaces between. While the pitting is still of the alternate-multiseriate type the continuity is interrupted by the unpitted spaces.



TEXT FIG. 2. Bar of Sanio in unpitted space between two groups. × 200.

Previously, no explanation has been offered for the grouping of the pits and the radial alignment of these groups. Examination, however, of a recently discovered silicified specimen has made the situation quite clear (text fig. 1). In the unpitted spaces between the groups an intercellular transverse band is visible (text fig. 2). Similar structures occurring in both living and fossil woods are referred to as bars of Sanio. They consist of bands of an intercellular substance which originally separated the primordial pit areas of the cambium cells, and were carried over into the secondary tissues. The primordial pit areas of *Callixylon* were large, several pits were formed within a single area, and these areas were separated by unusually large and regularly placed bars of Sanio.

In *Larix occidentalis*, Bailey (2) has shown that two pits are often laid down over a single primordial pit area. In *Pinus Strobus* the pits tend to be radially aligned. In *Araucaria* the intercellular substance is more evenly

distributed and thinner, and only when the pits are sufficiently far apart do the bars of Sanio appear. This brings up the question as to whether the pit groups in *Callixylon* might be equivalent to the single large pit in pine, since the pits in the latter are often separated by a very conspicuous band. The multiseriation in *Callixylon*, however, makes this quite improbable and one is also pressed for an explanation as to why many pits are laid down over a single primordial pit area in *Callixylon* and only a single pit in pine. The best inference, therefore, is that the arrangement in *Callixylon* is simply a modification of the ancient alternate-multiseriate *Dadoxylon* type.

Except for the segregation of the pits into groups the arrangement is typically araucarian. The pits are in two to four rows per tracheid, alternately arranged, and often hexagonal as a result of mutual pressure. The pit orifice is a diagonal slit, the two opposing ones giving the cross appearance (text fig. 2).

The number of pits per group varies. The range is from one to ninety but commonly there are between eight and twenty, with an average of about fourteen (text fig. 1). The extremely large groups are probably multiple groups. This grouping is not present in the primary wood, which shows a complete transition from spiral to pitted structure.

The grouping of the pits in *Callixylon* was first observed by Newberry (5) in *Callixylon* (*Dadoxylon*) *Newberryi*. Two additional American forms, *C. Oweni* (3) and *C. Marshii* (4), have since been described as showing the radial banding but neither of these shows the primary wood. Seward (6) has objected to referring these forms to *Callixylon* on secondary wood characters alone. However, recent investigations in New York have resulted in the discovery of some twelve or fifteen specimens of this genus showing both primary and secondary wood. This wood is quite abundant in some localities (1) and since it shows no differences sufficient to warrant generic separation, the pit grouping alone is therefore considered sufficient for generic reference.

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LITERATURE CITED

1. **Arnold, C. A.** Some Devonian plant localities of central and western New York. Science **67**: 276–277. 1928.
2. **Bailey, I. W.** Structure, development, and distribution of the so-called rims or bars of Sanio. Bot. Gaz. **67**: 449–468. 1919.
3. **Elkins, M. G., and G. R. Wieland.** Cordaitean wood from the Indiana Black Shale. Amer. Jour. Sci. **188**: 65–78. 1914.
4. **Hylander, C. J.** A mid-Devonian Callixylon. Amer. Jour. Sci. **204**: 315–321. 1922.
5. **Newberry, J. S.** Devonian plants from Ohio. Jour. Cincinnati Soc. Nat. Hist. **12**: 53–55. 1889.
6. **Seward, A. C.** Fossil plants. Vol. 3, p. 292. 1917.
7. **Zalessky, M. D.** Etude sur l'anatomie du *Dadoxylon Tchihatcheffi* Goeppert. Com. Géolog. Russe. N. S. **68**: 29. 1911.