

NOTES.

THE STRUCTURE OF LEPIDODENDRON OBOVATUM, STERNB.—It rarely happens that the palaeobotanist has the opportunity of investigating the anatomical structure of a specimen which at the same time exhibits external characters allowing of its specific determination. In the present preliminary note I propose to place on record a case of this kind which has recently come under my observation.

On December 15, 1904, I received from Mr. J. Parker, of Earby, near Colne, Lancashire, among other specimens from the Lower Coal-measures at Towneley, the petrified stem of a *Lepidodendron*, from which the matrix had split away in such a manner as to expose a part of the external surface of the plant. The exposed surface is completely clothed by the leaf-bases, of which about twenty are visible; they are not flattened, as is usually the case in the ordinary casts, but stand out in strong relief. The scar from which the leaf had fallen is plainly seen at the top of each cushion, and the cushion itself has a well-marked median rib. On either side of the rib the lateral prints can in some cases be clearly seen; the markings on the scar itself are somewhat obscure. The detached portion of the matrix, giving the mould of the surface, shows the corresponding features clearly. The general outline of the leaf-cushions is rhomboidal with rounded angles; the slope of the lateral surfaces towards the rib, together with that of the scar above, gives the whole somewhat the form of a three-sided pyramid, modified, however, by the fact that the rib itself has a concave curvature.

The plant was evidently capable of specific determination, and with this view I submitted the specimen to the highest systematic authority in this country, Mr. R. Kidston, F.R.S., who kindly examined it, and states in a letter dated March 17, 1905, 'The specimen showing structure is without doubt *Lepidodendron obovatum*.'

The species having thus been satisfactorily identified, I sent the block to Dr. Krantz, of Bonn, to have sections cut, taking care that the part showing the superficial characters should be preserved uninjured.

In addition to the branch (A) of which the surface was exposed, the block contained another specimen, evidently of the same nature, but immersed in the matrix. Sections were prepared from both branches, which proved to be united below, forming part of the same dichotomizing stem.

The branch A showing the surface measures about 50 × 30 mm., the other is somewhat larger, having a diameter of about 65 × 25 mm. in its present condition, the leaf-bases being included in each case. The preservation is very fairly good. The stele has a medulla, enclosed within the broad ring of primary centripetal wood, which does not show any specially well-marked corona. Surrounding the primary

wood is a zone of radially arranged tissue, evidently of secondary origin, and occupying the place of the secondary xylem. I have not, however, been able to detect any tracheides in this zone, which appears to be wholly parenchymatous, except of course where the leaf-traces pass through it. The presence of this parenchymatous zone is characteristic of the type of stem commonly referred to *Lepidophloios fuliginosus*; in some specimens of the latter type groups of secondary tracheides are embedded in the secondary parenchyma, while in other cases the structure has been found to be entirely parenchymatous, as in the fine Halonial branch which Professor Weiss refers to *Lepidophloios fuliginosus*.¹ I have found the specimens in my collection extremely variable in this respect, the tracheides, where they appear, being sometimes quite local in their occurrence.

The phloem-zone in our specimen of *Lepidodendron obovatum* is imperfectly preserved; beyond this we come to the inner cortex, a comparatively narrow zone of dense, small-celled tissue; outside this the broader middle cortex is partially preserved, and consists of a delicate tissue of relatively large cells. The outer cortex has a firmer structure, resembling the inner cortex in this respect, but with rather larger cells. The leaf-bases present the usual structural features—vascular bundle, parichnos, and ligular pit. Within the leaf-bases the zone of periderm, usual in *Lepidodendreae*, is well developed; in branch A a second periderm, internal to the first, is present locally.

The leaf-traces are met with in all parts of their course from the stele to the leaf-bases; they are often well-preserved, and show exactly the same structure as has been figured in stems referred to *Lepidophloios fuliginosus*.² The presence, on the phloem-side of the strand, of the dark mass or crescent, interpreted by Mr. Seward as secretory tissue, is a striking point of agreement.

In branch A there is a specially interesting feature in the presence of a small lateral stele, which, in the three transverse sections of this specimen, is shown at three points of its outward course. The small stele has a somewhat horse-shoe form at first, gradually closing up into a circle as it passes further outwards. The wood appears to enclose a small pith, and leaf-traces are given off while the stele is still on its way through the parent cortex. There is a very marked resemblance to the steles supplying Halonial tubercles, as shown, for example, in Professor Weiss's specimen. The main stele remains open on the side from which the lateral stele has been given off, the gap becoming narrower upwards, but not closing within the region from which sections have been cut.

The most striking point about the structure of the stem of *Lepidodendron obovatum* is its close agreement with that of *Lepidophloios fuliginosus*. If the specimen had been found in the usual condition, without superficial characters, it would beyond doubt have been placed in the genus *Lepidophloios*, if not in the species *L. fuliginosus*. The fact that our stem is clearly referable to a typical species of *Lepidodendron* shows that external and anatomical characters do not necessarily correspond in the *Lepidodendreae*, and warns us that all identifications of *Lepidophloios*

¹ F. E. Weiss, A Biseriate Halonial Branch of *Lepidophloios fuliginosus*, Trans. Linn. Soc. London (Bot.), vol. vi, 1902, p. 225.

² Seward, Notes on the Binney Collection of Coal-Measure Plants, Part I, *Lepidophloios*. Proc. Cambridge Phil. Soc., vol. x, 1899, Pl. III, Figs. 1 and 2. Weiss, l. c., Pl. XXV, Fig. 13.

based on anatomical features are open to suspicion. From the examination of specimens in my own collection, I have no doubt that quite heterogeneous stems are commonly confounded under the name *Lepidophloios fuliginosus*. Some, no doubt, like that originally identified by Messrs. Cash and Lomax¹, really belong to *Lepidophloios*, but others are in all probability referable, like the specimen now described, to species of *Lepidodendron*. Internal structure is presumably of more importance than external configuration, and we may conjecture that the characters of the leaf-bases, on which systematists have been compelled to rely, possess but small taxonomic value.

D. H. SCOTT.

Kew.

LIGNIFICATION OF PHLOEM IN HELIANTHUS.—Some observations on the phloem of the common sunflower were described in a note² published in 1902; the chief points were as follows. In an old stem, collected early in October of the previous year, it was found that lignification of the walls had taken place in a considerable number of sieve-tubes and companion-cells, as well as in many of the phloem-rays, and in the whole of the pericycle; the rather surprising result was also obtained, that the proteid-contents of some sieve-tubes and companion-cells gave lignin-reactions³, especially in the root, where lignification of the walls of these elements was not observed.

These results were based on an examination of two plants only, and required to be supplemented by further observations. For this purpose additional material was collected in 1902 for future investigation, and included eleven plants of *Helianthus annuus*, L., one plant of *H. tuberosus*, L., and stems of *H. laetiflorus*, Pers., and *H. decapetalus*, L. All of these except the specimen of *H. tuberosus* were grown at Kew. The object of the present note is to give the results of the examination of this material.

The lignification previously observed appears to be of general occurrence in old stems of the sunflower, since the walls of a large number of sieve-tubes and other elements of the phloem proved to be lignified in all the specimens of this species; the same was observed in the three other species of *Helianthus* mentioned above. The contents of numerous sieve-tubes and companion-cells were lignified in the root of all the sunflower-plants and in that of *H. tuberosus*⁴. Thus the previous observations are confirmed for the sunflower, and extended to other species of the same genus.

Of the eleven plants of the sunflower, nine were grown close together and at first treated alike, but two of them were transferred to a green-house in August, and from two other plants the different capitula were successively removed before reaching

¹ W. Cash and J. Lomax, On *Lepidophloios* and *Lepidodendron*, Report of the British Association (Leeds), 1890, p. 810.

² Boodle, On lignification in the phloem of *Helianthus annuus*, Annals of Botany, vol. xvi, p. 180.

³ The different reagents used are mentioned on p. 181, loc. cit.

⁴ The roots of *H. laetiflorus* and *H. decapetalus* were not examined.



Scott, Dukinfield Henry. 1906. "The structure of *Lepidodendron obovatum*, Sternb." *Annals of botany* 20, 317–319.

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