

IV.—STIGMARIA STRUCTURE.—BY HENRY S. POOLE, F. R. S. C.
F. G. S., &C.

(Read March 18th, 1901.)

The specimen of *Stigmaria* here exhibited is from the Coal Measures at Stellanston, and from a fireclay bed between two of the working coal seams. The original fragment, about 9 inches long and 3.5 by 2.25 in cross-section, was given to the Geological Survey Museum with a preferred right to a section should the piece ever be cut. This was done on the advice of the Director, the late Dr. Dawson, who also sent another section to Mr. Kidston of Stirling, Scotland.

The special interest in the specimen, lies in the exceptionally well preserved condition of the heart or medulla due to infiltration, the whole root having been converted into clay ironstone. The piece here shown presents a cross section only of the beautifully preserved scalariform tissue of the medulla which is placed below the centre of the root and nearest the concave underside. Mr. Kidston in his acknowledgment to Dr. Dawson, remarked that the section was one of considerable interest from a botanical point of view, shewing more numerous and finely radiating wedges of vascular tissue than other *stigmaria* roots he has lately been studying.

Stigmaria, when first found, were considered a distinct genus but are now known to be but the roots of *Sigillaria*. The late Mr. R. Brown of Sydney Mines, Cape Breton, found in the cliffs near the pits a tree trunk that clearly showed the passage of the *Sigillaria* stem into the *Stigmaria* roots, and similar specimens have been found elsewhere.

The *Sigillaria*, Mr. Carruthers describes as consisting of a central cellular pith or medulla surrounded by a sheath consisting wholly of scalariform vessels, the whole enveloped in an

external cortical mass of cellular tissue. The medullary sheath is perforated by meshes for the passage outwards of the vascular bundles which go to the aerial appendages (the leaves and branches), but there are no true medullary rays. Hence he classes the *Sigillaria* as Cryptogamic and Lycopodiaceous.

The external surface of *Stigmaraia* is without the vertical and parallel fluting between the pits or shallow tubercles distinctive of the *Sigillaria*, and in this particular specimen the pits are rounded, depressed and widely separated and not sharply defined. No rootlets were attached. When found the fire-clay bed had weathered away from the specimen.

The internal structure exhibits a central pith surrounded by a sheath of scalariform vessels, the whole enclosed in a cellular envelope. Dr. A. H. MacKay, our President, kindly undertook to examine this specimen, and I am glad to be able to append his description with reproductions of photographs of magnified portions of the section.

I would merely add that it is now believed that such piths as this specimen illustrates have, when separated from their envelope, given rise to fossils classed as *Sternbergia*, which are described as comprising cylindrical transversely marked casts of pithy cylinders of other plants, belonging chiefly to conifers, but referable also to *sigillaria*.

Dr. MacKay's Description of the Section.

The section is transverse, about 21^{mm} thick, black, with infiltrations of brown to white in some crack-like lines, and is polished where cut. This polished black surface (clay iron-stone) can be scratched by the point of a hard steel knife, but does not effervesce under a drop of hydrochloric acid. The whitish infiltrated lines referred to effervesce as if calciferous.

The contour of the section is an irregular oval with rectangular axes respectively about 95^{mm} and 60^{mm}. An approximately concentric crack-like line partly infiltrated with whitish material runs around more than two-thirds of the periphery, about 4^{mm} from the edge, suggesting an exterior bark layer.



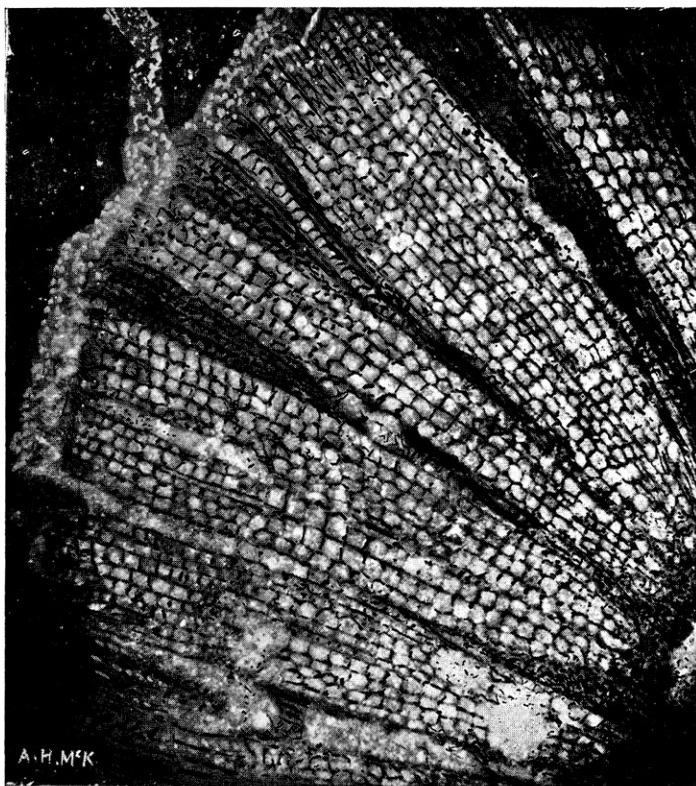
Photograph by DR. A. H. MacKAY.

TRANSVERSE SECTION OF VASCULAR CORE OF STIGMARIA

Magnified about $3\frac{1}{2}$ diameters.

(TO ILLUSTRATE PAPER BY MR. POOLE.)

Face p. 345.



Photograph by DR. A. H. MacKAY.

TRANSVERSE SECTION OF VASCULAR BUNDLE FROM CORE
OF STIGMARIA.

Magnified 15 diameters.

(TO ILLUSTRATE PAPER BY MR. POOLE.)

Face p. 346.

Eccentrically placed within the dark and apparently structureless surface, about 30^{mm} from one side and less than ten from the opposite side, is a nearly circular band of over thirty slightly wedge-shaped bundles of rectangular cells, surrounding a structureless central circular area like the rest of the section surface about 11^{mm} in diameter.

The bundles of cells are in radial direction from 6 to 7^{mm} in length and from less than 1 to about 2^{mm} in breadth, containing from 5 to 15 radial rows of cells, each having about 40 or more rectangular cells in a row. The bundles are separated by the uniform black material within and without the ring of bundles of cells, each bundle being separated by a space of more or less than 1^{mm}.

The lumen of the cell is white (a calcium carbonate infiltration), rectangular, 100 microns by 175 being a common size. The cell wall is black and thin, less than 10 microns thick. The smaller cells are often nearly square, 50 to 75 microns, but the tendency is to a greater length radially than in breadth. Cells 125 microns by 200 are the largest commonly found. The cells become larger generally, as they recede from the centre, and the widening of the bundles in the same direction is also caused by the appearance of interstitial rows of cells, so that the bundle has a few more rows of cells across the wider than across the narrower end, as a rule.