Discovery of a Stem of Calamites from the Palaeozoic of Japan.

By

H. YABE¹⁾ and S. ENDO.

I. The Upper Palaeozoic coal formation is well developed in northern China and Manchuria, and also a little in northern Korea; it often contains plant remains in great profusion, and we know now that the fossil flora does not much differ from that found in Europe and North America. The contemporaneous deposits of Japan, represented by the uppermost part of the Chichibu formation, however, are all of marine origin, and we have there no coal seams of this age and also no hope to find a rich fossil flora of terrestrial origin. As a matter of fact, no land plant remains of the Palaeozoic age have yet been found from insular Japan, except the very doubtful one recorded by Prof. **K. Fujii**²⁾ of the Botanical Institute, Imperial University of Tokyo, in 1915.

The material recorded by the above named author was brought to him by Mr. **J. Sakakura** who found it near a small village Ichinose³⁾ in the upper valley of the Seto-gawa, province of Suruga. It is a piece of greywacke sandstone, with an impression which shows a number of small hexagonal marks. These marks are not of regular hexagonal shape, but bilaterally symmetrical, and have the rim as well as the minute scars at the center distinctly raised above the other parts. **Fujii** believes he has here an external cast of a Sigillarian stem of the Favularia type, the

1) **H. Yabe**: Coal Geology of Heian-nan-do, Korea (in Japanese). Bull. Geol. Surv. Korea, vol. I., No. 1. 1918.

2) **K. Fujii**: On the Occurrence of a Sigillarian Plant of *Favularia* Type in Hohshu of Japan. Botanical Magazine, Tokyo, vol. XXIX., No. 346. 1915. (in Japanese)

3) 駿河國志太郡一ノ瀬

central scars being supposed to be scars of the vascular bundles. The rock with this impression, according to him, is found under the microscope to contain numerous vegetable tissues in detrital condition.

Through the courtesy of Prof. **Fujii**, one of the present writers (**H. Yabe**) once had a chance to see this specimen; basing our statements on what he remembers as well as on the figure given by **Fujii** of this fossil in his paper, we wish to point out that there exists a striking resemblance between this Japanese fossil and *Cephalites maximus* **Eichwald** recorded by **N. I. Karakash**¹⁾ from a Jurassic micaceous sandstone of the Crimea, the latter being a fossil also of a doubtful nature and having been early assigned by **Eichwald** to sponge.

Mr. **Sakakura** who found the Japanese fossil, undertook a geological study of the district along the valley of the Seto-gawa. According to him, the sandstone from which the fossil was found belongs to the upper division of the Mikura series, and not to the Palaeozoic Chichibu formation which is unconformably overlaid by the Mikura series near the fossil locality.

This being all we know at present of this interesting impression and its geological occurrence, we are not so convinced of its real nature and geological age as Prof. **Fujii** is; on the contrary, it seems to us, first, not yet certain whether the fossil really belongs to the Palaeozoic Sigillaria or its allies, and second, not yet evident that it is derived from a deposit decidedly older than the Mesozoic.

II. Last Summer, Mr. **S. Makabe**, a student of our Geological Institute, Imp. University of Sendai, accidentally found a few curved cylindrical bodies in limestone exposed near the Sasagatani

1) **N. I. Karakash**: Les restes problematiques du *Cephalites maximus* **Eichw.** Traveau de la Soc. Imp. des Naturalistes de St. Pétersbourg, vol. XXXV, No. 5 (Section de Géol. et Min.), p. 154. 1910.

mines in the province of Iwami.¹⁾ These bodies were first suspected to be mollusca, for instance a *Cyrtoceras*-like shell; but the microscopical examination of a thin section of them revealed a structure unquestionably peculiar to Calamitean stems.

The petrified specimens now at hand, 4 or 5 in number, are slightly curved cylindrical bodies. They are almost cylindrical, being circular or somewhat oblong in cross-section; one of them is some 30 mm. broad and another 13 mm. Macrosocpically they appear to be hollow in their interior which is nearly as broad as the wall. One specimen, longitudinally cut, shows two imperfect partitions across the interior and at a distance of 20 mm. (text-figure).

Calamites (Arthropitys) sp., from Sasagatani, province of Iwami; a decorticated stem in radial-longitudinal (a) and transverse (b) section, to show the fistular pith crossed by diaphragm at two nodes, and the vascular cylinder. Nat. size.

The thin slices show under the microscope that the wall represents a vascular cylinder, the interior the pith cavity, and the transverse partitions the nodes. The inner face of the vascular cylinder is more or less regularly sinuate, each projection indicating the position of a vascular bundle and each concave part that of a primary medullary ray. A distinct longitudinal carinal canal is visible traversing some of the vascular bundles along their inner edge.

The secondary xylem elements are scalariform tracheids disposed in regular series; these are associated with numerous narrow secondary medullary rays. The scalariform tracheids are subquadrate in transverse section and ca. 0.038–0.042 mm. broad, while the secondary

1) 石見國鹿足郡笹ヶ谷

medullary rays are composed of elements generally narrower and radially somewhat elongated in the same section. The elements of the primary medullary rays are larger than the tracheids of vascular bundles and in general 0.2 mm. long; these rays taper rather abruptly outwards, giving place to interfascicular xylem. There is no trace of the occurrence of prosenchymatous elements.

Radial longitudinal sections show large polygonous, non-seriate parenchymatous cells lying inside the vascular cylinder; in a slender stem, its interior appears as if being entirely or to a greater part occupied by these almost equidimensional cells, 0.75 mm. in average diameter. Between this tissue and the outer zone composed of scalariform tracheids, there are usually two or more layers of narrower but vertically elongate cells. Here and there are the scalariform tracheids in the innermost 2 or 3 layers which are distinguished from those lying outside by being considerably narrower (0.026 mm. broad). Neither reticulate nor annular tracheids are found in the thin sections microscopically examined.

The foregoing are the chief characteristics of the petrified wood from Sasagatani; though they are in a very bad state of preservation and their microstructure is in most part destroyed, yet we can safely conclude that they are remains of stems of *Calamites*, and represent a species of *Arthropitys* type, especially similar to *A. communis* **Binney**. Finally it may be added that the Japanese fossil is characterised by having its cells considerably small in size.

The limestone in which these fossils are imbedded is grey in colour, while the vascular cylinder is pink. The vascular cylinder owes its colour to numerous minute haematite flakes disseminated in it; the reason why this part alone contains such haematite flakes is not quite clear to us.

The limestone bed belongs to a complex which, besides the limestone, is composed of siliceous rock (customarily called horn-

stone by Japanese geologists), schalstein, sandstone and slate. The hornstone contains numerous radiolarian remains. This complex may represent a part of the Palaeozoic Chichibu formation, which, as a whole, is considered to be marine in origin. The contents of petrified wood in the Chichibu formation as in the present case, is hence an exceptional instance.