

NOTES ON SOME FOSSIL REMAINS FROM THE SHIHCHIENFENG SERIES IN NORTHWESTERN SHENSI

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The purpose of this paper is to illustrate and describe briefly the fossil remains discovered in 1951 by Messrs. T. Y. Tien and L. M. Yang from the Shihchienfeng Series at the Locality Motzekou of Linyu district, N. W. Shensi. The question as to the geological age of this series has given rise to considerable diversity of opinion among geologists and palaeontologists for many years. The discovery of fossil plants from this series is therefore of considerable interest. The fragmentary nature of the fossils renders identification of much of the material difficult and some of it impossible. In spite of this condition, the preservation of many of small fragments is good, and for this reason the size of the specimens rather than the state of preservation is generally the chief difficulty encountered. In the meanwhile, it seems desirable to place upon record only those forms which have been determined with a reasonable degree of certainty. The remainder, of which there are a number of indeterminable fragments, will be reserved for a later report.

Lobotannularia cf. ensifolia Halle

Pl I fig.1.

The small fragment of a leaf-whorl shown in pl. I, fig.1 more closely resembles *Lobotannularia ensifolia* Halle than any other known species of this genus. The material is too meagre to permit of a definite specific determination, but in many respects, the similarity is close. It would be necessary to find material of this type in connection with larger leaves to establish its identity beyond all doubt. It differs from *Lobotannularia lingulata* Halle principally in having less confluent leaves.

Calamites cf. suckowii Brongniart

Pl. I, fig. 3.

The fragment shown in pl. I, fig.3 is characterized by the short inter-

nodes, the flat and broad ribs with rounded ends. The specimen may belong to *Calamites suckowii* Brongn., but the material is not sufficient for determination. The characteristic circular tubercles of this species are not preserved on the specimen.

***Pecopteris cf. lativenosa* Halle**

Pl. I, figs. 2, 2a.

The single fragment shown in pl. I, figs. 2, 2a apparently belongs to a species of *Pecopteris*, but it is too imperfectly preserved to be determined specifically. In regard to the form and shape of the pinnules and the pattern of venation, the present fragment bears some resemblance to *Pecopteris lativenosa* Halle. Pinnules ovate to oblong, falcate, with a slight auriculate distal expansion at the base. Midrib strong, decurrent, bending slightly forward, persisting almost to the apex. Secondary veins dense and thick, arching, bifurcating close the midrib, both branches generally dividing once more or sometimes twice.

***Stigmaria ficoides* Brongniart**

Pl. I fig. 4.

Specimen referable to this species occurs in the collection. The characteristic round scars are very small and placed regularly. The surface between the scars shows an irregular longitudinal wrinkling recalling that of specimens named by Goeppert *Stigmaria ficoides* f. *undulata*; but features of this kind may well be accidental, as remarked also by Prof. Halle (1927, p. 181). Very similar specimens have already been figured from Shansi by Zeiller (1901, p. 16; pl. VII, fig. 8) and by Halle (1927, pl. XLIX).

? *Lepidodendron oculus felis* (Abbado) Zeiller

Pl. I, figs. 5, 5a.

A single, leaf-cushion of *Lepidodendron* appears to belong to this species. The cicatrices are not well preserved.

***Yuania striata* gen. et sp. nov.**

Pl. I, figs. 6, 6a; 7, 7a.

The curious specimens shown in pl. I, figs. 6-7 cannot be referred to any

existing genus of fossil plants. The morphological nature of the specimens is entirely obscure, but it represents a peculiar type which ought to be distinguished by a name for the purpose of reference. The adoption of the new generic name *Yuania* is to place on record the enthusiasm and careful work of collections of Prof. P. L. Yuan to whose labours we are indebted for the knowledge of fossil floras and faunas of Northwestern China.

The specimens are here described under the supposition that they are parts of Megasporophylls. The fragmentary Megasporophyll has a rachis about 1 mm. broad which bears some ovoid fruit or seed-like bodies in two rows. The ovoid bodies are well spaced, alternate to opposite about 11 mm. long and 5 mm. in breadth, and near the apex with a narrow apical sinus. The surface of the bodies is marked with very fine longitudinal, more or less converging striations or veins. The base of the bodies is usually prolonged into a short attachment stalk. The internal structure is unknown.

It is not at all certain that these ovoid objects represent seeds or fruits. Granting that the specimens are "sporophylls", the plant probably belongs to the Pteridosperms, though it is quite different from any known member of that group. There are no clues whatsoever to the plant which bore this sporophylls.

Conclusion

The small florula discovered from the Shihchienfeng Series of Northwestern Shensi are decidedly Permian in appearance and affinities. It comprises only six forms: *Lobatannularia* cf. *ensifolia* Halle, *Calamites* cf. *suckowii* Brongn., *Pecopteris* cf. *lativenosa* Halle, ? *Lepidodendron oculus felis* (Abbado) Zeiller, *Stigmara ficoides* Brongn. and *Yuania striata* n. g. et sp. The number of species is too small to permit of a satisfactory characterization of the flora. It is obvious however, that there is no great floral difference between the Shihchienfeng Series and the upperpart of underlying Upper Shihhotze Series. The most important forms of these species are *Lobatannularia* cf. *ensifolia* and *Pecopteris* cf. *lativenosa* which are very characteristic plants of the Upper Shihhotze Series of Central Shansi. *Calamites suckowii*, *Stigmara ficoides* and *Lepidodendron oculus felis* are all very common species, with a wide vertical range extending from the Lower Carboniferous to the Lower Permian. *Calamites suckowii* is a most common species in the West-

phalian and the Stephanian in Europe (Kidston & Jongmans 1915, p. 17). It occurs also in the Lower Permian and probably also in the Culm (=Lower Carboniferous) formations (Gothan 1923, p. 105). The species has been described by Halle from the Yuemenkou and the Lower Shihhotze Series in Central Shansi (1927, p. 37, pl. 10, fig. 13) and by Mathieu and Stockmans from the Chaokochwang Series in the Kaiping basin (1939, p. 99, pl. XXVII, figs. 6, 7; pl. III, fig. 9). It was also recorded by Kawasaki from the Jido Series of Seizen district of Korea (1927, p. 29, pl. XV, fig. 79). *Stigmariopsis* is distributed in Europe all through the Carboniferous, especially through the Westphalian and Stephanian and are rare in the Lower Permian. The species has been found from the Yuemenkou and the Lower Shihhotze Series in Central Shansi (Halle 1927, p. 181; Pl. XLIX, figs. 11, 12) and from many other localities from the Permo-Carboniferous formations of Eastern Asia. It occurs also in the Wutung Quartzites (=Etroengtian) of Lungtan area near Nanking (Gothan 1933, pl. XXVII, fig. 5) and in the Tseshui Coal Series (=Viséen) of Central Hunan (Sze 1951b, p. 305). Both formations belong to the Lower Carboniferous. *Lepidodendron oculus felis* is a common and characteristic elements of the *Gigantopteris*-flora, extending from the Uppermost Westphalian through Stephanian to the Permian. For further information pertinent to the geological and geographical distributions of this species, the reader is referred to the discussions given by the present writer in his paper published in 1951 (Sze 1951a, p. 117).

The palaeobotanical evidence as to the age of the Shihchienfeng Series is thus quite unequivocal as far as the scanty material at present available is concerned. All the evidence of fossil forms points decidedly to the conclusion that this series is of the late Palaeozoic age. For the present, there is no evidence that it reaches to anywhere near the Permo-Triassic boundary.

It has long been known that the Shihchienfeng Series is a thick series of red or green, arid and barren sediments of the late Palaeozoic or Permo-Triassic age extending very widely in Northern China, that it is a well defined lithologic unit readily distinguishable in the field from the underlying Shihhotze and Yuemenkou Series, and that there is no very considerable time-interval between it and the underlying Shihhotze Series. According to Dr. E. Norin, the original material which supplied both for the Shihchienfeng and for the Shihhotze and Yuemenkou Series came from one and the same

formation, viz: rocks mainly belonging to the Pre-Cambrian porphyries, metamorphic schists and gneisses. The writer has recently described a petrified wood discovered from the Shihchienfeng Series of Northern Shensi and has discussed the geological age of this series at great length (Sze 1952, p. 171-181). The present discovery of plant-impressions confirms the view that the Shihchienfeng Series cannot belong to the Mesozoic. There are other considerations, however, that must be taken into account, the main one being whether the fossil remains here described were actually collected from the underlying Shihhotze Series. The plant-bearing sediments might have been wrongly interpreted in the field by the collectors for the Shihchienfeng Series. In the absence of further data, this remains however a mere conjecture which can neither be proved nor disproved at the present time. Which of these alternatives is correct can be satisfactorily determined only after full consideration has been given to everything that may bear upon them and only after a renewed investigation of the sediments in the field. The present writer is quite prepared to believe that the fossils here described actually derived from the Shihchienfeng Series, because of the fact that this series is overlain by the Kusnezsk Formation with a flora of an undoubtedly Upper Permian or Permian-Triassic aspect in the Nanshan region of Kansu Province (See Halle 1935, p. 106-111; 1937, p. 237-245; Sze 1952, p. 178-179). If there were any plant-remains in the Shihchienfeng Series, the assemblage might not be greatly different from that of the upper part of the underlying Upper Shihhotze Series. The present discovery indicates that some plant elements of the luxuriant vegetation of the Shihhotze Series may continue to flourish with unimportant and gradual changes all through the Shihchienfeng Series, which bears witness of arid condition and must have been formed under a quite different climate than that indicated by the coal seams and the rich flora of the underlying Shihhotze Series. The new and more rigorous conditions may cause the extinction of many of the older types, while a comparatively small number were able to persist as dominant forms in an impoverished flora. It is not surprising that under conditions of considerable aridity such as shown by the rocks of the Shihchienfeng Series records of contemporary vegetation are extremely scanty.

Addendum

In addition to the material described in the present paper, a few fragments of indeterminable pith-casts of *Calamites* with very fine ribs recalling somewhat *Calamites cisti* Brongn. have been collected by Tien & Chu from the Shihchienfeng Series (Pl. 1, fig. 8) at the locality Yangkiatien of the Wupu district, N. E. Shensi and a big pith-cast of *Calamites* more than 1.2 m. long and ca 26 cm. in diameter has been found by members of the Geological Department of the Northwestern University, Sian from the purple shales of the upper part of the Shihchienfeng Series at the locality Tzu-Fong of Tungchuan district, N. Shensi. Many indeterminable plant-fragments were also found by Mr. Tang from the same locality.

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