

On the Occurrence of the Genus *Gigantopteris* in Korea.

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With 1 plate.

In the introduction to my paper entitled "Mesozoic Plants from Korea",¹⁾ I made a brief reference to the plant-bearing slate of Mun-gyong,²⁾ in northern Kyong-syang-do, in which Dr. C. GOTTSCHÉ once found what seemed to him to resemble *Neuropteris flexuosa* STERNBERG, a species characteristic of the Carboniferous.³⁾ After the more recent discovery of Jurassic plants in a sandstone- and shale-complex well exposed near Nak-tong, the greater part of the tract, which was formerly regarded by GOTTSCHÉ as composed of Carboniferous rocks, was proved to be decidedly younger. Nevertheless the plant-bed of Mung-yong itself was still considered to be Palæozoic. I, however, retained the impression that it was of a somewhat younger geological age, and therefore I once expressed this opinion in the foot-note to p. 28 of my "A Contribution to the Genus *Fusulina*, with Notes on a *Fusulina*-Limestone from Korea"⁴⁾

1) This Journal, Vol. XX., Art 8.

2) 開慶

3) GOTTSCHÉ: Geologische Skizze von Korea, p. 12.

4) This Journal, Vol. XXI., Art. 5.

as follows: "The plants found in the slate which GOTTSCHÉ referred to the Carboniferous, on account of the occurrence of his supposed *Neuropteris* in it, though not yet studied in detail, so far as my opinion is concerned, are probably of a Triassic age".

The fossil locality of Mun-gyong was visited by Prof. Koro in 1900. Among the plant fossils collected by him at the place and kindly put at my disposal, there are a few, mostly fragmentary, impressions of a fern of a particular type, which has very characteristic outline and venation. At first glance, the leaves appears to be those of some broad-leaved plant with dentate margin, though a careful examination dispels this view. This attracted my special attention, and during a subsequent trip in the southern part of the peninsula, I visited the locality once more in order to secure, if possible, some additional specimens of this remarkable form. Though fairly successful, none of my examples are better than those previously collected by Prof. Koro. The present paper is intended to treat this plant in particular.

Mun-gyong is a wretched town on the southern side of Tyoryong,¹⁾ which is a famous pass over the boundary of northern Kyong-syang-do and Chhyung-chhyong-do, and through which runs one of the main roads leading from Seoul to Fusan. The main road which I followed from Mun-gyong southwards, runs down a more or less wide valley trending north and south for the first five miles. At first, it runs along the stream, but finally rises gradually to a low hill, which it descends again abruptly with a very steep slope to the left bank of the stream. On the top of the hill, there is a ruined stone-wall and gate facing southward. There the stream, after suddenly making a sharp

1) 鳥嶺

bend from north to south and then to east, becomes closely hemmed in on both sides by high cliffs composed of an alternation of hard slate, sandstone and conglomerate. After crossing the stream at this point, the road then follows the right bank for about two miles down to a village called Uon-dong.¹⁾ The ford goes by the name of Kai-youl,²⁾ and this is the locality where the plant fossils in question were found (fig. 1). I believe, with Prof. Korô, that it is almost certain that this is the very place in which Dr. GOTTSCHE himself once sought for plant fossils; for it is mentioned by him as lying "20 li suedlich von Mun-gyong".

In striking contrast to the Jurassic Naktong series, the Mun-gyong series, as I call it, is steeply inclined, showing at Kai-youl an inclination of about 70°-50° northwestward. The predominating rocks are black slate, dark gray sandstone and conglomerate, often merging into one another. The conglomerate was confounded by Dr. Gottsche with that of the Naktong series; but the resemblance of the slate to that of the upper part of the Kyong-syang formation is still more striking. Besides these rocks, the Mun-gyong series seems to contain limestone and green phyllitic tuff in some places; the limestone contains, according to Mr. K. INOUE,³⁾ some obscure organic remains. The chiastolite slate and crystalline limestone with tremolite, exposed immediately south of Mun-gyong, are in all probability rocks of this series, metamorphosed by the contact action of a granitic rock exposed near by; this chiastolite slate was included by Dr. GOTTSCHE in his Phyllite group.⁴⁾

1) 院洞

2) 犬灘

3) INOUE: Geology and Mineral Resources of Korea. 1907. p. 27.

4) GOTTSCHE: l.c., p. 9.

On the other hand, Mr. INOUE included the complex of Kai-youl in his Korean formation together with the Cambrian limestone with Trilobites, found in Phyong-yang-do.

The majority of my examples were collected on the right side of the stream at Kai-youl and especially at the first cliff after crossing it from the north; but the fossils are by no means confined to that locality and I often found some traces of them by hammering the slate and sandy slate exposed everywhere in that neighbourhood. As a whole, however, the fossils are rare so far as my experience goes, and their preservation is always imperfect so that they can hardly be recognized in the field.

Interesting plant remains are shown in three figures in the accompanying plate. Fig. 2 represents a frond, the smallest but most perfect of the examples now at my disposal. It lacks a little of the apical portion and also the greater part of the basal, and is 4 cm. long and 3.5 cm. broad. The margin is coarsely dentate, with pointed teeth turned somewhat upward. The median vein as also the secondary ones, are straight and definitely impressed though weak; the latter are simple, parallel and alternate, making with the former angles of about 40° – 60° , and passing to the end of each tooth, there being seven of them on one side of the median vein and six on the other. The tertiary and quaternary veins are quite obscure in this specimen, as in many others. These, however, are more or less distinct in some of them and especially in the one represented in fig. 4, which though very fragmentary, is valuable in this respect. From this figure, it will be seen that the tertiary veins are very crowded; they are simple, parallel and subopposite, making with the secondary vein an angle of about 50° – 90° . The quaternary veins are much more delicate and their course is difficult to trace in detail. Fig. 3 represents still

another example which, though a part of a similarly large frond, shows the margin simply undulated, instead of being regularly dentate as in the one shown in fig. 1; the secondary veins are somewhat flexuous.

Though I know nothing more about this fossil plant, still from what has been said above, it is quite clear that the characters of the plant are very distinctive. By its dentate margin, it somewhat reminds one of *Clathropteris platyphylla* from the Triassic; but no trace of areolation of veinlets, very marked in *Clathropteris*, is recognizable on our examples. And thus, so far as I know, the present fossil indicates no sign of relation to any other plant than the monotypic genus *Gigantopteris*.

Gigantopteris nicotienifolia is a remarkable plant, first described by SCHENK¹⁾ from Lui-pa-kou, in the province of Hunan. It was originally published under the name of '*Megalopteris*'; but finding the generic name preoccupied, SCHENK soon substituted '*Gigantopteris*' for it.²⁾

The diagnosis of this frond was given by him as follows:

"Folia late ovato-lanceolata integra leniter undulata, nervus primarius crassus supra sulcatus apicem versus tenior, nervi secundarii angulo acuto egredientes oblique ascendentes arcuati, tertiarii obliqui anastomosantes".

Thus, in the general features of the frond, our examples agree quite well with this Chinese form; though there is a little difference in the character of the margin which, however, is only of a subordinate value. Therefore I feel justified in putting them together in one and the same genus.³⁾

1) SCHENK: Steinkohlenpflanzen, p. 238.

2) This fact first became known to me from the review of this paper mentioned by Weiss and Geyler in "Neues Jahrbuch f. Mineralogie, Geologie u. Paleontologie", 1883, II. p. 256.

3) ZELLER took them specifically identical as referred to further on.

WEISS and GEYLER expressed the opinion that the Chinese form is identical with *Idiophyllum rotundifolium* LESQUEREAUX from the Carboniferous of Illinois, but the latter is now proved by SELLARD¹⁾ to be *Neuropteris rarinervis* in a particular state of preservation, and consequently the genus *Idiophyllum* seems rightly to be removed from the present consideration.

The above mentioned study was made three years ago, and a very brief account of it, especially my suggestion of a new specific name (*G. dentata*) for the frond in order to distinguish it from the type species of the genus, *G. nicotianifolia*, was given in our Jour. Geol. Soc. Tokyo, Vol. XI., No. 127, p. 159, 1904 (in Japanese). Soon afterward, a fragment of a similar frond was found among the Chinese fossils collected by Prof. YAMADA of Kyoto University. This is illustrated in Prof. YOKOYAMA'S recent paper²⁾ as a species of *Clathropteris*; there is some doubt on account of its quite incomplete preservation. The locality is Shui-tang-pu, Hsuan-wei-chou,³⁾ Prov. Yunnan, and the other fossils found in association are *Angiopteridium infarctum* FEISTM. and *Phœnicopsis? Yamadai* YOK. according to the author, who regarded the flora as of the Triassic age. It is this important fact, together with the doubt expressed by Prof. ZEILLER⁴⁾ as to whether the Lui-pa-kou bed is not of the Triassic age, instead of being Carboniferous, (this being his conclusion from a detailed investigation of the Rætic flora of Tonkin), which led me to consider our Mun-gyong series to be of the same age, as already stated at the beginning of this paper.

1) SELLARD: On the Validity of *Idiophyllum rotundifolium*.

2) YOKOYAMA: Mesozoic Plants from China p. 14.

3) 宣威州水塘舖

4) ZEILLER: Flore Fossile des Gites de Charbon du Tonkin, p. 136.

Now, my opinion on the geological age of the Mun-gyong series has received additional support from Prof. ZEILLER's more recent paper¹⁾ on the fossil flora of Yunnan, in which he records two new localities for this interesting species, namely, Tou-tze (in Sine-si-keou) and I-Ioui-chao. It is found in these places together with *Pecopteris* (*Cladophlebis*) sp., *P.* sp., *P.* (*Callipteridium?*) sp., *Neuropteridium* cfr. *bergense* BLANCKENHORN, *N.* sp., *Tæniopteris* sp., *T.* sp., cfr. "*Annularia*" *maxima* SCHENK, a stem of an Equisetaceæ, and *Stigmaria* sp. This eminent authority, however, regarded the Yunnan *Gigantopteris* as specifically identical with *G. nicotienifolia* SCHENK.

The coal-bearing series, composed of light yellowish gray soft clayslate at Tautze and light gray soft clayslate with a slightly purplish tint at I-Ioui-chao, is said to be covered by a conformable upper Triassic sandstone and to overlie a red sandstone, which in turn is underlaid by a lower Permian limestone. Zeiller remarks that this stratigraphical relation does not, however, conflict with the palaeontological evidence drawn from the fossil plants. Among which are found species characteristic of both the Palæozoic and Mesozoic, thus indicating flora in a transition period.

From the foregoing it may safely be concluded that the age of the Mun-gyong series is most probably Triassic.

In conclusion, I wish to express my best thanks to Prof. Kotô for his kind permission to use his photograph of Kai-youl, and to Prof. YOKOYAMA and Dr. M. C. STOPES for kindly undertaking the revision of my manuscript.

1) ZEILLER: Note sur Quelques Empreintes Végétales des Gites de Charbon du Yunnan Méridional, p. 13.

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PLATE

Illustrating Mr. H. YABE'S paper "On the occurrence of the genus
Gigantopteris in Korea."

Explanation of the plate.

- Fig. 1. Kai-youl, south of Mun-gyong.
- Fig. 2. *Gigantopteris nicotianifolia* Schenk; natural size.
- Fig. 3. Do; natural size.
- Fig. 4. Do; show the fine venation, natural size.



Fig. 1.

Fig. 3.

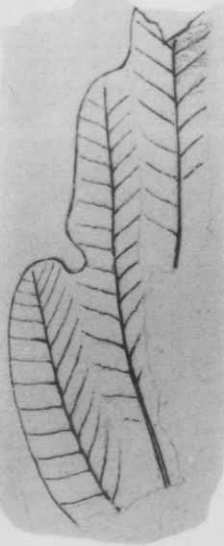


Fig. 4.



Fig. 2.

