148. Palaeozoic Coals Recently Found in the Kwanto Mountains.

By Shigeyasu TOKUNAGA.

Waseda University, Tokyo.

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Though the Palaeozoic formations are developed extensively in the Japanese Islands no trace of coal or coaly shale in these formations was found by any geologist during the last half century. The fossils of that era ever found were almost exclusively those of marine facies, such as Foraminifera, Radiolaria, Mollusca and corals. Of the fossils of land-plants only two small pieces from the provinces of Iwami and Suruga were reported by Yabe, Endo and Fujii.

The Kwanto mountains are an extensive mountain mass ranging to the west of a plain of the same name, where the city of Tokyo is situated. The larger parts of the mountains are of Palaeozoic formation called the Chichibu system, and have been a classical field for geological studies in this country. Three other systems are found in the same mountains: namely, the Kobotoke system which is considered to represent the youngest Palaeozoic; the Mikabu system, the old Palaeozoic; and the Sambagawa system, older than the Palaeozoic.

The Chichibu system consists chiefly of siliceous sandstone, quartzite, schalstein, chert, limestone, clay-slate and green siliceous slate. From the occurrence of several species of *Fusulina* in that limestone it has been inferred that the greater parts of this system belong to the Permo-carboniferous.

In the summer of this year the writer, spending several weeks with his assistant Iizuka in these mountains, was fortunate enough to come upon a number of layers of coal and coaly shale with numerous land-plants remains. The occurrence of graphite powders mixed with decomposed clay-slate caught their attention at first, then minute pieces of coal were found, and at last the above-mentioned layers.

Close to the southeastern foot of the Kwanto Mountains there is a small town Hanno, a terminus of a local tram line and is forty-four kilometers from the metropolis. Another eleven kilometers up along the charming valley of the River Koma is Sakaishi, a village market of

the community Agano-mura. Many layers of coaly shale embedded in the Chichibu system are found covering an extensive area of the western part of this village. The strike of the strata in this region is W.N.W.—E.S.E. The strata incline southward in the north of the village, and northward in the south, so the main valley running through the village district makes an axis of a synclinal fold.

The most typical one of these coal-bearing layers is found at Sakaishi. It is a mixture of coal and coaly shale with its maximum thickness of 0.7 m. The thickness, however, is much variable. The rocks, resting on the coal seam are schalstein, chert, siliceous sandstone and limestone, and from this limestone, about 40 m. above the coal, are found, some species of *Fusulina* indicating that the layers belong probably to the uppermost series of the Carboniferous formation. It should be noted that a number of fossilized land-plant stems and leaves are found also in the coaly shale of this district. Unfortunately, however, their preservation is not quite well for the determination of the species, though the hollowness of some stems points to be that of *Calamites* or other *Equisetales*. The coal is anthracite, and the result of the analysis of that from Sakaishi is as follows :—

	No. 1 (Best quality).	No. 2.
Moisture	0.93 per cent.	0.69 per cent.
Volatile matter	4.85 ,,	5.20 ,,
Fixed carbon	92.59 ,,	75.02 ,,
Ash	1.63 ,,	19.09 ,,
Calorific value	7138 calories.	

From those data it can be said without hesitation that the Permian-carboniferous strata in the Kwanto Mountains contain layers of such a land facies of the same kind of rocks as found in Korea and China.

Another thin layers of coal and coaly shale is found with slate at Iwai near Itsukaichi, a town twenty kilometers south of Agano-mura and forty-eight kilometers west of Tokyo. Near this locality exposes a thick layer of Permian limestone which is considered to be under the coal seams. The coal differs in quality from that of Agano and is easily combustible and well caking.

Not far from this locality in the south, there is an extensive area of the Kobotoke system. Three very small patches of the so-called Torinosu limestone of Jurassic or lower Cretaceous period and Pseudomonotis sandstone of Triassic period are scattered in the area of the Chichibu system.

On account of the complicated structure of Mesozoic and Palaeozoic formations, whose mutual relations are still obscure, the writer hesitates, at present, to make any definite statement on the age of the Itsukaichi coal. But so long as there is no counter-evidence, the coal-bearing layer may be regarded as the uppermost horizon of the Chichibu system.