

GEOLOGIC COLUMN AND UNIT DESCRIPTION

AGE	ROCK UNIT	LITHOLOGY; THICKNESS WHERE KNOWN	UNIT DESCRIPTION	ECONOMIC VALUE	REFERENCES
QUATERNARY	Alluvium	Sand, gravel and silt; thickness more than 10 meters	Alluvium, consisting of fluvial sand, gravel and silt, is widely distributed over the vast Hebei plain and along the rivers in the hills west of Pei-p'ing.		CHERN, M. K., and HSIUNG, Y. H., 1935, Note on some thrusts in the Western Hills of Pei-p'ing: Geol. Soc. China Bull., v. 14, no. 4.
	Diluvium	Loess, gravel and silt; thickness more than 30 m	Diluvium consists chiefly of primary loess of aeolian and fluvio-aeolian origin, accompanied by gravel and lenticular calcareous conglomerate near the base. In many places Diluvium rests on a red clay of probable Pliocene age. In the Hebei plain which makes the northern border of the Huang Ho delta, alluvium grades downward into the fine silty deposits of Pleistocene age, and the combined thickness may attain to 800 m according to the records of drillholes at Tien-ch'in.		CHU, S., and HUANG, T. K., 1928, Some notes on the contact between the Yang-fang granite and the overlying Tiao-chi-shan beds: Geol. Soc. China Bull., v. 7.
TERTIARY	Changhsintien gravel	Gravel and clay; thickness 100 m	The Changhsintien (常 新 田) gravel consists chiefly of gravel beds containing lignitic fragments, intercalated with red clay (HSIEH, C. Y., 1933).		HSIEN, C. Y., 1933, Note on the geology of the Chang-hsin-tien - Tuo-li district, southwest of Pei-p'ing: Geol. Soc. China Bull., v. 12.
	Cretaceous granite	Granodiorite and hornblende-biotite granite	Cretaceous granite comprises granodiorite and hornblende-biotite granite. The Fangshan granodiorite near Fangshan (房 山) intrudes the Paleozoic formations and the Triassic Mentoukou series (Mt). The Tangtang (汤 汤) granite on the north out of the map area was confirmed (CHU and HUANG, 1928) to intrude the Tiaochishan formation (Mjv). No contact relation was observed between the granite and the Cretaceous formation (Mk).		1937, An outline of the geological structure of the Western Hills of Pei-p'ing: Geol. Soc. China Bull., v. 26.
MESOZOIC	Cretaceous formation	Shale, sandstone, conglomerate, marl and limestone; thickness 950 m	The Cretaceous formation (HSIEH, 1933) in the Chang-hsin-tien -- Tuo-li (桃 李) district includes, in descending order, 3) the Hsichuang series, 200 m thick, consisting of purple shale, sandstone, conglomerate, marl and limestone, and containing plant and molluscan fossils in several horizons, 2) the Lushang series, 350 m thick, an assemblage of shales of various colors, with conglomerate and sandstone, and 1) the Tuo-li conglomerate, 400 m thick, intercalated with purple, yellow and gray shales.		HSIUNG, Y. H., 1936, The Ching-shui-chien shale formation of the Western Hills of Pei-p'ing: China Geol. Rev., v. 1.
	Tiaochishan formation	Agglomerate, andesite tuff, andesite and limestone breccia; thickness 1,000 - 1,500 m	The Tiaochishan (桃 桃 山) formation is essentially an alternation of agglomerate, andesite tuff and andesite, with limestone breccia in the basal part. Boulders of the agglomerate are mostly andesite, accompanied by some liparite and quartz porphyry. The andesite tuff is composed of fragments of andesite. The Tiaochishan formation is a volcanic complex which was intruded and contact-metamorphosed by a granitic leucolith of the Yangfang granite (CHU and HUANG, 1928) adjacent to the north of the map area. According to HSIEN (1933), the Tiaochishan volcanic complex in the Chang-hsin-tien -- Tuo-li district is overlain in succession by the Tahuichang (桃 桃 山) series, 50 m thick, consisting of black shale containing <i>Etheria</i> , sandstone and volcanic rocks, and the Hsinshung (新 兴) shale and conglomerate, 300 m thick, and is assigned to the Lower Cretaceous. This volcanic complex bears a close resemblance to the Jurassic volcanic formation occurring extensively in the Heun-ho (浑 河) and the Jehol districts, and is difficult to distinguish from others megascopically. Hence, it is highly probable that they are contemporaneous, in spite of their separate occurrences.		KAO, C. S., and others, 1934, Preliminary notes on the Sinian stratigraphy of North China: Geol. Soc. China Bull., v. 13, no. 2.
	Andesite	Andesite, quartz porphyry, liparite, trachyte, breccia and agglomerate	Andesite is predominantly in flows and sheets, associated with some quartz porphyry, liparite, trachyte, flow-breccia and agglomerate. It may be contemporaneous with the Tiaochishan formation.		KAWADA, Michio, and others, 1937, Report of the Tai-an-shan (太 安 山) coal field, Fang-shan Hsien (房 山 县), Hebei, with 1:25,000 geologic map: <i>Ibid.</i>
	Kiulungshan series	Shale, sandstone, agglomerate and conglomerate; thickness 500 - 650 m	The Kiulungshan (九 隆 山) series is an alternation of variegated sandy shale, sandstone, and tuffaceous sandstone, with two layers of basal conglomerate. Purple tuffaceous sandstone predominates upward. Fine agglomerate at the top is indistinguishable in appearance from the agglomerate of the Tiaochishan formation. The series may belong to the upper part of the Lower Jurassic, or to the Middle Jurassic.		and others, 1937, Report of the Pan-chiao (潘 家 川) coal field, Wang-p'ing Hsien (旺 平 县), Hebei, with 1:30,000 and 1:10,000 geologic maps: <i>Ibid.</i>
	Diabase porphyrite	Hypersthene-diabase porphyrite	Diabase porphyrite, consisting of intrusive sheets of hypersthene-diabase porphyrite, is distributed chiefly in the Mentoukou series, and the Yangchiatun coal series.		and others, 1937, Report on the Men-t'ou-kou coal field, Wang-p'ing Hsien, Hebei, with 1:10,000 geologic map, in Reports of Coal Field Party of the Geological Survey Group: Geol. Survey Group, Sugiyama Special Service Agency of the Japanese Troops in North China.
	Mentoukou series	Sandstone, shale, conglomerate and coal; thickness less than 1,000 m	The Mentoukou (蒙 头 沟) series is generally intruded by sheets of diabase porphyrite and andesite porphyry. According to WANG, C. C., and CHU, Y. H. (1933), the series in the Men-tou-kou district can be divided, in descending order, into the Lungmen formation and the Yaopo formation in a disconformable relation. The Lungmen formation consists of shale and sandy shale, intercalated with several thin unworkable coal seams. Two layers of basal conglomerate are found. The formation is 140 to 200 m thick in the Men-tou-kou coal field, and 0 to 200 m thick in the Fangshan coal field. The Yaopo formation consists chiefly of sandstone and shale; the upper part, 130 to 270 m thick, is mainly shale and has no workable coal seams, the lower part, 50 m thick, is mainly sandstone intercalated with many workable coal seams. Thirty seams are known in the Men-tou-kou coal field, more than 10 of which are workable; 13 seams are known in the Fangshan coal field, 3 to 8 of which are workable; in the Chai-tang coal field the number of workable coal seams is unknown because of the disturbed strata. Plant fossils in the Lungmen formation in the vicinity of Hsiang-yü (香 峪), north of Men-tou-kou (YIH, L. F., 1920) are <i>Ctenozamites bromiana</i> , <i>Cladophlebis</i> sp., <i>Asplenium whitbriense</i> , <i>Podozamites</i> sp., <i>Araucaria</i> sp., <i>Clatides</i> sp., and <i>Pterophyllum</i> sp.; those from the Chai-tang coal field (KAWADA and others, 1937) are <i>Ctenozamites rigida</i> Heer, <i>Franconopsis speciosa</i> Heer, <i>Pterophyllum longifolium</i> Nath., <i>Podozamites lanceolatus</i> L. et H., and <i>Asplenium whitbriense</i> Brong.	Coal (Mentoukou series) The Men-toukou, Chai-tang, Ta-an-shan, Pan-chiao, Wang-ping-tsun, and Fang-shan coal fields (see locs. I-VI in the chart) have been known for several hundred years. Coal is mainly anthracite, with some flaming coal; both are used for household consumption. About 840,000 tons of anthracite was supplied to the Pei-p'ing and Tien-chin district, 510,000 tons of which was produced by the Men-tou-kou coal field. The Fang-shan and the Chai-tang coal fields rank next in production. The Men-tou-kou coal field has 30 coal seams, about 10 of which are workable. In the valley of Men-tou-kou the Men-tou-kou Sino-British Coal Mining Co. (opened 1908) and two other firms worked on coal by 200 to 300 deep vertical shafts. More than 130 native pits were also known (as of 1937). The Chai-tang coal field was formerly owned by the Chai-tang Coal Co., but coal was not worked systematically until the end of World War II. Because of stratigraphic disturbance, the number of seams or the number of workable seams are unknown. The Fang-shan coal field has more than 10 seams, 3 or 4 of which are workable, and more than 60 native pits were in work (as of 1937). The Pan-chiao and the Wang-ping-tsun coal fields are not important, and only native pits were in operation.	
PALEOZOIC	Hungchiaoling series	Sandstone, shale and clay; thickness less than 350 m	The Hungchiaoling (红 旗 岭) series is mainly gray sandstone intercalated with thin shale; a thin layer of red clay occurs at the base. The series is intruded in many places by sheets of diabase porphyrite. At Hung-miao-ling, south of Men-tou-kou, it was measured as 350 m thick. According to ORUKI (1954) the series is divided into the Permian-Triassic Shuangchiang formation (双 双 岭), 0 to 200 m thick, and the Upper Permian Hungchiaoling formation, 100 to 150 m thick, in a disconformable relation.		T'AN, H. C., 1924, Explanatory text to the Geological Map of China, "Feking"-Tsinan" sheet, scale 1:1,000,000: China Geol. Survey.
	Yangchiatun coal series	Sandstone, conglomerate, shale and coal; thickness 300 - 420 m	The Yangchiatun (杨 家 屯) coal series is divided into the Yangchiatun formation and the Penchi formation in descending order. The Yangchiatun formation, 300 to 400 m thick, is separated into the upper and lower parts; the upper part is Middle Permian in age and consists mainly of sandstone and conglomerate, the lower part is Lower Permian, consisting of black shale with several seams of coal. The Penchi formation is Middle Carboniferous in age, 0 to 30 m thick, and consists of shale accompanied by limestone lenses. Plant fossils from the Yangchiatun formation are, <i>Calamites</i> sp., <i>Lepidodendron</i> sp., <i>Neuropteris</i> sp., <i>Pecopteris</i> cf. <i>orientalis</i> (Schenk), etc. Marine fauna of the Penchi formation includes <i>Spirifer</i> (<i>Choristites</i>) <i>mosquensis</i> Fischer, <i>Productus</i> cf. <i>taiyuanensis</i> Grabau, P. cf. <i>semireticulatus</i> Martin, <i>Nuculopsis anthracinoides</i> Chao, <i>Deltaplecten multistriatus</i> (?) Chao, <i>Ariculoplecten</i> sp., and abundant <i>Entolium</i> (?) sp. (YANG, and others, 1928). The Penchi formation at Ch'ing-shui-chien (清 水 涧) on the Mentoukou-Chaitang (蒙 头 沟 - 柴 汤) Railway yields <i>Fuxularia</i> cf. <i>eximia</i> Eichwald, T. sp., <i>Fusulina</i> (<i>Girtyina</i>) <i>cylindrica</i> (Fischer), F. (<i>Girtyina</i>) <i>quasicylindrica</i> Lee, Z. (<i>Girtyina</i>) <i>konoi</i> Ozawa, <i>Fusulinella</i> (<i>Heurynellina</i>) <i>parva</i> Lee, etc. (HSIUNG, 1936).	Coal (Yangchiatun coal series) The coal from the Yang-chia-tun coal series is anthracite produced from igneous action. The Yang-chia-tun coal field (loc. VII in the chart) was worked intermittently by native mines. In the Fang-shan coal field (loc. VI in the chart) two or three seams of the Yang-chia-tun coal series are workable by native methods. The coal is good for briquette manufacturing.	Tsuda, Sadataro, 1951, Limestone resources in the district of Chou-kou-tien, in Geology and mineral resources of the Far East, North China, II-3b-2: Comp. Comm. Geology and Mineral Res. Far East, Tokyo Geog. Soc.
	Cambro-Ordovician system	Limestone and shale; thickness 700 - 1,000 m	The Cambro-Ordovician system in the district north of Chun-chuang (春 光) was divided (OBATA, 1939) in descending order as follows: (5) the Chunchuang formation or the Middle Ordovician, 290 m thick, consisting mainly of dark massive limestone and platy limestone, and yielding <i>Armenoceras submarginale</i> (Grabau), <i>A. pseudoseptatum</i> (Grabau), and <i>A. richthofeni</i> (Frech); (4) the Hsipeichien (西 平 川) formation or the Lower Ordovician, about 240 m thick, consisting mainly of limestone and shaly limestone with thin shale layers, and yielding <i>Hsipingoceras</i> sp. and <i>Manchuroceras</i> sp.; (3) the Shihpapa (石 家 帕) formation or the Upper Cambrian, 75 m thick, is characterized by the layers of "Marskirk" limestone; (2) the Hanchuang (韩 庄) formation or the Middle Cambrian, 75 m thick, consists of oolitic limestone intercalated with shale; and (1) the Mantou (蒙 头) formation or the Lower Cambrian, 100 to 250 m thick, consists of reddish shale yielding <i>Tsinania cerea</i> (Walcott) and <i>T. peipingensis</i> Sun. According to OBATA (1951) the Middle Ordovician Chunchuang formation (5) is about 540 m thick, and is subdivided into eight stages.	Limestone Limestone quarries working the Ordovician limestone are known in various places around Chou-kou-tien (周 口 店) and Chun-chuang.	YOSHIZAWA, Hazime, 1937, Report on the coal field west of Wang-p'ing-tsun (旺 平 镇), Men-p'ing Hsien, Hebei, in Reports of Coal Field Party of the Geological Survey Group: Geol. Survey Group, Sugiyama Special Service Agency of the Japanese Troops in North China.
PRECAMBRIAN	Sinian system	Limestone, shale and quartzite; thickness more than 2,000 m	The Sinian system distributed between Hsia-ma-ling (下 马 岭) and Heng-ling (横 岭), out of the map area was separated in descending order by HSIEN, C. Y. (1937) as follows: (6) the Chingerhyü (程 家 峪) limestone, 320 to 370 m thick, (5) the Hsiamaling shale, 400 to 420 m thick, (4) the Tiching (提 荆) limestone, 350 to 400 m thick, (3) the Hengshichung (横 石 冲) shale, 50 to 80 m thick, (2) the Wanhsan (万 善) limestone, more than 900 m thick, and (1) the Hengling quartzite, thickness not measured. The thickness of the Sinian system in this map area may attain more than 2,000 m.		

(Column not drawn to scale)

