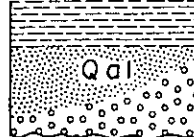
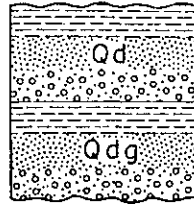
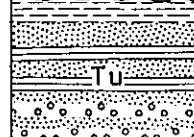



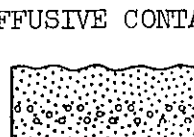
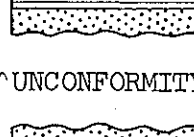

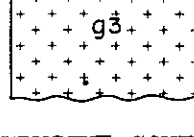

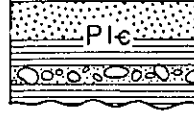
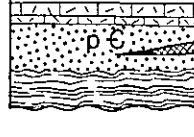
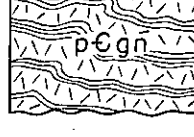



# GEOLOGIC COLUMN AND UNIT DESCRIPTION

| AGE         | ROCK UNIT                       | LITHOLOGY; THICKNESS WHERE KNOWN   | UNIT DESCRIPTION  | ECONOMIC VALUE  |
|-------------|---------------------------------|--|---|---|
| QUATERNARY  | Alluvium                        |  Clay, sand and gravel; thickness less than 15 meters   | Alluvium, consisting of sand, clay and gravel, is distributed in the drainage basins of the Amur River and its tributaries, covering low terrace remnants and flood plains. The thickness is less than 15 meters. Where the river forms a narrow gorge downstream of Kuan-yin-shan (观音山), the alluvial deposit contains pebbles of quartz, pegmatite, granite and diorite porphyry; placer gold occurs in it.   | <p>(Au) Placer gold is derived from decomposed auriferous quartz veins and pegmatite veins that were intruded into the schist, gneiss, and granite during the Early Cretaceous period. The southwestern part of the map area constitutes the famous Kuan-Tu (宽土) placer gold district including Kuan-yin-shan and the Tu-lu Ho, and is the most prominent of all gold-producing districts of Manchuria.</p> <p>The gold localities surveyed by S. MONDEN (1936) are as follows:</p> <p>(1) T'ai-p'ing-kou: Placer gold occurs in the Recent deposits, 400 m wide, 5 km west of T'ai-p'ing-kou village, where the bedrock consists chiefly of biotite schist and metagneiss. Gold-bearing sand and gravel bed underlain by mica schist is 60 cm thick, and is covered by a non-auriferous sand and gravel bed 3 m thick. The total output of gold from the T'ai-p'ing-kou area and neighboring localities amounted to about 187 kg a month in 1936.</p> <p>(2) Ku-chan (阔滩): Placer gold occurs near the junction of the Amur River and the Erh-tao Kou (二道沟) (not shown on map). The bedrock consists of mica schist and granite gneiss, penetrated by dikes of quartz porphyry and pegmatite. The gold-bearing sand and gravel bed is 1 m thick and is covered by sand and gravel 0.6 m to 1.2 m thick, brown sand 0.6 m thick and black earth 1 m thick, in ascending order. Although the width of the Recent deposits is 400 m, the exploited area is only 30 m wide along the stream for the convenience of water supply. Placer gold on the Soviet side also is being worked prosperously.</p> |
|             | Diluvium                        |  Qd: clay, sand, gravel, and aeolian-lacustrine sand; thickness unknown<br>Qdg: sandy clay, sand and gravel; thickness 20 m to 40 m           | Diluvium (Qd) consists chiefly of clay, sand, gravel, and aeolian-lacustrine sand and is distributed in the southeastern part of the map area, where it is considered an Upper Quaternary deposit (Nalivkin, 1955). The thickness is unknown.<br>Diluvium (Qdg) is exposed in the northwestern part of the map area. In the drainage basin of the K'an-ch'in Ho, the upper part consists of sandy clay, the middle part is sand, and the lower part is sand and gravel. The thickness is 20 meters to 40 meters.  |   |
| TERTIARY    | Neogene formation               |  Shale, sandstone, conglomerate and lignite; thickness unknown  | The Neogene formation in the vicinity of Yang-shan-ts'un (杨山屯) consists of clayey shale, soft sandstone and conglomerate, locally accompanied by low-grade lignite and bentonitic shale. The formation may be correlated with the continental deposits of Pliocene age in the U.S.S.R.  |   |
|             | Neogene basalt                  |  Basalt, andesite and tuff  | Neogene basalt, consisting of basalt, andesite and tuff, is sporadically exposed along a line connecting Yadrin on the north and the Malaya Samara River on the south. It may have become exposed as a result of the upheaval of the Hsiao-hsing-an-ling (小兴安岭). Soviet geologists define it as Quaternary andesite and basalt.   |   |
| MESOZOIC    | Cretaceous andesite             |  Flows of hornblende andesite   | The Cretaceous andesite occurs as flows exposed near Kuan-yin-shan, and constitutes a tableland 50 m to 100 m in relative height. The rock is mainly dark green hornblende andesite consisting of a glassy groundmass and acicular crystals of plagioclase and hornblende. It is marked with columnar joints.   |   |
|             | Cretaceous rhyolite             |  Rhyolite flows and quartz porphyry   | The Cretaceous rhyolite occurs as flows occasionally associated with quartz porphyry. It is exposed on both banks of the Amur River between Chuan-yao (穿窑) and Ma-lien-chen (马连屯). Soviet geologists defined it as Upper Cretaceous acidic effusive rock. The rhyolite in the Manchurian territory is light brown or grayish black, and consists of a glassy groundmass and large phenocrysts of quartz and feldspar. The quartz porphyry is also light brown or grayish black, but is microcrystalline and granitic in texture.  |   |
|             | Upper Cretaceous formation      |  Sandstone and shale; thickness unknown   | The Upper Cretaceous formation is exposed in the northwestern part of the map area, and forms a river cliff, about 30 m above the river bed, near Chuan-yao and Yu-lo-ts'un (岳乐屯). It consists chiefly of light gray or brown coarse-grained sandstone, intercalated with grayish black tuffaceous shale in the lower part. The sandstone contains occasional pebbles 1 cm in diameter of porphyry, diorite porphyry, andesite porphyry, granite, schist, quartz and agate, and some marcasite nodules. The dip of the formation is very gentle or almost horizontal.   |   |
|             | Lower Cretaceous formation      |  Sandstone, shale, conglomerate and coal; thickness unknown  | The Lower Cretaceous formation, consisting of sandstone, shale, conglomerate and coal, is mentioned in the Geological map of U.S.S.R. (NALIVKIN, 1955). Available data are very few.  |   |
| PALEOZOIC   | Cretaceous granite              |  Granite, granodiorite and quartz diorite   | The Cretaceous granite is exposed in the vicinity of Lymbavinskiy and Radostnyy. According to Soviet geologists, it comprises such acidic intrusives as granite, granodiorite and quartz diorite.   |   |
|             | Pre-Jurassic granite            |  Biotite granite, biotite-hornblende granite and gneissic granite   | The pre-Jurassic granite is widely exposed in places. Soviet geologists define it as a Middle Paleozoic acidic intrusive. The granite in the Manchurian territory is reddish holocrystalline, fine- to coarse-grained biotite granite or biotite-hornblende granite, associated with gneissic granite.  |   |
|             | Lower Cambrian formation        |  Sandstone, shale, clay slate, phyllite and conglomerate; thickness unknown   | The Lower Cambrian formation is mentioned in the Geological map of U.S.S.R. It consists of sandstone, shale, clay slate, phyllite and conglomerate, and strikes N-S. Available data are few.  |   |
| PRECAMBRIAN | Proterozoic (Sinian?) formation |  Limestone, clay slate, sandstone, quartzite, mica schist, chlorite schist, talc schist and quartz schist, with iron ore; thickness unknown | The Proterozoic formation is exposed only in the U.S.S.R. It consists of crystalline limestone, calcareous clay slate, sandstone, quartzite, mica schist, chlorite schist, talc schist and quartz schist. In places it is penetrated by granite (Gp). The formation is occasionally accompanied by iron ore deposits of the An-shan type.   |   |
|             | Precambrian gneiss              |  Biotite orthogneiss, hornblende orthogneiss, allied metagneiss, and granite gneiss   | The Precambrian gneiss is light gray biotite orthogneiss or hornblende orthogneiss, locally accompanied by biotite metagneiss or hornblende metagneiss. Soviet geologists define its age as Archean. The orthogneiss consists of large phenocrysts of quartz, orthoclase, biotite and hornblende; apatite and zircon occur as accessory minerals. Although it is not shown on the Manchurian side of the border, it is probably equivalent to much of the granite gneiss (gg) on this map sheet.  |   |
| AGE UNKNOWN | Precambrian schist              |  Biotite-garnet schist and muscovite-sericite schist  | The Precambrian schist, defined as Archean schist by Soviet geologists, consists chiefly of grayish black or dark brown biotite-garnet schist and snowy white muscovite-sericite schist. The principal constituent minerals are quartz, biotite, muscovite, sericite, feldspar and garnet. Under a microscope, augite, hornblende, epidote, zircon, accompanied by minor amounts of chlorite, tourmaline and magnetite, are found. The schistosity strikes generally NE and dips 30° to 40° NW or SE. The schist is widely intruded by quartz veins and pegmatite veins that are the source of placer gold in the neighboring localities such as T'ai-p'ing-kou and Ku-chan (阔滩). |   |
|             | Granite gneiss                  |  Biotite orthogneiss, hornblende-biotite metagneiss, and gneissic granite   | Granite gneiss, shown only on the Manchuria side is probably equivalent in age to the Precambrian gneiss of the U.S.S.R. side in this map area, as it is similar in lithology and field relationships. It consists chiefly of light gray biotite orthogneiss with biotite or hornblende metagneiss and gneissic granite. In the upper reaches of the T'ai-p'ing Kou the granite (Precambrian?) gneiss is intercalated with Precambrian schist (Pcs). To the southwest it grades into the granite gneiss of the Hao-li-chen and Tui-mien-shan sheets (NL 52-3 and NL 52-2).  |   |

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(Column not drawn to scale)