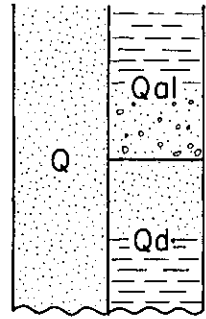



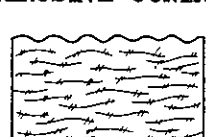
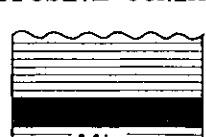


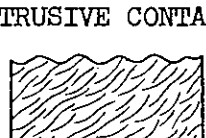


GEOLOGIC COLUMN AND UNIT DESCRIPTION

AGE	ROCK UNIT	LITHOLOGY; THICKNESS WHERE KNOWN	UNIT DESCRIPTION	REFERENCES
QUATERNARY Pleistocene - Recent	Quaternary deposits	 <p>Q, Quaternary deposits, undifferentiated, Qa1, Recent sand, silt, clay and gravel, Qd, Pleistocene sand and silt; maximum thickness about 50 meters</p>	<p>The Quaternary beds cover the vast plain region which comprises the coastal plain of Lake Hanka and the fluvial plains of the Mu-leng Ho (穆稜河), the Chi-hu-lin Ho (齊魯河), and the Sungacha and Ussuri Rivers. Swampy depressions filled with alluvial beds (Qa1) of silt and sticky clay, 2 - 10 m thick, occupy the greater part of the plain region. Low terraces, less than 20 m above the nearby water level, surround the swamps. These terraces are generally covered by fluvio-lacustrine beds (Qd) of sand and silt, presumably the Upper Pleistocene in age. Low terraces with three benches, consisting of beach sand, were reported on the north coast of Hsiao-hsing-k'ai Ho (小興開河) which is separated from Lake Hanka by an offshore bar. In the USSR area the Quaternary beds are roughly divided into Alluvium and Diluvium, but in the Manchurian area such division is quite difficult due to lack of information.</p>	<p>KIRITANI, Fumio, 1942, Geologic report on the route between Po-li (寶力) and Pao-ching (寶清); Unpub. rept. Manchuria Mine Devel. Co.</p> <p>NAGAO, Suteichi, 1950, On the Mesozoic coal-bearing formations in eastern and northeastern Manchuria, in Geology and mineral resources of the Far East, Manchuria, VII-2t: Comp. Comm. Geology and mineral Res. Far East, Tokyo Geog. Soc.</p> <p>NALIVKIN, D. V., editor, 1955, Geological map of U.S.S.R., scale 1:5,000,000: U.S.S.R. Ministry of Geology.</p> <p>SAITŌ, Rinji, compiler, 1940, Geological map of Manchuria and adjacent areas, scale 1:3,000,000: Manchoukuo Geol. Inst.</p> <p>SAKAMOTO, Takao, and others, 1937, Geology and geography of northeastern Manchuria: Geol. Inst., S. Manchuria Ry. Co.</p> <p>SAWA, Kaiji, 1933, Reconnaissance reports on the geology and mineral resources of the northeastern border zone of Kirin Province: Unpub. rept. Geol. Inst., S. Manchuria Ry. Co.</p>
	UNCONFORMITY			
TERTIARY Neogene	Neogene basalt	 <p>Olivine basalt, dolerite, titaniferous augite-olivine basalt, sandstone and shale.</p>	<p>The Neogene basalt is chiefly augite-olivine basalt, accompanied by titaniferous augite-olivine basalt; all occurring as flows and sheets of varied thicknesses. It is distributed as cap rock of the Wan-ta (完達) Mountain Range, as low hills on either side of the Ussuri River, as monadnocks in the fluvial plain of the Hsiao-mu-leng Ho (小興稜河) and as lava terraces north of Lake Hanka.</p>	
	Neogene beds	 <p>Sandstone, conglomerate and shale; thickness 30 m.</p>	<p>The Neogene beds cover coastal hills between Iman and Il'inskiy east of the Ussuri River. According to the geological map of USSR (1955), the beds consist of sandstone, conglomerate and shale, and the thickness is probably more than 30 m.</p>	
UNCONFORMITY				
MESOZOIC Cretaceous	Cretaceous granite	 <p>Porphyritic granite</p>	<p>The Cretaceous granite is known to occur at three localities in the USSR area. The pink porphyritic granite constituting Shih-ching Shan (石鏡山) northwest of Hei-tsui-tzu (黑水) in the Manchurian area probably is Cretaceous granite.</p>	
	Andesite	 <p>Augite andesite and porphyrite</p>	<p>Andesite constitutes low gentle hills northeast of Hei-tsui-tzu, monadnocks between Hsi-tsui-tzu (黑水) and Pao-tung-t'un (寶通屯) south of the Linkow - Hulin Railway, and a hill northwest of Kuang-tao (廣島). The rock is mainly augite andesite, characterized by phenocrysts of plagioclase, augite and biotite. An exposure near Kuang-tao was reported to have a rather acidic mineral composition. The andesite lava flows may be roughly contemporaneous with the Lower Cretaceous beds or the Huashan series of the Tung-an sheet (NL 52-9) adjacent on the west.</p>	
UNCONFORMITY				
MESOZOIC Jurassic	Upper Jurassic beds or Mishan series	 <p>Arkose, conglomerate, shale and coal; thickness not known</p>	<p>The Upper Jurassic beds of unknown thickness around the Wan-ta Mountain Range were discovered in 1942 by the Japanese garrison forces stationed at Kuang-tao. The beds consist of arkose, conglomerate and shale, and are intercalated with several coal seams. The coal-bearing formation of the coal field north of Kuang-tao generally strikes east-west and dips steeply to the north. The coal is not worked. The coal-bearing formation may be correlated with the Maleng formation of the Mishan series which is Uppermost Jurassic in age.</p>	
	UNCONFORMITY			
Triassic (?)	Pre-Jurassic granite	 <p>Biotite granite and biotite-hornblende granite</p>	<p>The granite of the Triassic (?) system is known to occur in broad areas in both the USSR and Manchuria parts of the map. The granite north of the Mu-leng Ho is predominantly biotite granite showing marked decomposition. The granite quarried as building stone from Feng-mi Shan (鳳鳴山) north of Lake Hanka is gray biotite granite and biotite-hornblende granite, containing many felsitic veinlets. In the USSR area the granite is exposed in a north-northeasterly direction and constitutes such mountains as Gora Otorá, Gora Laugodyn, Gora Sarydynza, etc.</p>	
	UNCONFORMITY			
PRECAMBRIAN (?)	Gneiss	 <p>Granite gneiss and paragneiss; thickness not known</p>	<p>The gneiss is chiefly granite gneiss, accompanied by various kinds of paragneiss, and is widely distributed on both sides of the Ussuri River.</p>	
	Crystalline schist	 <p>Quartz-mica schist and biotite schist; thickness not known</p>	<p>The crystalline schist comprises quartz-mica schist and biotite schist, and is distributed in the hills north of Hei-tsui-tzu. Some Japanese geologists formerly regarded it as metamorphosed Toman formation or Upper Paleozoic, but lithologically it more closely resembles the Precambrian crystalline schist of southern Manchuria. The schist is found also at two localities in the USSR area of the map.</p>	
UNCONFORMITY				
(Column not drawn to scale)				