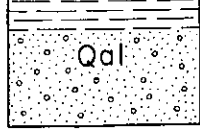
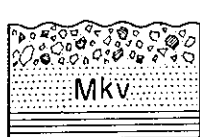
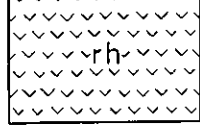
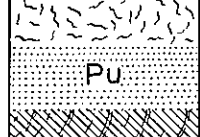


GEOLOGIC COLUMN AND UNIT DESCRIPTION

AGE	ROCK UNIT	LITHOLOGY; THICKNESS WHERE KNOWN	UNIT DESCRIPTION	REFERENCES
QUATERNARY	Alluvium	 Sand, clay and gravel; thickness less than 10 meters.	Alluvium, consisting of sand, clay and gravel, covers lower terrace remnants and vast flood plains of such rivers as the Ch'i-li-hsing Ho [七里河], the Nao-li Ho [挠力河], the Ch'i-hu-lin Ho [七虎林河] and the Ussuri River. Swamps are filled by fine sand and clay probably less than 10 m thick.	<p>KAWADA, Kiyosuke, 1951, Some problems on the topography and geology of northeastern Manchuria, in <i>Geology and mineral resources of the Far East, Manchuria</i>, II-5-1; Comp. Comm. Geology and Mineral Res. Far East, Tokyo Geog. Soc.</p> <p>KIRITANI, Fumio, 1942, Geology along the route from Po-li [勃利] to Pao-ch'ing [寶清]: Unpub. rept., Manchuria Mine Devel. Co.</p> <p>KOBAYASHI, Teichi, 1942, (i) The Akiyoshi orogenic cycle in the Mongolian geosyncline; (ii) The Sakawa orogenic cycle in the Amur geosyncline; (iii) The relation among the Mesozoic fossil beds in Korea-Manchurian land and their ages: <i>Tokyo Imp. Acad. Proc.</i>, v. 18.</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>NODA, Mitsuo, 1950, The Carboniferous and the Permian periods of Manchuria, in <i>Geology and mineral resources of the Far East, Manchuria</i>, III-5: Comp. Comm. Geology and Mineral Res. Far East, Tokyo Geog. Soc.</p> <p>SAITO, Rinji, compiler, 1940, Geological map of Manchuria and adjacent area, 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: Geol. Inst., S. Manchuria Ry. Co.</p>
	Diluvium	 Sand, clay and gravel; thickness unknown.	Diluvium consists of sand, clay and gravel, and covers somewhat elevated terraces fringing the above-mentioned flood plains. A cut bank 2 meters high along the river near Yen-erh-wo-chih [燕兒窩北], consists of gray or brownish clay, containing fragments of mammalian bones and fresh water shells including <i>Unio</i> and <i>Viviparus</i> . K. KAWADA tentatively named the clay bed the Yenerhwo bed and correlated it with the so-called Kihsiangtun bed of the Harbin district.	
TERTIARY	UNCONFORMITY			
	Neogene basalt	 Flows of olivine basalt	The Neogene basalt occurs as flows of variable thickness, and is exposed mainly as caprock in the Wan-ta [完達] Mountain Range south of Pao-ch'ing [寶清].	
	EFFUSIVE CONTACT			
	Paleogene formation	 Sandstone, shale and conglomerate; thickness less than 1,000 m	The Paleogene formation may be closely related to the Posyet series of the Southern Ussuri Region, and the Hunch'un series of the Hun-ch'un district in Manchuria. The thickness is probably less than 1,000 m.	
MESOZOIC	UNCONFORMITY			
	Upper? Cretaceous volcanic complex	 Volcanic flows and agglomerate, with tuffaceous sandstone and shale; thickness unknown	The Upper? Cretaceous Volcanic complex is indicated on the Geologic Map of USSR. Presumably it is closely related to the so-called Tuffaceous Nikan of the Southern Ussuri Region which is associated with tuffaceous sandstone and shale. Thickness is not known.	
	Rhyolite	 Flows and sheets of rhyolite, with dikes of quartz porphyry; thickness unknown	Flows and sheets of rhyolite with dikes of quartz porphyry are mainly distributed west of Pao-ch'ing.	
	Andesite	 Flows and breccia of augite andesite; thickness unknown	Augite andesite, occurring as flows or breccia, is mainly exposed as mesas. West of Kung-ssu [公司] it covers the so-called Kungssu formation or Jurassic formation.	
	EFFUSIVE AND INTRUSIVE CONTACT			
	Jurassic formation (Kungssu formation)	 Sandstone, shale, conglomerate, hornfels and coal; thickness unknown	The Jurassic formation on the Manchurian side of the Ussuri River corresponds to what was called the Kungssu formation [公司層] by K. KAWADA (1951). KAWADA tentatively included it in the Permo-Carboniferous Manmo formation [滿蒙層], but its lithologic characters indicate that the Kungssu formation is closely related to the Jurassic formation on the Soviet side. The formation consists of sandstone, shale and conglomerate, and is occasionally intercalated with hornfels. The sandstone contains poorly preserved fragments of plant fossils. The conglomerate consists of cobbles of reddish chert and grayish quartzite, both derived from the metamorphic rocks of the Tumuho formation [柵木河層]. The shale has locally been changed to hornfels due to igneous contact. The Jurassic formation in the Soviet territory has lately been divided into the Lower (J ₃), Middle (J ₂) and Upper (J ₁), but no descriptions are available. A coal field occurs in the headwaters of the Hsiao-se-chin-pieh Ho [小色奎別河], a tributary of the Nao-li Ho, about 30 km south of Pao-ch'ing. Coal was not worked due to difficult access.	
UNCONFORMITY				
Pre-Jurassic granite	 Biotite granite and hornblende-biotite granite	The pre-Jurassic granite intrudes the Upper Paleozoic formation and has affected it by contact metamorphism.		
INTRUSIVE CONTACT				
PALEOZOIC	Upper Paleozoic formation	 Quartzite, graywacke, sandstone, slate and chert; thickness unknown	The Upper Paleozoic formation corresponds to the Tumuho formation (K. KAWADA, 1951). It consists chiefly of thick quartzite and graywacke, intercalated with thin sandstone, slate, and chert. The quartzite and graywacke are grayish, compact and cleavable. The chert is purplish and marked with networks of vein quartz, and contains radiolarian fossils. The formation is correlatable with the Permo-Carboniferous marine formation of the Knavalofsk district.	
PROBABLE UNCONFORMITY				
PRECAMBRIAN?	Granite gneiss	 Granite gneiss and migmatite gneiss	Granite gneiss and migmatite gneiss constitute low hills around Yao-ying Shan [腰營山] on the west bank of the Ussuri River. The granite gneiss forming Gora Sokolikhka in the Russian territory beyond the river is assigned to Archean in the Geological Map of U.S.S.R. (1955).	

(Column not drawn to scale)