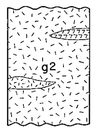
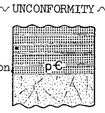
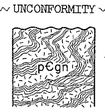
GEOLOGIC COLUMN AND UNIT DESCRIPTIONS

AGE	ROCK UNIT	LITHOLOGY; THICKNESS WHERE KNOWN
QUATERNARY	Alluvium 	Sand, clay and gravel; thickness less than 10 meters
	UNCONFORMITY	
TERTIARY	Neogene basalt 	Doleritic basalt
	EFFUSIVE CONTACT	
MESOZOIC	Cretaceous andesite 	Biotite andesite and hornblende-biotite andesite
	EFFUSIVE CONTACT	
	Cretaceous rhyolite 	Rhyolite, lithoidite and obsidian
	EFFUSIVE CONTACT	
	Lower Cretaceous formation 	Sandstone, shale, tuff and agglomerate; thickness unknown
	UNCONFORMITY	
	Jurassic formation 	Tuff, breccia, sandstone, shale and hornfels; thickness unknown
	UNCONFORMITY	
	Pre-Jurassic granite 	Biotite granite, two-mica granite, graphic granite and aplite
	INTRUSIVE CONTACT	
PALEOZOIC	Middle Paleozoic formation 	Limestone and clay slate; thickness unknown
	UNCONFORMITY	
	Precambrian(?)(Sinian) formation 	Sandstone, clay slate and quartzite; thickness unknown
	UNCONFORMITY	
PROTEROZOIC	Precambrian gneiss 	Biotite granite gneiss, hornblende granite gneiss, muscovite granite gneiss and mica schist

(Column not drawn to scale)

U N I T D E S C R I P T I O N

Alluvium, consisting of sand, clay and gravel, is distributed in the drainage basins of the Argun River, the Pei-erh-tz'u Ho (貝爾次河), the Chin Ho (金河), the An-ko-lin Ho (安格林河), the Mo-erh-tao-ka Ho (莫爾道喀河), the Chi-la-lin Ho (吉拉林河), and their tributaries. It covers low terrace remnants and flood plains, and is covered by marshes or grasslands. The thickness is less than 10 meters. Diluvium, consisting of clay, sand and gravel, is distributed on the banks along the above-mentioned rivers, though it is not shown on the geologic map because of narrow and complicated distribution, and available data are very few. It forms river terraces in small, scattered areas, and is dissected by the present rivers. Diluvium is covered by blackish gray humus. The thickness is more than 10 m.

The Neogene basalt is exposed in the following three places:

(1) The rock in the southeastern corner of the map area consists chiefly of a black or dark gray, cryptocrystalline, compact, trap-type basalt. Under a microscope, it shows a granular structure with microcrystals of augite and feldspar, and the groundmass rarely contains microphenocrysts of olivine and augite.

(2) The rock in the uppermost reaches of the Chi-la-lin Ho is a porous, doleritic basalt.

(3) The rock in the U.S.S.R. is a typical basalt, defined by Soviet geologists as Quaternary basalt, andesite, and tuff (NALIVKIN, 1955).

The Cretaceous andesite occurs as flows in the southern and eastern parts of the map area. It is a dark or light green, massive, compact, porous biotite andesite, showing a fluidal structure, and is locally associated with hornblende-biotite andesite. It rests unconformably on the pre-Jurassic granite (g_2), the Jurassic formation (Mj), and the Cretaceous rhyolite (rh).

The Cretaceous rhyolite occurs as flows in the southeastern part of the map area. It includes typical rhyolite and lithoidite, and is locally associated with obsidian. The rhyolite is dark gray or dark brown, porphyritic or fluidal in texture, and consists of phenocrysts of quartz, feldspar, biotite, and rarely hornblende, and a cryptocrystalline groundmass containing microcrystals of biotite. The lithoidite is a cryptocrystalline felsitic rock without any phenocrysts. The Cretaceous rhyolite is overlain by the Cretaceous andesite (Mka), and rests on the pre-Jurassic granite (g_2) and the Jurassic formation (Mj).

The Lower Cretaceous formation, consisting of sandstone, shale, conglomerate, and tuff, is exposed along the Argun River. It rests unconformably on the pre-Jurassic granite (g_2) and the Middle Paleozoic formation (Pm), and is overlain by the Neogene basalt (b_2) in the U.S.S.R.

The Jurassic formation, in the southern margin of the map area, is a lacustrine deposit consisting of an assemblage of tuff, breccia, sandstone, shale, and hornfels. It strikes EN and dips 20° - 30° SE. The formation is overlain by Cretaceous rhyolite (rh) and andesite (Mka), and rests unconformably on the pre-Jurassic granite (g_2) which had not contact metamorphosed it.

The pre-Jurassic granite is widely exposed as batholith all over the map area. It consists chiefly of coarse-grained biotite granite, containing light reddish orthoclase phenocrysts, and is locally associated with medium- to coarse-grained two-mica granite and fine-grained aplite in the southwestern part of the map area, and with graphic granite in the northeastern part of the map area. It is locally intruded by many small quartz veins of post-Jurassic age which are considered as the source of gold placers along the rivers. It is overlain by the Neogene basalt (b_2), the Cretaceous andesite (Mka), rhyolite (rh) and the Jurassic formation (M_1); it intrudes the Middle Paleozoic formation (Pm), the Precambrian (Sinian) formation, and the Precambrian gneiss (pCgn). The granite in the U.S.S.R. is defined by Soviet geologists as Middle Paleozoic acidic intrusives such as granodiorite and quartz-diorite.

The Middle Paleozoic formation, defined as Ordovician and Silurian by Soviet geologists (NALIVKIN, 1955), occurs only in the U.S.S.R. It consists of limestone and phyllitic clay slate, but is markedly metamorphosed by granitic intrusion and contains no fossils.

The Precambrian formation is exposed in the northwestern part of the map area. It consists of dark green muscovite sandstone, the upper of which is interbedded with clay slate, and quartzite, which is locally interbedded with hematite in the lower part. The formation rests on the Precambrian gneiss (pCgn), and may be Proterozoic to Cambrian in age. It is correlated with the Sinian system of South Manchuria.

The Precambrian gneiss consists chiefly of white to dark gray coarse-grained biotite granite gneiss, locally associated with hornblende granite gneiss, muscovite granite gneiss, and lenticular mica schist. The gneiss near the Jirinda-ka is unconformably overlain by the Precambrian quartzite, and its schistosity strikes N 20° - 30° E and steeply dips SE. The gneiss extending northeastward through the hills north of A-la-ch'i Shan (阿拉奇山) locally grades into granite, and the boundary between the two is difficult to determine.

E C O N O M I C V A L U E

Gold

Several gold placers are found in the Quaternary deposits along the Chi-la-lin Ho, the Mo-erh-tao-ka Ho, the Pi-la-erh Ho (畢拉爾河), the Karatochiya Ho, the Pei-erh-tz'u Ho, the Ha-wu-erh Ho (哈烏爾河), and the Chin Ho. The rivers run through the pre-Jurassic granite area, and the placer gold is derived from numerous gold-bearing quartz veins which intruded the granite. Chi-pao-kou (吉寶溝) along the Chi-la-lin Ho was noted for the Chi-la-lin gold mine which is situated 17 km SSE of Chi-la-lin town along the Argun River.

At Chi-pao-kou the Quaternary deposits covering the granite have a 500 m width along the Chi-la-lin Ho. The eastern bank is steeper than the western bank, and the Pleistocene deposit forms a two-step river terrace. The deposit is stratified in descending order as follows:

(d) Surface soil consisting of blackish gray humus (0.5 m - 1.0 m thick)
(c) Terrace deposit consisting of yellowish gray clay with sand and gravel, resulting in cross-bedding (10 m - 18 m thick)
(b) Gold-bearing gravel bed overlain by the Re·ent deposit, consisting of coarse sand with gravel (1 m thick)
(a) The most promising gold-bearing gravel bed consisting of fine-grained clay and sand containing angular or rounded pebbles of granite (1 m thick).

The gold-bearing gravel bed lies at the depth of 2 m and the permanent frozen bed lies 0.7 - 1 m beneath the flood plain, so the frozen gold-bearing gravel bed is worked by melting it by heated stones inserted into excavated holes. The total production of gold at the Chi-la-lin gold mine between 1906 and 1937 was estimated at 2,834 kg. The largest production was reported in 1927 when 150 kg was obtained.

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