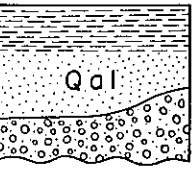
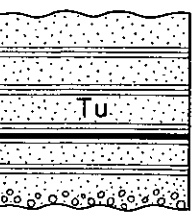
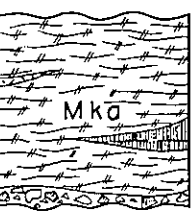

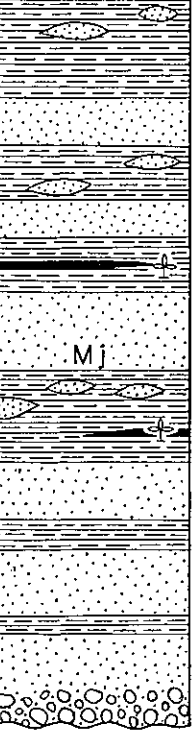
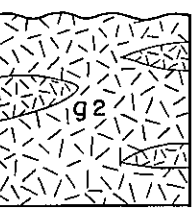

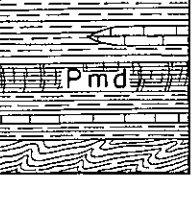
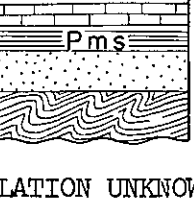
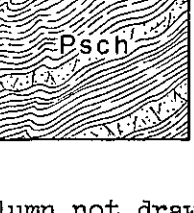


# GEOLOGIC COLUMN AND UNIT DESCRIPTION

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, is distributed in the drainage basins of the Amur River and its tributaries such as the Hu-ma Ho [呼瑪河] and the Zeya River, and covers low terrace remnants and flood plains. The Amur River forms a narrow meandering gorge with cliffs 20 - 40 m in relative height.	Geological Institute, South Manchuria Railway Company, 1936, Outline of Wang-yen Shan [望煙山] (Burning Mountain) in Russia: Shina Kogyō Jihō (Manchuria Geol. and Mining Rev.), no. 84, Geol. Inst., S. Manchuria Ry. Co.										
TERTIARY	Neogene formation	 Sandstone, clayey shale, lignite, bentonite and gravel; thickness unknown	The Neogene formation widely covers the hilly land between the Amur and the Zeya rivers. It rests unconformably upon the Paleozoic, Jurassic and Cretaceous formations, pre-Jurassic granite and Cretaceous andesite and is defined by Soviet geologists as a Pliocene continental deposit. It consists of white, reddish yellow or reddish gray rough porous soft sandstone, dark brown to black clayey shale, lignite, bentonite and gravel. The shale and lignite beds, 0.3 - 1 m thick, are interbedded in the sandstone at 2 to 3 m intervals. The formation is generally stratified horizontally, forming cliffs in places along the Amur River. A light blue smoke rises from several holes in the sandstone in the cliff north of Soldatka along the Amur River. The smoke has been seen for the last 300 years according to Russian records. It may be due to spontaneous combustion of the low-grade lignite.	GRABAU, A. W., 1928, Stratigraphy of China, Part 2, Mesozoic: China Geol. Survey, Peking. IVANOW, M., 1899, The watershed between the Amur and the Zeya: Djel. Dor. XII.										
MESOZOIC	Cretaceous andesite	 Andesite, basalt, andesite porphyry, diorite porphyry and pyroclastics	Cretaceous andesite near Ts'ao-ti-ying-tzu [趙德營子] occurs as flows resting upon the pre-Jurassic granite, and is overlain by the Neogene formation. It consists chiefly of andesite in association with basalt, andesite porphyry, diorite porphyry and pyroclastics. The unit is defined by Soviet geologists as the Upper Cretaceous intermediate and basic effusive rocks.	NALIVKIN, D. V., editor, 1955, Geological map of U.S.S.R. scale 1:5,000,000: U.S.S.R. Ministry of Geology. SAITŌ, Rinji, compiler, 1940, Geological map of Manchuria and adjacent areas, scale 1:3,000,000: Manchoukuo Geol. Inst.										
	Jurassic-Cretaceous formation	 Clay shale, clay slate, sandstone, conglomerate and marl; thickness unknown	The Jurassic-Cretaceous formation in the northern part of the map area consists of clay shale, clay slate, sandstone, conglomerate and, locally, marl. The formation is overlain by the Neogene formation and rests conformably on the Jurassic formation. It is defined by Soviet geologists as Upper Jurassic to Lower Cretaceous in age.	SCHMIDT, F., 1884, Reisen in Gebiete des Amurstromes etc.										
	Jurassic formation	 Clay shale, clay slate, sandstone, conglomerate and coal; thickness unknown	The Jurassic formation along the Amur and the Zeya Rivers is a continental deposit consisting of clay shale, clay slate, sandstone and conglomerate, locally intercalated with some coal seams. The formation near Chernyayev and Kuznetsovo along the Amur River and near Ust'-tygda along the Zeya River is fossiliferous, yielding many remains of ferns and conifers. The fossils collected by IVANOW, SCHMIDT and others from the formations of the map area and other localities west of longitude 126° E (refer to sheets "I-hsi-ken-ho", NN 51-12, and "Magdagachi", NN 51-9) were listed by GRABAU (1928) as follows:											
			<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">FILICES</th> <th style="width: 25%;">CYCADACEAE</th> <th style="width: 25%;">CONIFERAE</th> <th style="width: 25%;">ABIETINAE</th> <th style="width: 25%;">EQUISETACEA</th> </tr> </thead> <tbody> <tr> <td> <i>Thyrsopteris prisca</i> (Eichw.)  <i>Dicksonia concinna</i> Hr.  <i>D. saportana</i> Hr.  <i>D. longifolia</i> Hr.  <i>D. glehniana</i> Hr.  <i>D. acutiloba</i> Hr.  <i>Adiantites schmidtianus</i> Hr.  <i>A. amurensis</i> Hr.  <i>Asplenium whitbiense</i> Brngn.  <i>A. var. tenue</i> Brngn.  <i>A. (Cladophlebis) argutulum</i> Hr.  <i>A. spectabile</i> Hr.  <i>A. distans</i> Hr.  <i>Taeniopteris parvula</i> </td> <td> <i>Cycadites gramineus</i>  <i>Anomozamites (Nilssonina) schmidtii</i> Hr.  <i>A. acutilobus</i> Hr.  <i>A. angulatus</i> Hr.  <i>Pterophyllum helmersianum</i> Hr.  <i>Pt. seminovianum</i> Hr.  <i>Podozamites lanceolatus</i> (L. &amp; H.)  <i>P. var. intermedius</i>  <i>P. var. eichwaldi</i> Schpr.  <i>P. var. distans</i>  <i>P. var. minor</i>  <i>P. plicatus</i> Hr.  <i>P. ensiformis</i> Hr.  <i>P. glehnianus</i> Hr.                 </td> <td> <i>Phoenicopsis speciosa</i> Hr.  <i>Ph. latior</i> Hr.  <i>Ph. angustifolia</i> Hr.  <i>Baiera longifolia</i> (Brngn.)  <i>B. pulchella</i> Hr.  <i>B. palmata</i> Hr.  <i>Ginkgo flabellata</i> Hr.  <i>G. sibirica</i> Hr.  <i>Czechanowskia rigida</i> Hr.                 </td> <td> <i>Pinus (Pityophyllum) nordenskiöldi</i> Hr.                 </td> <td> <i>Equisetum</i> sp.                 </td> </tr> </tbody> </table>	FILICES	CYCADACEAE	CONIFERAE	ABIETINAE	EQUISETACEA	<i>Thyrsopteris prisca</i> (Eichw.) <i>Dicksonia concinna</i> Hr. <i>D. saportana</i> Hr. <i>D. longifolia</i> Hr. <i>D. glehniana</i> Hr. <i>D. acutiloba</i> Hr. <i>Adiantites schmidtianus</i> Hr. <i>A. amurensis</i> Hr. <i>Asplenium whitbiense</i> Brngn. <i>A. var. tenue</i> Brngn. <i>A. (Cladophlebis) argutulum</i> Hr. <i>A. spectabile</i> Hr. <i>A. distans</i> Hr. <i>Taeniopteris parvula</i>	<i>Cycadites gramineus</i> <i>Anomozamites (Nilssonina) schmidtii</i> Hr. <i>A. acutilobus</i> Hr. <i>A. angulatus</i> Hr. <i>Pterophyllum helmersianum</i> Hr. <i>Pt. seminovianum</i> Hr. <i>Podozamites lanceolatus</i> (L. & H.) <i>P. var. intermedius</i> <i>P. var. eichwaldi</i> Schpr. <i>P. var. distans</i> <i>P. var. minor</i> <i>P. plicatus</i> Hr. <i>P. ensiformis</i> Hr. <i>P. glehnianus</i> Hr.	<i>Phoenicopsis speciosa</i> Hr. <i>Ph. latior</i> Hr. <i>Ph. angustifolia</i> Hr. <i>Baiera longifolia</i> (Brngn.) <i>B. pulchella</i> Hr. <i>B. palmata</i> Hr. <i>Ginkgo flabellata</i> Hr. <i>G. sibirica</i> Hr. <i>Czechanowskia rigida</i> Hr.	<i>Pinus (Pityophyllum) nordenskiöldi</i> Hr.	<i>Equisetum</i> sp.	
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	Pre-Jurassic granite	 Biotite-hornblende granite, gneissose granite, aplite, granodiorite, diorite and quartz diorite	The formation near Ou-p'u [鴉片湖] is folded in a NNE direction, and the formation near Hsai-jou-chan [海州鎮] is folded in an E-W direction.											
	Granite gneiss	 Biotite-hornblende granite gneiss	Granite gneiss, forming hills between the Amur River and the Ta-ma-t'i Ho [大馬蹄河], consists chiefly of biotite-hornblende granite gneiss which grades into pre-Jurassic granite. Small masses of granite gneiss occur sporadically within the granite. The rock may be a marginal facies of the pre-Jurassic granite, but was metamorphosed into orthogneiss owing to the post-Jurassic disturbances.											
PALEOZOIC	Devonian formation	 Limestone, clay slate, mudstone, marl and schist; thickness unknown	The Devonian formation, consisting of limestone, clay slate, mudstone, marl and schist, is exposed near Amosovo in the U.S.S.R. Available data are very few.											
	Silurian formation	 Limestone, marl, sandstone, shale and phyllite; thickness unknown	The Silurian formation, consisting of limestone, marl, sandstone, shale and phyllite, is exposed on the bank opposite Ts'ao-ti-ying-tzu.											
	Paleozoic(?) crystalline schist	 Crystalline schist, quartzite and slate; thickness unknown	Crystalline schist in association with quartzite and slate is exposed near Hsin-chieh-chi [新街基]. Due to scarcity of data, it is not known whether it is a Precambrian schist or a Paleozoic metamorphosed schist. According to its lithological resemblance to the Paleozoic formation in the U.S.S.R., it may be a Paleozoic formation which was excessively metamorphosed into crystalline schist by the pre-Jurassic to Cretaceous disturbances.											

(Column not drawn to scale)