### *Triassic*

The specially characteristic rocks, gray thin bedded limestone interbedded with red clay, of Triassic are exposed in the valley between T'anchang (炭塘) and Changhopa (長河壩). The thickness is about 200 meters or more (Pl. I, Fig. 1.).

### *Coal Bearing Rocks, Jurassic*

The coal bearing rocks appear at T'anchang, Hualingping (化林坪) and east of Hukuping. At T'anchang it seems to lie conformably upon the Triassic, but in the Hualingping valley the typical gray limestone with red clay is missing. It is characterized by a series of dark sandy clay with sandstone layers, containing thin coal seams. In several places coal is mined, as for instance, NE of Lungpapu (隆八堡), T'anchang and the valley opposite to Shangpa (上壩).

### *Red Beds (Cretacic)*

The general colour of this formation in the nature is purple to brown-madder, which distinguishes this series already at a distance from the dark Jurassic sandstone. At the base the purple and gray sandstone is predominant, interbedded with a conglomeratic layer, which is exposed in the valley, east of Hualingping. Sanwangkang (三王岡) and the vicinity of Hsinmiaotze are covered by the purple red sandstone with purple, red clay shales. The series may be correlated to the Tshungking Series.[1] The thickness of what is left of this series is around 1000 meters.

### *Alluvium*

A little deposit we can see at Lengchi and the mouth of Lungpapu valley, which only are formed by deposition in the river or fan deposit.

## III. Igneous Rocks

Three kinds of igneous rocks appear in this region as follows:

(a) Gabbro-Diorite—West and SW of Lungpapu, the dark green, more weathered gabbro-diorite is predominant. The age of this rock seems to be older than the red granite porphyry because it is intruded by the latter behind the village of Lungpapu.

1. Arn. Heim—Special Public. No. VI of Geol. Surv. of Kwangtung and Kwangsi, 1931.

(b) *Normal Granite*—The contact of the normal granite with the porphyritic granite appears at the top of Niangniangshan. It seems to be older than the porphyritic granite.

(c) *Porphyritic Granite*—Niangniangshan and the mountains between Changhopa and Yehniuping are formed by this rock which contains big crystals of quartz and feldspar with a little biotite, and usually are of red colour. It is the youngest igneous complex.

## VI. Geological Structure

(A) *Sanwangkang Syncline*—Sanwangkang proper is formed of a beautiful syncline of Cretacic Red Beds.

The SWW limb, upon the porphyritic granite, seems to be bent up abruptly to a nearly vertical position (70°-75°), as presented by the Jurassic coal bearing rocks, and Cretacic Red Beds (Pl. I, Fig. 1). The bottom is wide and flat (Pl. II, Fig. 2), with a slight pitch towards SE.

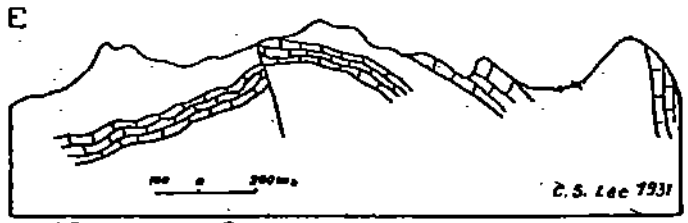



Fig. 3. Below Lianghokou

On the ENE side of the Syncline, the Red Beds dip 20° but the coal bearing and Triassic dip gradually steeper and steeper from 30° to 50°.

On both sides of the syncline the porphyritic granite cuts off the Triassic or Jurassic formations.

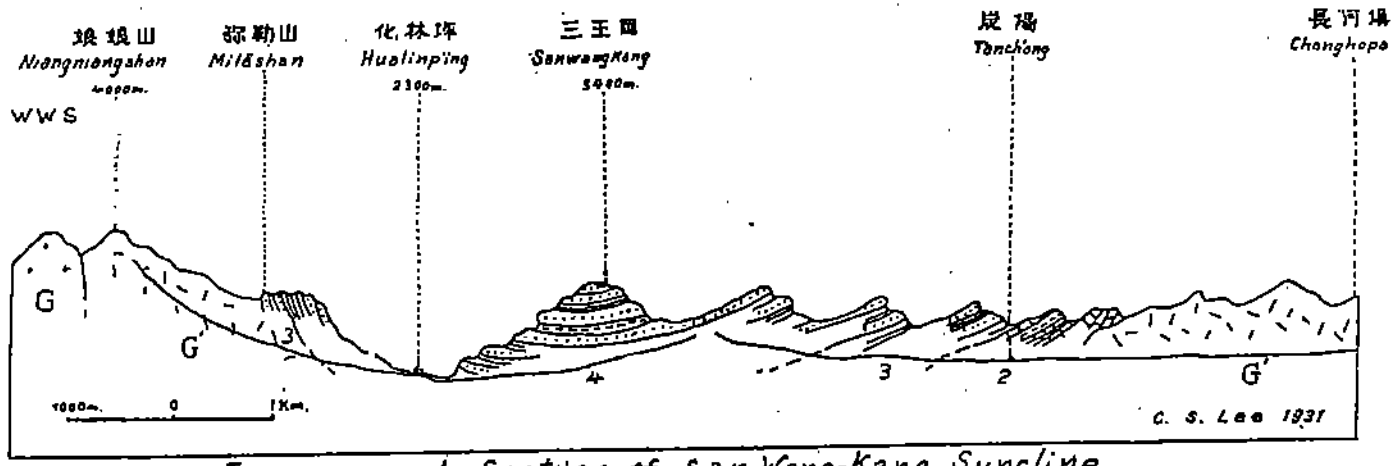
(B) *Lianghokou* (兩河口) *Anticline*—The west side of the anticline is intruded by the porphyritic granite, so that the limestone is more disturbed, even vertical slightly reversed (Pl. I, Fig. 2) and some faults are happened frequently (Fig. 3).

The E side is more smooth and gentle except at the mouth of the valley Santawan (三大灣), with 50°. Jurassic sandstone and Red Beds dip E or SEE with an angle 20°-80° (Pl. I, Fig. 2.; Pl. III, Fig. 2).

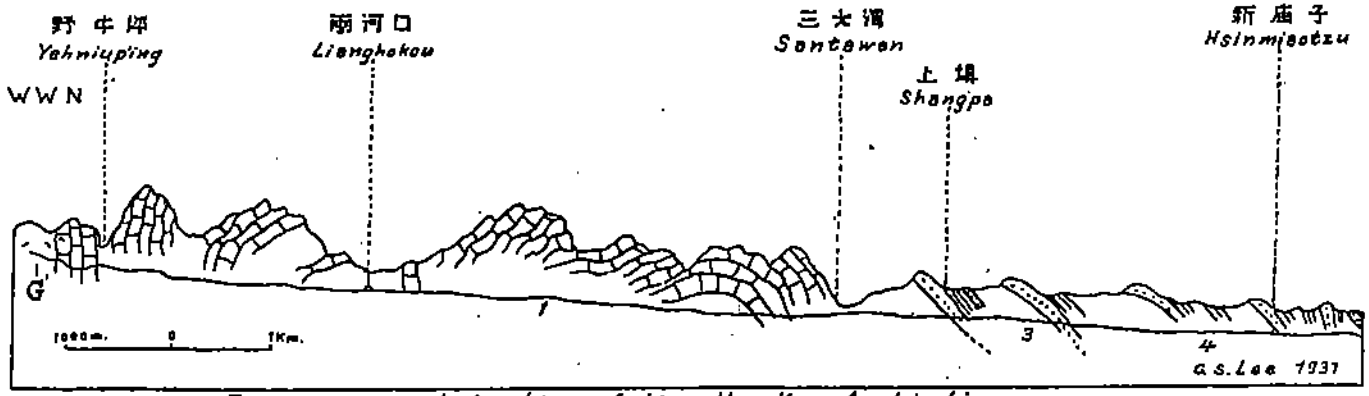
(C) *Complicated folds between Lungpapu and Hualingping*—At Fueryeh, we have seen (Fig. 1) all the strata in vertical position. The limestone exposed at Enkuotsui dips N 70° E with 45° in the upper part, but in the lower part it bends back to SW (Fig. 2). The green slate occupies the axial portion of the anticline. The folds which are formed in the dark sandstone from Enkuotsui to Hualingping, are numerous.

## V. Orogenic Movements

According to the views and sections we could get a general idea that the direction of the orogenic movement was coming from W to E. In regard to the concordance of the Jurassic and Cretacic series and west wing of Sanwangkang Syncline (Pl. I, Fig 1), we can at least conclude that the foldings of this region is younger than the Red Beds, that means the foldings were formed at latest Mesozoic or early Tertiary time. At Hsikang, Prof. Arnold Heim, Mr. J. L. Hsü and the writer have surveyed the more beautiful and 7500 meters high snow mountain which is called Minya Gongkar (which range is seen from Niangniangshan, Pl. II, Fig. 1). They think the snow mountain range which extends nearly S-N is a very young mountain just parallel to the axis of the foldings of this region. Minya Gongkar is a great batholitic intrusion which is a vertical movement no doubt. Thus the youngest orogenic movement of this region probably corresponds to Yinshan or Alpine movement.




Transversal Section of San-Wang-Kang Syncline
(Same Scale for Vertical & Horizontal Distances)




Transversal Section of Liang-Ho -Kou Anticline
(Same scale for vertical & horizontal Distances)

Succession of strata
1. Permo-Carboniferous Limestone
2. Triassic Limestone and Red clay
3. Coal bearing Jurassic Sandstone Shale and coal seam
4. Red Beds Cretacic

Igneous Intrusions
G. Normal Granite
G'. Porphyritic Granite

# Explanation of Plate II

## PLATE II

Fig. 1. Niangniangshan and Minya Gongkar snow mountain range, showing the highest snow mountain range parallel to the range of Niangniangshan and the axes of the foldings in Hsikang region, slandpoint on the slope of Niangniangshan looking to.....W.....?

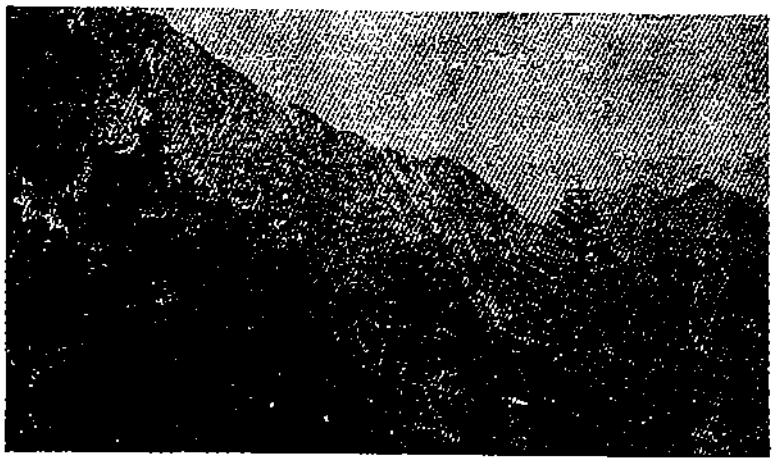
Photo. C. S. Lee.

19, Jan. 1931. a. m.

Fig. 2. Hualingping valley, Cretacic Red Beds, showing the horizontal stratification of the Sanwangkang Syncline.. The new trail follows the left valley, the old one is on the right side.

Photo. C. S. Lee.

18. Jan. 1931, a. m.



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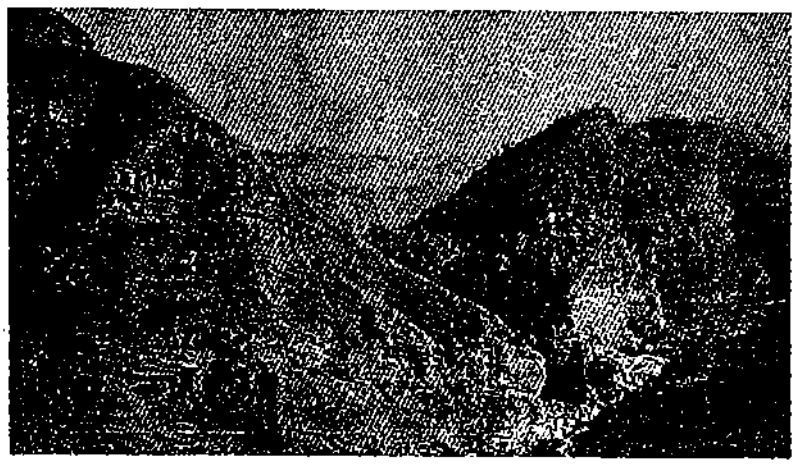

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# Explanation of Plate III

## PLATE III

Fig. 1. Liaohokou valley, showing the enormous isolated cliffs of limestone.
Photo. C. S. Lee,
20. Jan. 1931. a. m.

Fig. 2. Hsinmiaotze, showing the Cretacic Red Beds dipping to NEE.
Photo. C. S. Lee,
21, Jan. 1931. a. m.

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# THE INVERTED STREAM OF SUNGLINKOU (松林口), EASTERN HSIK'ANG (西康)

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Participating to the Szechuan-Tibetan Expedition of Sun-Yatsen University, guided by Prof. Arnold Heim, I had an opportunity to study the geology as well as the physical geography of NE Hsik'ang (西康) from May 1930 to Feb. 1931. The entire trip lasted about 10 months.

This paper contains a report on a reconaissance work which was undertaken as a part of the expedition from Dec. 27th, 1930 to Jan. 3rd, 1931, along the route from Luho (鑪霍) to Taining (泰寧).

Because of the incidental delay, the actual working days were not more than one week. It was hardly long enough to study accurately all the details.

On account of the cold climate of the plateau, all my developed films concerning this subject were unfortunately frozen and at once ruined by numerous cracks.

Special thanks are expressed to Prof. Arnold Heim for the most valuable suggestions and hints in the field, and to Prof. Chu Ting-Oo from whom he has received many valuable criticisms and corrections in the preparatory of this paper.

## I. Outline of Stratigraphy and Structure

The strata by the sides of the valley of Hsintu River (新都河) of eastern Hsik'ang are rather simple, and the rivers flow along the strike of the formations. The outcrops of Devonian limestone and Jurassic slate, sandstone and shale are found along the river valley. The intrusive rocks are also found here and there in the vicinity of Sunglinkou (松林口).

All these mentioned above are closely connected to the history of the development of the stream course in this region.

Much more important are the effects from earthquakes. The region has been affected by many earthquakes, of which those of 1893, 1905 and 1923 are

specially noteworthy (in 1893, the city of Taining was visited by several earthquakes, in 1905, a great earthquake took place in Taofu (道孚), and in 1923, a heavy earthquake happened at Luho).

Of these shocks the epicenters, which are situated on a line, seem to move northward.

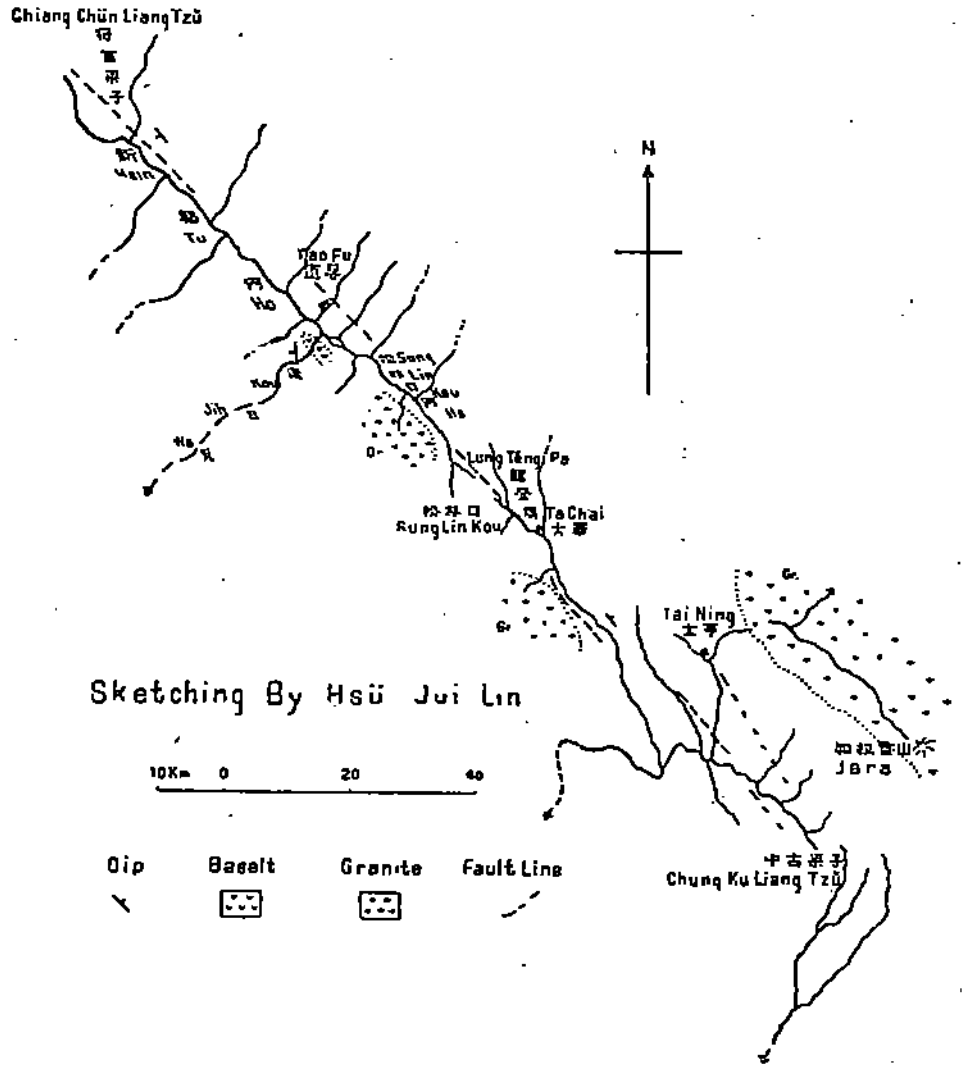


Fig. 1.—The sketech of one part of the Hsintu River and its tributary Sunglinkou