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OF PEIPING.

PEIPING

GEOLOGICAL RECONNAISSANCE ALONG THE PROJECTED RAILWAY LINE FROM NANCHANG TO FUCHOW.

(Summary)

BY H. C. TAN AND S. W. WANG.

This reconnaissance work was carried out by the order of Mr. Sun Foh, the Minister of Railways, during three months from March to June 1929. The itinerary ran from Nanchang, capital of Kiangsi province, to Fuchow capital of Fukien province. More topographic details are given in the Chinese text, this summary is only to record the essential geological facts and some general ideas on the mineral resources.

STRATIGRAPHY

The principal geological formations are distinguished as follows:

Archæan - Shankuan Series(杉關系):— This chiefly includes gneissic rocks with numerous igneous intrusions among which granite is predominant. Granite and gneiss often grade one to the other. This formation is referred to Archæan on the basis of its similarity to the Taishan complex in Shantung which Mr. Tan has studied over wide areas in North China. It is of wide distribution usually forming mountain mass or high ridges. The name is taken from the great pass on the boundary between the two provinces.

Algonkian - Linchuan Series(臨川系):— The chief components of this series are crystalline schists with frequent intercalation of gneiss. The gneiss some times contains a little graphite as is the case east of Nanchang district. To this series is also referred a phyllitic formation particularly well developed north of Linchuan district. It contains also mica and chlorite schiste and paper slate with numerous quartz veins. The same series includes also a marble formation associated with quartzite and schists with Cupriferous quartz veins near Nanping(南平). This series constitutes heights of second order and is also widely distributed in the two provinces.

Carboniferous - Chinkhsien Coal Series(進賢系):— Unconformably above the Linchuan series (fig.1 see Chinese text), comes a coal bearing series which includes about 600 meters of quartzite sandstone in the lower part often forming cliffs,

less than 200 meters of coal bearing sandstone and shale in the middle and about 300 meters of sandstone and quartzite in the upper part. This formation is distributed in several districts in Kiangsi as Chihhsien, Linchuan, Nanchang and Feng cheng (豐城).

This formation has yielded the following fossils:

Neuropteris	scheuchzeri	Hoffm	found	at	Liuling(劉嶺) & Siaoling(小嶺).
"	inflata	Ferqx.	"	"	Siao-Ling
"	sp.	"	"	"	Liu-Ling.
"		"	"	"	" "
"		"	"	"	Lo-ssu-ling(螺絲嶺)
Calamites	sp.	"	"	"	Liu-Ling.

Permian - Chunglingchiao (鍾陵橋) Limestone and Luoling(羅嶺) Sandstone:— These two formations have only been observed at isolated outcrops and do not occupy conspicuous place in the general map. Their relation with the Chihhsien limestone is shown by fig. 2 (see Chinese text) where the curious form of the limestone summits may be also noticed.

The Chunglingchiao limestone contains crinoid stems at Shih-hui-ting(石灰頂) in Chihhsien district and imperfect traces of fusulinidae at Shang-hou-lou-kou(上後路口) in Nanping district.

Jurassic - Lipichiao(禮陂橋) and Chungjen(崇仁) Coal Series:— The Jurassic coal bearing sandstone attains great thickness and is for convenience divided into two main parts. The lower one, the Lipichiao Series is unconformably succeeding the Permian limestone (fig. 3, see Chinese text). The upper one is called Chungjen Coal Series probably 1000 meters thick. The sandstone part forms quite conspicuous hills between Shaowu(劬武) and Nanping.

Jurassic - Yungshan(榮山) Sandstone:— This is a soft sandstone and shale series without coal seams observed in Chung-jen and Lin-chuan districts forming low rolling hills in contrast with the definite heights of the Chungjen series.

The Lipichiao formation has yielded at the coal field of the same name the following plant fossils:

Cladophlebis denticulata Brongn.

Podozamites lanceolatus Lind. & Hutt.

The fossils found from the Chung-jen series at Wu-yang-keng(芙蓉坑) coal pits and at Cha-lu-kou(叉路口) are identified as

Clathropteris meniscoides Brongn.

Cladophlebis denticulata ..

Podozamites lanceolatus Lind. & Hutt.

At different places in Shao-wu district, N, Fukien the following plants have been found:

Cladophlebis denticulata Brongn.

Podozamites lanceolatus L. & H.

Sphenopteris sp.

Pityophyllum longifolium Moll.

Cretaceous (?) - Nancheng (南城) Red Sandstone:—This is a series of red sandstone with intercalations of hard quartzite, conglomerate and thin shales. This formation at least 500 meters thick unconformably overlies the Jurassic beds, but often in fault contact (?) with older metamorphic formations. The age of this thick series is tentatively assigned to Cretaceous without fossil evidence.

Early Tertiary - Hangpu (航埠) Sand and Gravel:— This is superficial covering above all older formations. The sand and gravel may locally so consolidated as to become sandstone and conglomerate. The thickness varies from 20 to 100 meters. Chiefly well developed in the district of Chinsien, Linchuan and Chungjen. The red sandstone NE of Chungjen shows distinct inclination.

Quaternary - Alluvians:— From 5 to 10 meters thick, very seldom more than 50 m. in basin regions.

Igneous rocks - Granite:— According to the author's observation the granite mostly occurs in the Archæan and often grades into gneiss. The Shan-ling (杉嶺) range as observed between Lichuan (黎川) district in Kiangsi and Kuangchi (光澤) district in Fukien is chiefly composed of the Archæan granite.

Syenite:—Only forming small intrusive bodies in the Archæan.

Porphyry:—Porphyritic intrusive bodies in stocks or dykes are often encountered in the Archæan or Algonkian. Quartz porphyry predominates, for instance in the districts of Kuangchi and Nanping in Fukien province.

STRUCTURAL GEOLOGY.

As marked in the accompanying geological map (see Chinese text), the authors interpret the major structure of the region as due to a series of more or less parallel faults roughly NE-SW in direction giving rise to a succession of horsts and grabens (fig 4-9 see Chinese text). The horsts are mostly constituted by Archæan gneiss and granite while the depressions are covered by Jurassic to Tertiary beds. Thus the Shanling range i.e. that section of the Nanling range on the Kiangsi-Fukien

border crossed by the projected railway would be a horst on the both sides north and south of which occur basins of the coal bearing Jurassic.

Some local structures are mentioned under the following heading.

MINERAL RESOURCES.

1. CARBONIFEROUS COAL FIELDS.

Carboniferous coal series are mostly buried under Tertiary red clay or gravel and sand so that outcrops are few and scattered. Broadly considered the Palaeozoic coal fields seems to be related with the following structure:

Chinhsien anticline:—Axis about NE-SW. The north limb generally dipping northwest is occupied by the coal field of Lossuling, Linchuan, Peiling(北嶺) till Ssukuling(師古嶺) while the southern limb is constituted by the Ouchi(歐溪), Liuling(劉嶺) and Tsounaling(走馬嶺) fields. In fact Lossuling and Peiling are already close to the anticline axis.

Lichiatsu(李家渡) dome:—There seems to be a broad dome structure already destroyed by erosion with its centre approximately situated at Lichiaua between Chinhsien and Linchuan districts. Around this alluvium buried centre of the dome there are coal fields at Chushan(儲山) on the west, Lossuling and Siaoling on the north, and Shan-hia-hu-chia(山下胡家) on the south-east where the coal series in a very broad way dip away from Lichiatsu. The central portion of the coal dome already has been eroded away.

Owing to the scattered condition or covering of younger rocks, the outcrops of the coal beds are few and discontinued, the observation is rendered the more difficult by the fact that there are very few native mines which could throw light upon under-ground condition in the absence of boring. Informations on the number and thickness of coal seams are therefore very scanty, which fact makes it very difficult to make any quantitative evaluation of the coal reserve. As generally known there are three coal seams, the total workable thickness of which varies from 1 to 8 feet. The coal is mostly anthracitic and of bad quantity. 50 million would be a good guess for the total probable reserve of all fields related the above named structures calculated for a depth of 300 m.

Chenchiapien(陳家邊) syncline:—Coal series dipping to NNW and cut on the north by a fault bring in contact the metamorphic strata are assigned to Algonkian. Coal seams are thin and not worked. Extension over 12 km. but reserve unestimated.

2. JURASSIC COAL FIELDS.

Chungjen fields.—South of Chungjen district, the Jurassic coal series extends over 20 km and are now worked by native mines at Chalakcu(义路口), Changchialing(張家嶺), Lipichiao and Anyuan(諸源). There seem to be four coal seams, the thickest of which may attain 4 to 8 feet. The two better known fields are (1) the Lipichiao field where the main seam is 5 feet thick and the probable reserve is estimated at 10 million tons for a depth of 300 m, and (2) the Anyuan field of which the reserve is probably 3 million tons. The coal is a high rank bituminite in Wong's classification (Bull. Geol. Surv. China No. 8 p. 46), usually coking, but rather high in ash.

Coal fields between Linchuan and Yihuang(宜黃).—Extension over 20 km. Condition little known owing to the lack of old pits or new prospection.

Shaowu fields.—The Chiaokeng(蕉坑) coal field in the Shaowu district is the best field in N. Fukien. Coal seams occur in the upper part of the Jurassic (fig. 11 see Chinese text). Good anthracite low in ash and very high in fixed carbon. Owing to the low content of volatile matter below 5% the coal is rather difficult to burn. The actually known part of the field contains four seams, the thickest of which may attain 11 feet but the total workable thickness is only assumed to be 2 meters. The reserve is more than 8 million tons. This estimate is probably to be several times multiplied if all the extension of Jurassic bed is taken in. But the condition of coal seams are too little known for lack of development work.

As a whole our knowledge on the Kiangsi and Fukien coal fields is yet extremely meager. It needs much detailed surveying and development for ascertain their real value.

3. METALLIFEROUS DEPOSIT.

Milowan(米羅灣) silver ore.—NE of Kuangche district, Fukien, galena veins occur in a quartz porphyry intruded the Archæan gneiss. Veins are filled up with quartz & fluorite, argentiferous galena occurs in the middle of these gangue minerals. The veins are mostly vertical in N-S or NE-SW direction. They are usually short, less than a meter or a few meters in extension. The thickness varies from a few inches to 2 feet. A specimen of ore tested in the Survey laboratory contains about 48 ounces silver per ton.

Tsaotou(棗兜) copper ore.—SW of Nanping district Algonkian and Archæan formations form rather complicated structure with porphyry intrusion. Quartz

veins occur in Algonkian (?) formation, varying from a few to over 10 feet in thickness. The longest one near Tsao-tou extends over 1000 feet. The prospective work reaches a depth of over 180 feet but has not yet gone through the oxidation zone. The ore chiefly consists of bornite with subordinate amount of chalcoppyrite, and frequently also malachite and azurite. The average ore contains 14 to 19% of copper with 20 ounces of silver per ton and appreciable trace of gold.

GEOLOGICAL RECONNAISSANCE ALONG THE NANKING-NANPING SECTION OF THE PROJECTED RAILWAY LINE FROM NANKING TO CANTON.

(Summary)

BY H. S. WANG AND C. Y. LI.

STRATIGRAPHY.

Archæan Gneiss:—The Archæan gneiss is often intruded by later granite. Typical Archæan occurs between Chien-ou (建甌), and Chien-yang (建陽), in northern Fukien. It is often difficult to distinguish the younger granite from the Archæan gneiss especially as the younger granite may have, as marginal facies, some banded texture which gives to the rock a gneissic appearance.

Algonkian Crystalline Schists:—Biotite schist predominates with many quartz veins often auriferous. Chiefly observed between Chien-Ou and Chung-An (崇安).

Taoshuiwu (倒水塢) Series (Cambrian):—For the Palæozoic formations the nomenclature of C. C. Liu and Y. T. Chao* is followed here. The Taoshuiwu series is observed only north of Changshan (常山) district in Chekiang, consisting of dark sandstone and conglomerate. It is so identified because of its stratigraphic position below the Yinchupu (印渚埠) Series.

Yinchupu Series (Ordovician):—This contains black shale at the lower part with intercalations of impure limestone, and at the upper part sandstone, green shale and shaly limestone. The latter contains graptolites. The following are the Ordovician graptolites found from the Yinchupu shale at Chiao-Tou-Pu (橋頭鋪) in Ningkuo (寧國) district:

Didymograptus hirundo Salter,

„ *serratulus* Hall,

Diplograptus sp.

The black shale of the lower part of this series is often so rich in Carbonaceous matter as to be usable for fuel in the lime kilns, or sometimes contains anthracitic

* C. C. Liu and Y. T. Chao, Geology of South-West Chekiang. Bull. Geol. Surv. China No. 5, pp. 13 etc.

seams as worked at Lungchung (龍冲) in Ningkuo district. Total thickness over 1000 meters.

Yenwashan (硯瓦山) Series (Middle Ordovician):—Chiefly developed between Kiangshan (江山) and Kaihua (開化) districts of W. Chekiang, but not observed in other provinces, it consists of green or yellow shale often phyllitic, frequently containing calcareous concretions which where whetted have a conglomeratic appearance, a special feature which is much appreciated as ornamental stone in Chinese gardens.

Fengchu Shale (豐竹) (Silurian):—This series occurs between Kiangshan and Changshan of Chekiang and in Shehsien (歙縣) of Anhwei. The yellow green sandy shale predominates. The intercalated black shale contains numerous Silurian graptolites. This series is equivalent to the Lungma (龍馬) shale of the Yangtze Gorge region as described by Messrs. Hsieh and Chao. Sometimes thin seams of anthracite are found as at Huntang (洪塘), S. Anhui. Total thickness over 300 meters.

Chienlikang 千里岡 Sandstone (Devonian):—This series contains shale intercalations at the lower part and more conglomerate in the upper part which forms high ridges between the three provinces Anhwei, Kiangsu and Chekiang. Recently fossil plants have been found by Messrs. Hsu and Wang at Tingshan (鼎山), Yishing districts (宜興), Kiangsu province which seem to indicate the Devonian age. Total thickness 700-800 m.

Chihsia (棲霞) Limestone (Upper Carboniferous):—This limestone was only observed at its typical locality Chihsia Shan near Nanking. The fauna has been restudied by late Mr. Y. T. Chao who correlated it with Upper Carboniferous.

Feilaifeng (飛來峯) Limestone (Lower Permian):—This thick bedded limestone is the best for lime burning in the Lower Yangtze valley. It is rich in fossil corals, brachiopoda and fusulina and occurs in all the four provinces traversed, namely Anhwei, Chekiang, Kiangsu and Fukien.

Hsuanching Coal Series (宣涇煤系) (Middle Permian):—This constitutes all the coal fields in south Anhwei as Hsuancheng (宣城) and Chinghsien (涇縣). It may succeed the Feilaifeng limestone or directly overlie the Chienlikang sandstone. Probably equivalent to the Lihsien (禮賢) series of Messrs. Liu and Chao in western Chekiang. A specimen of Gigantopteris is found in Fanchang (繁昌) district, S. Ankwei.

Mienniu-shih (眠牛石) Limestone (Upper Permian):—This occurs mostly in Fanchang, Hsuancheng and Chinghsien districts in S. Ankwei and overlies the coal series. This limestone is thin bedded, each bed only 2-3 to 10 cm thick. Total thickness 200 m. poor in fossil.

Lishan (梨山) Coal Series (Jurassic):—The Palæozoic formation up to the Permian limestone named above are often directly overlain by Cretaceous or Tertiary formation in Kiangsu, Chekiang and Anhwei. In Fukien however there is a thick formation of coal bearing sediments and containing fossil plants of Jurassic age. To this formation belong the coal fields in Chungan, Chien-ou and Pucheng (浦城) districts. The sandstone of this formation is often hardened by igneous intrusions and constitute high ridges in N. Fukien.

Wuyi Formation (武夷) (Cretaceous):—This is a new term which is to include the Chien-Teh (建德) series of Messrs. Liu and Chao and the overlying volcanic series. The volcanic activity really begun with the Chienteh series but became more intense in the latter phase. There is therefore reason enough to include the two phases into one single term. Wuyi Shan is the high hill in N. Fukien well known for its scenery due to the alternative bedding of lava-conglomerate and shales. The shales contain Cretaceous shells and the fossil fish *Lycopera* has been recently found in Western Chekiang. Total thickness 1700 m.

Hsuan-Nan (宣南) Red Clay Series (Tertiary): Red clay is well developed in Hsuancheng and Nanling (南陵) in S. Ankwei. Conglomerate often occurs at the base to be succeeded by the red clay constituting low rolling hills. This formation is common in Chekiang, Kiangsu and Anhwei and has been variously named Yuhatai (雨花台) formation near Nanking and red sandstone in Chekiang. Unconformable above all older formations.

Loess (Quaternary):—Loess equivalent to the great formation of this name in N. China is only observed near Nanking.

IGNEOUS ROCKS.

Granite:—Often in genetic relation with metallic ores such as gold and antimony of Chihsi (績溪), and magnetite placer of Pucheng.

Gneissic granite:—This is generally the marginal facies of the granite and should not be confounded with the Archæan gneiss.

Granite porphyry:—Containing large orthoclase phenocrysts and often constituting country rock of lead-silver ores.

Quartz porphyry:—With quartz phenocrysts often in association with the Wuyi formation, but is of intrusive origin.

Porphyry trachyte and rhyolite:—Occur near Nanking and at Yaoshan (凹山) of Tangtun (當塗) district, S. Anhwei. The porphyry at Yaoshan contains iron ore veins.

Olivin basalt:—Fangshan (方山) near Nanking. This is probably once extensive lava sheet now so widely dissected and denuded as to have only a few remnant left.

ITINERARY.

The Chinese report gives a detailed account of the topography, communication, regional geology and mineral resources of the itinerary divided into four sections:

1. *Nanking to Hsuancheng*:—Mostly in S. Anhwei where the contact iron ores constitutes the chief mineral resources. The communication is easy being in a country of mature hills of low altitude.

2. *Hsuancheng to Hsun-An (淳安)*:—This lies on the border of Anhwei-Chekiang provinces.

The main ranges are Tien-Mu-Shan (天目山), Yü-Ling (昱嶺) and Huang-Shan, of which the highest peaks surpass 1500 meters with many ridges approaching 1000 meters. In this region the Lower Palæozoic series from the Cambrian to Silurian are more developed with larger intrusive granitic bodies. The mountainous feature of the country does not exclude however the existence of local basins where the Permian coal constitutes the main riches. Hsuancheng and Ching-hsien are the two districts the most important for the coal field although the reserve seems to be in all cases rather limited. Some antimony ores have been found in Chihsi district.

3. *Hsun-An to Hsiakou (峽口)*:—In this and the above mentioned region, the heights are constituted by Yinchupu and Chienlikang series or the intrusive bodies. The Wuyi formation becomes here more developed, this forms hills of second order. The communication is rather difficult in this region. Some suggestion for the railway construction. The antimony ore of Sui-an (遂安) and the coal of Lihsien are the only minerals of mining interest.

4. *Hsiakou to Nanping*:—This section crosses the main range of Hsienhsialing (仙霞嶺) in prolongation of the Wuyi range; many peaks are at an altitude of 1500 meters. As a rule the heights of the first order are made up of granite or gneiss

while those of the second height composed of the Wuyi formation which are especially rich in abrupt scarps. The Jurassic coal is the chief mineral resource of north Fukien, namely the coal field of Chian-An, Chung-An, and Pu-Cheng. The magnetite and glod washed from the granite give place to some placer workings in Chien-An and Chien-Ou.

The report paid special attention to the topographical and geological conditions on the projected railway line and made some practical suggestion as to the exact line to follow or the eventual condition of tunnel construction. It contains also some reference to the population and other local products than the minerals.

To the main report is appended a more detailed account on Suitung coal field which is considered as the more important coal field in South Anhwei.

GEOLOGY OF THE SHIU-SHUI VALLEY OF KIANGSI PROVINCE.

(Summary)

By C. C. WANG.

The reconnaissance survey was carried out in 1924, from February to April, covering the districts of Teh-an (德安), Kiu-kiang (九江), Shui-chang (瑞昌), Yung-shin (永新), Wu-ning (武寧), Shiu-shui (修水), Tung-ku (銅鼓), I-feng (宜豐) and Feng-ning (豐寧). This report has been delayed in waiting for the continuation of the surveying work in the same province. It is now published as the author is engaged in other work and also it is not easy to continue the survey in the same region in the local conditions prevailing at present.

STRATIGRAPHY.

Shang-tsiao-shan Series (上樵山系) (Sinian):—This series is well developed north of Wu-ning district and consists of green and gray calcareous shale surmounted by conglomerate, white quartzitic sandstone and cherty beds. The total thickness as far as observed measures 1700 meters. In field this series is characterized by: (1) its resistance to erosion, forming mountainous regions and high passes, and (2) the conglomerate or coarse sandstone and the cherty beds of the upper part of the series is chiefly characteristic by forming gorge-like passes locally called Shih-men (Stone-gate).

The green shale becomes phyllitic north of Teh-an city. At several localities the shale is carbonaceous and anthracite has been worked. This series is also extensively developed NW of Shiu-shui and Wuning, constituting the border ranges between the provinces Hupeh and Kiangsi. In Taiping Shan (太平山) and several other places the series is intruded and metamorphosed by granite.

Geologists working on the Hupeh side have suggested that the metamorphosed shale of Tai-ping Shan is Silurian. The author has observed however the contact between his Shangtsiaoshan series and the overlying Cambro-Ordovician limestone on the southern slope of the same mountain, he still believes therefore that there is a distinct formation which may be partly Cambrian but more properly equivalent to Sinian first recognised in North China. If this be true this is the Sinian formation so far known in lower Yangtze.

Wu-shih-men (烏石門) *Limestone* (Cambro-Ordovician)—The stratigraphical relation of this limestone and the underlying Shang-tsiao-shan series is best observed in the Wuning district (fig. 1 & 2 see Chinese text). Among the fossils found there are a coral resembling *Helysites* from one locality and a trilobite which Dr. Y. C. Sun thought to belong to Upper Cambrian from another locality. From a third locality, I found the graptolite determined by Grabau as *Dendragraptus* cf. *persculphis* Hopkin of Lower Ordovician. The Wushihmen limestone is therefore Cambro-Ordovician in age—in which more precise decision should be made by further study.

In field the limestone is recognizable by (1) the gentle relief of medium height with the alternating shale depression and (2) the presence of yellow earthy bands intercalated in the limestone.

Yaishan (崖山) *Shale* (Silurian):—The regular succession of the yellow green shale—here named Yaishan shale. The Wushihmen limestone is clearly visible in Wuning (fig. 2) and in Teh-an (fig. 4). The middle part of the series sometime contain some red shale. The total thickness may attain 2500 m. At Siang-mien-yao (相面埗) NE of Yaishan, Wuning district, and about 300 m. below the top of the series there have been found two fossiliferous horizons. The lower one yielded the following Silurian fossil according to the preliminary determination by Dr. A. W. Grabau.

Orthonota antelonga Grabau; *Modiomorpha Wuningense* Grabau; *Aviculopecten cyheles* Barr. var. *acuta* Grabau;

The Upper horizon yielded:

Encrinurus (coronocephalus) rex. *Spirifer hsiehi* Grabau, and *Leptaena distorta*.

This series is easily recognized in the field by (1) the low and gentle topography constituted by yellow shale with a few red intercalations, and (2) the particular feature of weathering resulting in accumulation of small fragments of shale on the slope.

Tsoshan (鑿山) *Limestone* (Permian):—This limestone is usually dark colored or black. The lower part is often flinty. Its thickness as measured at Tan-shan-yao (炭山埗) (fig. 6) is 250 m. but is variable in other localities. This limestone seems to overlies conformably the Silurian shale. It is rich in fossils, *Schwagerina*, corals and brachiopods of Permian age have been collected near Kiukiang and in Wuning, Shiushui and I-feng. Among the fossils from Yifeng, late Mr. Y. T. Chao recognized *Productus Sinensis* Frech, *Neoschwagerina* sp. and *Ceinitzella* sp. which indicate the Lower Permian age. This formation is easily identified in the

field by (1) the massive character and cherty nodules of the limestone and (2) the rich fossiliferous beds especially visible on the weathered surface.

Laohushan (老虎山) Coal Series (Middle Permian):—This is a name which the author has used in his report on the Susung (宿松) coal field in Anhwei as well as the Tsoshan, Peishan limestone which are both localities of that province. At the lower part sandstone predominates (fig. 6). The middle part contains shales, coal seams and thin beds of flinty limestone. Still higher in horizon are yellowish shales. The total thickness measures at over 180 m. in Susung, north of the Yangtze River; south of the river it is reduced to 100 m. in Shuichang and only 30 m. in Shiushui. This tendency to gradually thinning out toward SW is quite clear.

Peishan (北山) Limestone (Upper Permian):—The rock is light gray in color and generally thin bedded, after alternating with thin and lenticular shale. Chert is rare or limited to the lower part. Corals have been found in Shuichang. Thickness about 300-400 m.

I-feng Coal Series (Jurassic):—This series occurs in I-feng district in direct contact—probably due to fault with the Taoshan limestone. The rocks are largely covered by red clay so that the outcrops are poor. Mesozoic plants have been found south of Pailou (牌樓) in I-feng.

Wuning Red Beds (Tertiary):—Conglomerate predominates at the base. Then conglomerate, sandstone alternate with red clay which becomes dominant in the upper part. The pebbles are mostly angular and of local origin. This formation as a rule occurs in the valleys near where the river has made young cutting of recent age. It is unconformable with all the older rocks and therefore is younger than the main tectonic movement which has folded all the older formation. There must have been however some younger movement again since the red beds themselves are dipping a 10-30°.

Red Clay (Late Tertiary—Quaternary):—This occurs extensively in a belt 20-50 km. wide in I-feng, Kaoan (高安) and Fengsing (奉新) districts forming low hills 10-50 m. in height. It is in horizontal position and is therefore younger than the Wuning red beds.

GRANITIC INTRUSION.

Granitic intrusions are found in Wuning, Shiushui, Tungku districts and are particularly extensive in I-feng, Kaoan and Fengsing districts. The Shang-tsiao-shan series is very often metamorphosed by the granite to which is probably also