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GEOLOGICAL SOCIETY OF HONG KONG

NOTES FOR THE GUIDANCE OF CONTRIBUTORS TO THE NEWSLETTER

General: Articles of a technical nature, as well as reports of interesting events, reviews and other topical items are welcome. Contributions must be short, although exceptions may be made at the discretion of the Society. Tables, figures and half-tone plates must be kept to a minimum and must all be on separate sheets. Typescripts, enquiries and all correspondence should be addressed to the Secretary, Geological Society of Hong Kong, c/o Department of Geography and Geology, University of Hong Kong, Pokfulam Road, Hong Kong. The Society does not assume copyright of material published in the Newsletter. Any other previous, current or expected future use of such material by the author must be stated at the time of submission.

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References: The author is responsible for ensuring that all references are correct. The list of references should be given in full, with no abbreviations.

Offprints: The Society does not provide authors with free offprints of items published in the Newsletter, but will obtain quotations on behalf of authors of technical articles who may wish to purchase offprints from the printer.

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STRATIGRAPHY OF HONG KONG

The team of geologists from the Nanjing Institute of Geology and Palaeontology (NIGP), Academia Sinica, left Hong Kong on 20 February 1990 to return home. The research project funded by Hong Kong Polytechnic Civil and Structural Engineering Department (HKP) lasted 15 months from November 1988 to February 1990 and involved M J Atherton, C M Lee (HKP) and J H Chen, G X He, S Q Wu (NIGP).

Several hundred fossils were found and many important discoveries made during the course of the research. Six papers have so far been written on the research and further papers will follow when an analysis of plant fossils and microfossils is completed. The six papers so far completed are:

1 A Report on the Discovery of Lower Devonian Fossils in Hong Kong

2 Supplementary Report on the Discovery of Lower and Middle Devonian Fossils in Hong Kong

3 New Collections for the Tolo Harbour Formation at Ma Shi Chau, New Territories, Hong Kong

4 Discovery of *Sulciferites hongkongensis* (Grabau) on the South Shore of Tolo Channel and the Geological Age of the Sedimentary Rocks at Nai Chung, New Territories, Hong Kong

5 Note on a New Locality of the Lower Jurassic in Hong Kong with Brief Discussions on the Correlation and Biogeographic Relationships of the Lower Jurassic Hong Kong Fauna

6 On the Age of the Ping Chau Formation

It is intended to publish all these papers in sequence in the Newsletter, and this Newsletter contains the introduction and first paper.

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THE STRATIGRAPHY OF HONG KONG REPORT NO CSE 90-01

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This collection of six papers is the result of 15 months of work between November 1988 and February 1990 conducted in Hong Kong by a team of geologists from Hong Kong and Nanjing. A further report will be made when an analysis of plant fossils and microfossils currently being examined at the Nanjing Institute is received.

Introduction and Background

Geological investigations in Hong Kong were first made in 1862 by Kingsmill, in 1880 by Guppy and in 1893 by Skertchly. Heanley continued investigations in 1923 and 1924, and Schofield in 1920, 1924 and 1943.

The highlight of Heanley's geological career was the discovery of ammonite fossils in shales on the north shore of Tolo Channel. These were the first Mesozoic fossils to be found in S E Asia.

The first geological survey of Hong Kong was made in the period 1923-1927 by the Canadian geologists, Brock, Uglow, Schofield and Williams but their geological map was not published until 1936.

Davis and Ruxton of Hong Kong University with Berry published several papers on Hong Kong's geology between 1953-1961.

The second geological survey of Hong Kong was made by Allen and Stephens of the Institute of Geological Sciences between 1969 and 1971, and is the basis for the current geological map of Hong Kong on a scale of 1:50 000.

The third geological survey of Hong Kong, by the Geotechnical Control Office with the help of the British Geological Survey, is now underway and is expected to take 10 years to map Hong Kong on a scale of 1:20 000.

In 1980, C M Lee and M J Atherton found fossil fish remains of Devonian Age in the rocks of Harbour Island, Tolo Channel and in 1984, ammonites of Liassic Age at Sham Chung, Tolo Channel. The finding of these fossils revolutionized the stratigraphy of Hong Kong by extending the succession back to 370 million years ago.

This Research Project

In spite of the previous work, very few fossils had been found in Hong Kong and our knowledge of the stratigraphy of Hong Kong is limited.

In 1985, therefore, it was proposed that a research assistant be employed for one year to search for and collect fossils in the sedimentary rocks of Hong Kong and bring them to the Civil and Structural Engineering geology laboratory in the Polytechnic for identification.

In 1988, following unsuccessful attempts to recruit locally, the Beijing-Hong Kong Academic Exchange Centre advertised in China. Three eminent scientists from the Nanjing Institute of Geology and Palaeontology applied for the research assistant post. They were interviewed in Shenzhen and as each was an expert in a different branch of palaeontology, it was decided to appoint all three for six months. Because the discoveries made by the Hong Kongian-Nanjing research team were so impressive, the research appointments were extended twice to a total period of fifteen months.

Future Research

It is felt that the team have only had a preliminary look at Hong Kong and that much more remains to be discovered. A further research proposal is being prepared.

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A REPORT ON THE DISCOVERY OF LOWER DEVONIAN FOSSILS IN HONG KONG

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Introduction

A joint survey team, comprising geologists and palaeontologists from China and Hong Kong, have found many fossils of Lower Devonian age in the strata in the New Territories of Hong Kong. These discoveries are very important to the study of the geological history of Hong Kong and for correlating Devonian strata in South China. The discoveries will change traditional ideas, published in many papers, on the age of transgression and regression in South China.

Fossil Localities and Stratigraphy

There are five localities of Lower Devonian fossils, which are all located in the area north of Tolo Channel, northeast New Territories, Hong Kong (see Figure 1). The greater part of the rocks in the area have been previously called "Jurassic Tolo Crest Formation" (Heim 1929), "the Jurassic Sediments" (Davis 1953) and the "Middle Lower Jurassic Bluff Head Formation" (Ruxton 1960; Allen & Stephens 1971) or were included in the "Mesozoic Volcanic Pat Sin Formation" (Williams *et al* 1945). Whereas some (Location l, see below) were regarded as the Jurassic volcanic Repulse Bay Formation (Allen & Stephens, 1971).

After Lee's discovery of the Devonian fish-fossil in 1980 at Harbour Island (see Figure l) the rocks of the area were subdivided into two formations, namely the Harbour Island Formation and the Plover Cove Formation[1] (Lee 1985, 1987). The Middle Devonian age of the Harbour Formation has been supported by the occurrence of placodermi fish-fossils which were used for correlating the formation with the fish-bearing strata of north and central Guangdong (Lee 1982). But the age of the "Plover Cove Formation", which was thought to cover the Harbour Island Formation by Lee (1985, 1987), was still a problem before our discovery because of a lack of fossil evidence.

According to Lee (1987) the "Plover Cove Formation" is characterized by interbedding of brown sandstone and siltstone with intercalations of red shale, while the Harbour Island is characterized by light-brown quartzite conglomerate and sandstone with few intercalations of red or brown-green shale. In the area the Plover Cove Formation is about 300 m thick and the Harbour Island Formation is about 200 m thick. The general strike of the rocks of the two formations is NE-SW and the dip is generally at 45-80° towards the northeast but locally towards southeast along the shore of the Tolo Channel. However, the present five fossil-localities (or fossil-beds)

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[1] This is a homonym for the Ruxton's Plover Cove Formation, which represents the "acid volcanic rocks" according to the definition (Ruxton 1960 p 237)

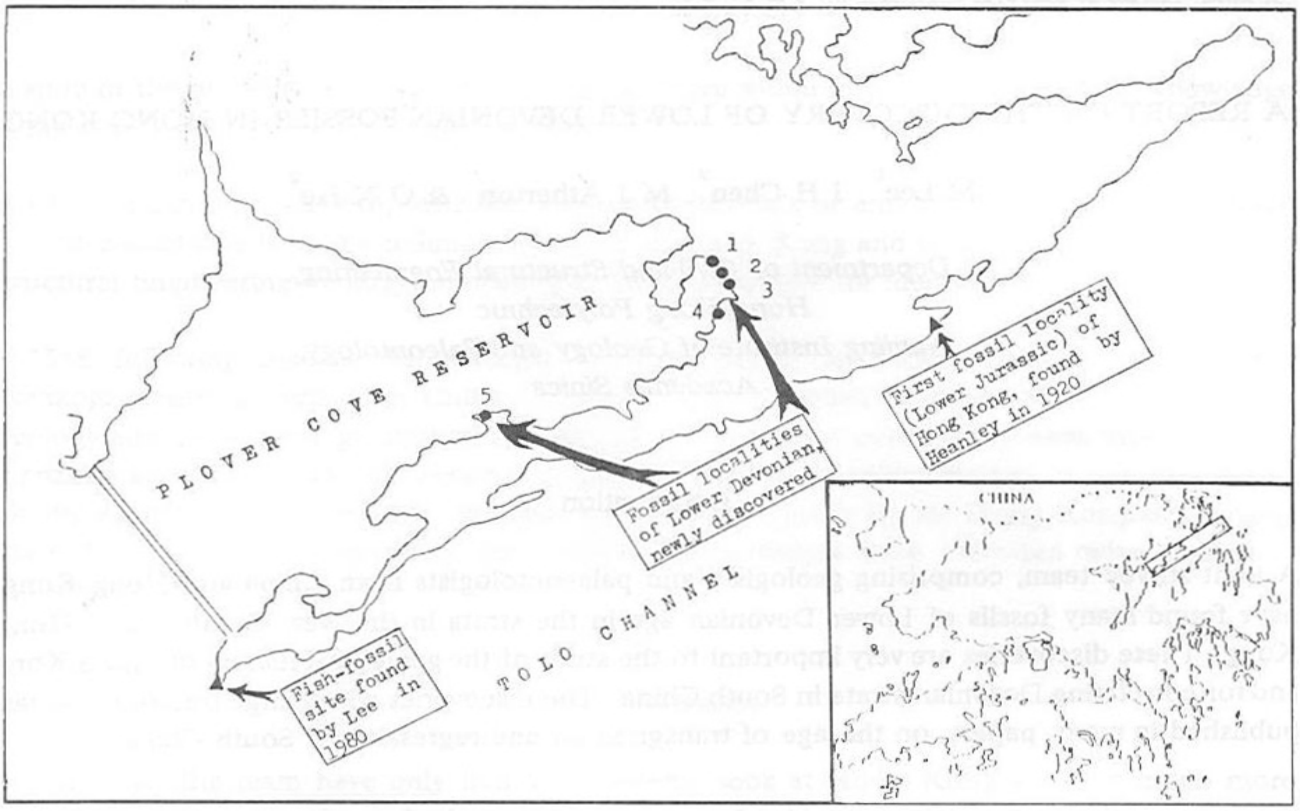


Figure 1 Fossil Localities

lithologically belong to Lee's "Plover Cove Formation", though Locality 1 (Bed 1) entered the limits of the so-called volcanic Repulse Bay Formation on the geological map by Allen & Stephens (1971) (see Figure 2).

The lithology and fossil contents of the five localities (Beds) are as follows:

- Locality (Bed) 1 – Light brown calcareous siltstone bearing bivalves, gastropods and crinoids
- Locality (Bed) 2 – Light grey siltstone bearing gastropods and crinoids
- Locality (Bed) 3 – Purple-red mudstone and brown and red siltstone yielding ostracods
- Locality (Bed) 4 – Purple-red siltstone and silty-shale bearing plant stems
- Locality (Bed) 5 – Brown silty mudstone yielding bivalves and plants

Geological Age

At the five localities we have collected more than 150 specimens of five kinds of fossil including 92 of Bivalvia, 60 of Ostracoda, 6 of Gastropoda and Crinoid and several plant fragments. The fossil bivalves, which occupy a dominant position both in specific diversity and individual abundance within the biota, are preliminarily studied here, while the others will be studied in the foreseeable future. The following assemblages of Bivalvia are in the related two beds:

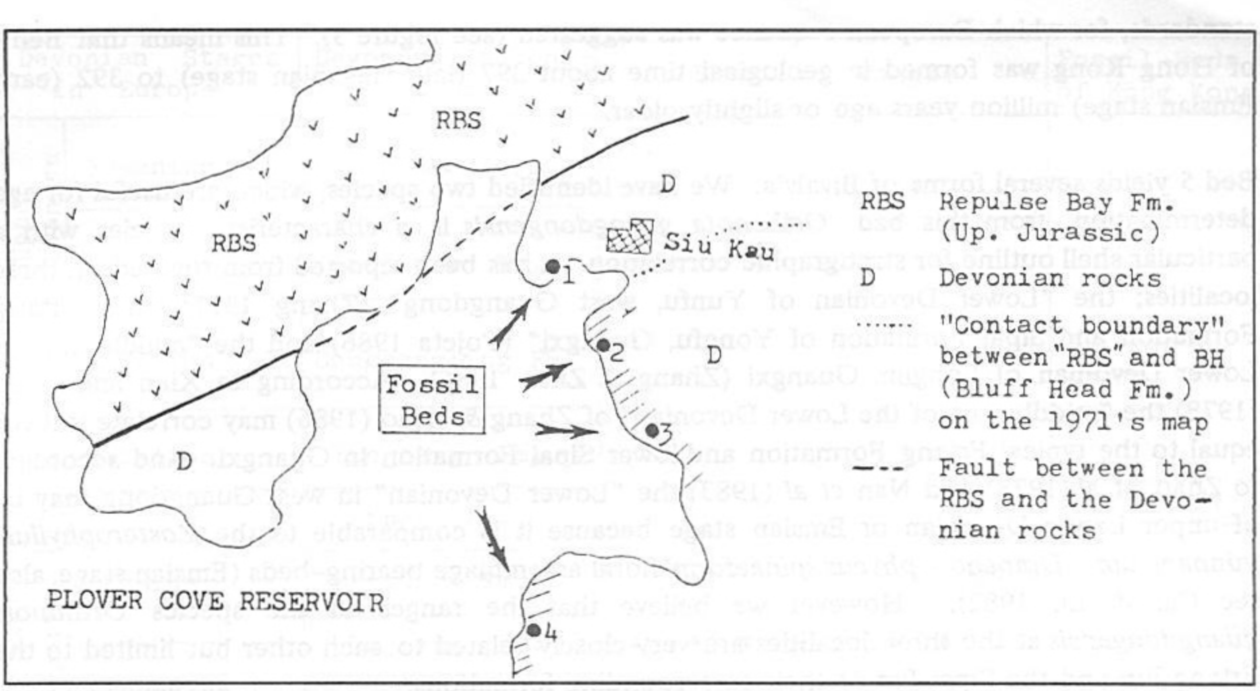


Figure 2 Map showing distribution of the fossil-beds near Siu Kau (notice the location of Bed 1)

Bed 1 - *Pseudonuculana zhaoi* Pojeta & Zhang, *Deceptrix guangxiensis* Zhang, *Nuculoidea minuta* Pojeta & Zhang, *Goniophora* (G) sp cf *G* (G) *rheana* Beush, *Cypricardella*? sp, *Eoschizodus* cf *inflatus* (Roemer) and *Mecynodon*? sp

Bed 5 - *Orthonota guangdongensis* Zhang, *Paracyclas rugosa* (Goldfuss), *Sanguinolites* sp 1, *Sanguinolites* sp 2, *Schizodus*? sp and *Edmondia* sp

Bed 1 contains seven bivalvian species of seven genera. Among them three species, *Pseudonuculana zhaoi*, *Deceptrix guangxiensis* and *Eoschizodus* cf *inflatus*, had a common range and were formerly found limited to the Lower Devonian Yujiang Formation in Guangxi, South China (Zhang 1977; Pojeta 1986). Two species, *Mecynodon*? sp and *Cypricardella*? sp are comparable to the corresponding specimens of the Lower Devonian Nagaoling Formation which underlies the Yujiang Formation (Pojeta 1986). One species, *Goniophora* (G) sp cf *G* (G) *rheana* is very similar to that of the Lower Devonian Ertang Formation (or the upper part of Yujiang Formation), Guangxi (Pojeta 1986). The other species, *Nuculoidea minuta*, has a longer range in Guangxi from the Lower Devonian Nagaoling Formation up to the upper Lower Devonian, or the lowermost Middle Devonian some people think, Sipai Formation (Pojeta 1986).

To synthesize the geological occurrences of the seven species, the greater part (five species) of the bivalvian assemblage of Bed 1 is limited to the Yujiang Formation in Guangxi, and a smaller part (two species) has formerly been recorded only within the lower horizon (Nagaoling Formation). Therefore it is probable that the bivalvian assemblage is horizontally equal to the Yujiang Formation or slightly older, but could not be younger.

The Yujiang Formation occupies the position about equal to the upper Siegenian stage to lower Emsian stage (Liao *et al* 1978; Hou *et al* 1982; Pojeta 1986), or equal to the lower Zlichovian stage (Wang *et al* 1982), according to the correlation with modern Devonian stratigraphic standards, for which European sequence was suggested (see Figure 3). This means that Bed 1 of Hong Kong was formed in geological time about 397 (late Siegenian stage) to 392 (early Emsian stage) million years ago or slightly older.

Bed 5 yields several forms of Bivalvia. We have identified two species, which are useful for age determination, from this bed. *Orthonota guangdongensis* is a characteristic species with a particular shell outline for stratigraphic correlation. It has been reported from the beds at three localities; the "Lower Devonian of Yunfu, west Guangdong" (Zhang 1977), the "Ertang Formation and Sipai Formation of Yongfu, Guangxi" (Pojeta 1986) and the "middle part of Lower Devonian of Longlin, Guangxi (Zhang & Zhao 1986). According to Xian and Zhou (1978) the "middle part of the Lower Devonian" of Zhang & Zhao (1986) may correlate to beds equal to the typical Ertang Formation and lower Sipai Formation in Guangxi. And according to Zhao *et al* (1978) and Nan *et al* (1983) the "Lower Devonian" in west Guangdong may be of upper Lower Devonian or Emsian stage because it is comparable to the *Zosterophyllum yunnanicum - Drapano - phycus spinaeformi* floral assemblage bearing-beds (Emsian stage, also see Cai & Li, 1982). However we believe that the ranges of the species *Orthonota guangdongensis* at the three localities are very closely related to each other but limited to the Ertang Fm and the Sipai Fm or their corresponding formations.

Another species, *Paracyclas rugosa*, of Bed 5 is a widespread one and has a range from Lower Devonian to Middle Devonian. Pojeta (1986) recorded that this species ranges "from the Ertang Formation to the lower part of the Donggangling Formation see Figure 3) and is "especially abundant in the Ertang Formation" in Guangxi (Pojeta 1986 p 81).

It is believed that the two species of Bed 5 commonly ranged from the Ertang Formation to the Sipai Formation according to former records and thus the age of Bed 5 is not younger or older than the two formations. To be more accurate, the thriving age of the species *Paracyclas rugosa* in the Ertang Formation may correspond to the age of Bed 5. And this formation can be correlated to the middle Emsian stage (about 392-390 million years old) on the European standard (Figure 3) according to Pojeta (1986).

Geological Significance of Our Discoveries

1 Changes to the Oldest Geological History of Hong Kong

Our knowledge of the oldest geological history of Hong Kong was greatly advanced by Lee's discovery of fish fossils in 1980 because it pushed the history "back about 120 million years" "from 250 million years (Permian) back to 370 million years (Devonian)" (see Lee 1982). Although the fish fossils had not been exactly identified then, both at generic and specific levels because of poor preservation, stratigraphic correlation of the fish-bearing bed with those in Guangdong can be made. In general the age of the Devonian fish-bearing strata in north and central Guangdong is of Middle Devonian, ie 387-384 million years old, according to Pan *et al* (1978) and Nan *et al* (1983).

Presenting the discovery of the Lower Devonian bivalves in the Bulletin of Hong Kong Polytechnic (May 1989 p 13) the age of the fauna was said to be "390 million years old" and "thus 20 million years older than the fossil fishes". In fact, the "390 million years old" is a conservative estimate of the age of Bed 1 at that time. As the actual age of Bed 1, as pointed

Devonian Stages in Europe		Devonian Sequence in Guangxi	Specific Ranges	Fossil-Beds of Hong Kong
Upper Devonian	Famenian	Wuzhishan Fm.		
	Frasmian	Liujiang Fm.		
Middle Devonian	Givetian	Donggangling Fm.		
	Eifelian	Yingtang Fm.		
		?		
Lower Devonian	Emsian	Sipai Fm.		Plover Cove Formation
		Ertang Fm.	★8 ●9--	Bed 5
		Yujiang Fm.	▲1 ▲2 ●3 ★4 ▲5 ▲6 ▲7 ---	Bed 1
	Siegenian	Nagaoling Fm.		
	Gedinnian	Lianhuashan Fm.		

1 Pseudonuculana zhaoi Pojeta & Zhang; 2 Deceptrix guangxiensis Zhang; 3 Nuculoidea minuta Pojeta & Zhang; 4 Goniophora (G.) cf. rheana Beush.; 5 Cypricardella? sp.; 6 Mecynodon? sp.; 7 Eoschizodus cf. inflatus (Roem.); 8 Paracyclas rugosa (Goldf.); 9 Orthonota guangdongensis Zhang; ..... stratigrahic range of the species in Guangxi and Guangdong; ▲ < 3, ● 5-10, ★ > 20 (the numbers of individuals of the species -- in Hong Kong)

Figure 3 Bivalvian horizontal correlation of Bed 1 and Bed 5 with those of Guangxi, South China

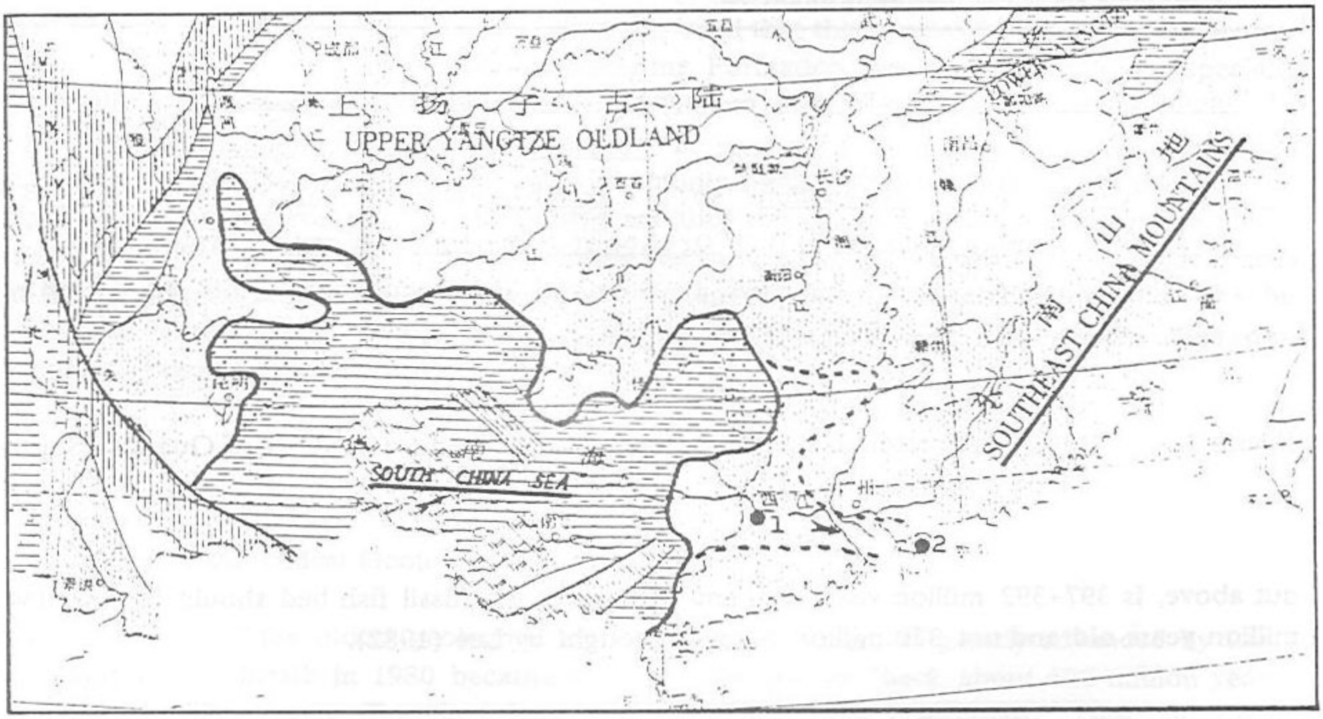
out above, is 397-392 million years old, and the age of the fossil fish bed should be 387-384 million years old and not 370 million years as thought by Lee (1982).

2 Changes Palaeogeography of South China

The Lower Devonian fossils, comprising marine bivalves, ostracods, gastropods, crinoids and some plant fragments, indicate a marine sedimentary environment, or one closely related to that at least.

On the Palaeogeographic Map of Lower Devonian Age (Wang *et al* 1985 Figure 58) there is a paleosea, namely the South China Sea, in the area west of Guangdong, which covers east Yunnan, South Guizhou and Guangxi provinces of south China. The greater part of Guangdong and Hunan is included in the "Southeast China Mountains" (see Figure 4), and thus the present marine fossil locality is more than 200 kilometres from the eastern border of the sea. Similar indicating ideas have also occurred in other studies. For example, in Hou (1978), Pan *et al* (1978), Liao *et al* (1978), Cai & Li (1982), Hou *et al* (1982) and Pojeta (1986). They all correlated the Devonian rocks of Guangdong and its northern and eastern neighbouring areas, such as Hunan and Jiangxi, with the Upper and Middle Devonian, but thought the Lower Devonian of these areas to be lacking (see Figure 5). This means that the opinions as in Wang *et al* (1985) have dominated the Chinese geologic academic circles for a long time, although some people held other opinions (such as Zhao *et al* 1978 and Nan *et al* 1983).

Our discovery provides dependable evidence to prove that the Lower Devonian transgression arrived in Hong Kong and that sea water certainly came from the western side, ie from the South China Sea, because of the faunal affinity to that of Guangxi which is believed to belong to that sea. Therefore we assume that there may have been a sea which extended from the South China Sea eastwards to Hong Kong passing through central west Guangdong (see Figure 4), where a marine fossil locality of Lower Devonian was found at Yunfu county, west Guangdong (Zhang 1977). Thus the South China Sea may have covered a larger area than was previously thought, and the region of north and central Guangdong may not have been mountainous but a delta or a littoral plain at that time.



● 1 ● 2 Lower Devonian marine fossil localities discovered in west Guangdong (1) and Hong Kong (2)

Showing the transgression passing through a possible sea way from the South China Sea eastwards to Hong Kong

The border of the South China Sea thought by Wang et al. (1985)

Figure 4 Palaeogeographic map of the Early Devonian of South China (from Wang *et al* 1985, modified)

Hou H.F., 1978 (for North Guangdong)

Age		Division
Upper Devonian	Xikuangshanian	Maotzefeng Formation
Upper Devonian	Shetianqiaonian	Tientzeling Formation
Middle Devonian	Dongganglingian	Dongganglinq Fm.
Middle Devonian	Yingtangian	Guitou Group
Lower Devonian	Sipaian	(lacuna)
Lower Devonian	Yujiangian	(lacuna)
Lower Devonian	Nagaolingian	(lacuna)
Lower Devonian	Lianhuashanian	(lacuna)

Pan et al., 1978 (for N.& C. Guangdong)

Age	Division	
Upper Devonian	Maotzefeng Formation	Maotzefeng Formation
Upper Devonian	Tientzeling Formation	Tientzeling Formation
Middle Devonian	"Chitzechao"F.	Laohuao Group
Middle Devonian	Dahepo Fm.	
Middle Devonian	Guitou Formation	
Lower Devonian	(lacuna)	(lacuna)

Liao et al., 1978 (for North Guangdong)

Age		Division
Upper Devonian	Famennian	Tientzeling Group
Upper Devonian	Frasnian	
Middle Devonian	Givetian	Chitzechao Fm.
Middle Devonian		Guitou Formation
Middle Devonian	Eifelian	(lacuna)
Lower Devonian	Emsian	
Lower Devonian	Siegenian	
Lower Devonian	Gedinnian	

Cai and Li, 1982 (for N.& C.Guangdong)

Age		Division
Upper Devonian	Famennian	Maotzefeng Fm.
Upper Devonian	Frasnian	Tientzeling Fm.
Middle Devonian	Givetian	Chitzechiao Fm.
Middle Devonian		Guitou Fm.
Middle Devonian	Eifelian	
Lower Devonian	Emsian	(lacuna)
Lower Devonian	Siegenian	
Lower Devonian	Gedinnian	

Hou et al., 1982 (for South Jiangxi)

Age		Division
Upper Devonian	Xikuangshanian	Xiashan Fm.
Upper Devonian		Sanmentan Fm.
Upper Devonian	Shetianqiaonian	Zhongpeng Fm.
Middle Devonian	Dongganglingian	Yunshan Fm.
Middle Devonian	Yingtangian	
Lower Devonian	Sipaian	(lacuna)
Lower Devonian	Yujiangian	
Lower Devonian	Nagaolingian	
Lower Devonian	Lianhuashanian	

Pojeta (ed.), 1986 (for Central Hunan)

Age		Division
Upper Devonian	Xikuangshanian	Xikuangshan Fm.
Upper Devonian	Shetianqiaonian	Shetianqiao Fm.
Middle Devonian	Dongganglingian	Qiziqiao Fm.
Middle Devonian		Tiaomajian Fm.
Middle Devonian	Yingtangian	
Lower Devonian	Sipaian	(lacuna)
Lower Devonian	Yujiangian	
Lower Devonian	Nagaolingian	
Lower Devonian	Lianhuashanian	

Figure 5 A table showing several published divisional schemes for Devonian strata of Guangdong and its neighbouring regions. In all of these the Lower Devonian was demonstrated as lacking (lacuna)

3 **Provides Evidence for Correlating Lower Devonian Formations in South China**

The Lower Devonian fossil locality of Hong Kong is the only known one in southeast China. Therefore its stratigraphic significance in the related area is important, for example in correlating the lower parts of the Devonian sequences of southwest Hunan and north and central Guangdong.

In southern Hunan the famous stratigraphic unit "Tiaomajian Formation", which was formerly considered to upper Middle Devonian in age, has been attentively investigated by Zhao *et al* (1978) and has been subdivided into three formations based on the lithological and palaeontological study as follows (in ascending order):

3 Tiaomajian Formation (ss) - Purple-red sandstones and quartz conglomerates containing fishes, dating to upper Middle Devonian or Givetian stage.

2 Lower Formation of Middle Devonian - Light grey quartz sandstones and conglomerates and dark green, light grey and green-yellow argillaceous siltstones or silty shales interbedding few purple-red beds, yielding plants, molluscs and brachiopods, belonging to lower Middle Devonian or Eifelian stage.

1 "Lower Devonian Formation" - Mainly of purple-red siltstones with some green shales intercalated, yielding plants *Zosterophyllum*? sp and *Taeniocrada*? sp. The age of this formation was included in the Lower Devonian but without any stage to be further correlated to.

In this sequence, however, the "Lower Devonian Formation" is lithologically very similar to the Lower Devonian "Plover Cove Formation" of Hong Kong, though the fossil evidence of the former was not too adequate then (Zhao *et al* 1978) for dating purposes. We are aware, however, that there exists an unpublished fossil record of a plant identified as *Zosterophyllum* cf *yunnanicum* Hsu, occurring in the same formation of Jiangyong, southwest Hunan (Nan *et al* 1983). This species is one of the indicators of the upper Lower Devonian (Emsian stage) floral assemblage in South China according to Cai & Li (1982). However we can correlate the "Lower Devonian Formation" to Hong Kong's "Plover Cove Formation" based on the lithological similarities and corresponding horizons to each other.

In north and central Guangdong the "Guitou Group" is also usually included in the Middle Devonian because of finds of fossil fish in the upper part. But later it was subdivided into two units, ie the Yangxi Group (red beds) in the lower and the Laohutou Formation (quartzose sandstones and conglomerates, containing fish fossils) in the upper by Nan *et al* (1983) according to the regional stratigraphic correlation (see Figure 7). They (Nan *et al* 1983) considered that the Yangxi Group may extend its lower part into the Lower Devonian age because of the lithological similarity to that of the "Lower Devonian Formation" of Hunan, although no fossil had been found in the group at the time. After the correlation we believe that the Yangxi Group is equal to the present "Plover Cove Formation" in age, and that it should not be impossible to find fossils in this group.

Age		Central & South Hunan		Northwest Hunan
Upper Devonian	Famenian	Xikuangshan Fm.	Yuelushan Fm.	Xiejingshi Fm.
Upper Devonian	Frasian	Shetianqiao Fm.	"Wujiafang" Fm.	Huangjiatun Fm. / "Yun-taiguan Fm."
Middle Devonian	Givetian	Qiziqiao Fm.	Qiziqiao Fm.	Xiaoxiyu Fm.
Middle Devonian	Givetian	Tiaomajian Fm.	Tiaomajian Fm.	
Middle Devonian	Eifelian	Lower Formation of Middle Devonian		(lacuna)
Lower Devonian		"Lower Devonian Fm."		

Figure 6 Devonian stratigraphic correlation in Hunan. This table is taken from Zhao *et al* (1978) who separated the "Lower Devonian Formation" (at left-below) from the so-called "Middle Devonian Tiaomajian Formation". This "Lower Devonian Formation" is here correlated with the Lower Devonian "Plover Cove Formation"

Age		Yinde-Hongyian Area	Shaoguan-Lechang Area	Renhua-Hukeng Area
Upper Devonian	Xikuangshanian	Yinde Gr.	Xikuangshan Fm.	Sanmentan Fm.
Upper Devonian	Shetianqiaonian	Yinde Gr.	Shetianqiao Fm.	Zhongpeng Fm.
Middle Devonian	Dongganglingian	Qiziqiao Fm.	Huanggangling Fm.	Yunshan Fm.
Middle Devonian	Dongganglingian	Tiaomajian Fm.	Laohutou Fm.	Yunshan Fm.
Middle Devonian	Yingtangian	(lacuna)	Yangxi Gr.	(lacuna)
Lower Devonian	Sipaian	(lacuna)	Yangxi Gr.	(lacuna)
Lower Devonian	Yujiangian	(lacuna)	Yangxi Gr.	(lacuna)
Lower Devonian	Nagaolingian	(lacuna)	Yangxi Gr.	(lacuna)
Lower Devonian	Lianhuashanian	(lacuna)		(lacuna)

Figure 7 Subdivision of the Devonian strata in North Guangdong. This table is taken from Nan *et al* (1983) who regarded the Yangxi Group to be partly Lower Devonian in age. The group is here correlated to the Lower Devonian of Hong Kong

Acknowledgements

Thanks are due to Dr M Anson, Head of the Department of Civil Structural Engineering, Hong Kong Polytechnic, for his encouragement. We extend our sincere thanks to all our colleagues of China and Hong Kong, especially to Prof W S Wu, Director of the Nanjing Institute of Geology and Palaeontology, and Dr J T Xu, Deputy Director of the Institute for their great support to our research project. The authors are very grateful for the assistance provided by the Geotechnical Control Office and Mr K W Lai, both in providing boats and land transport, and in collecting the fossil specimens.

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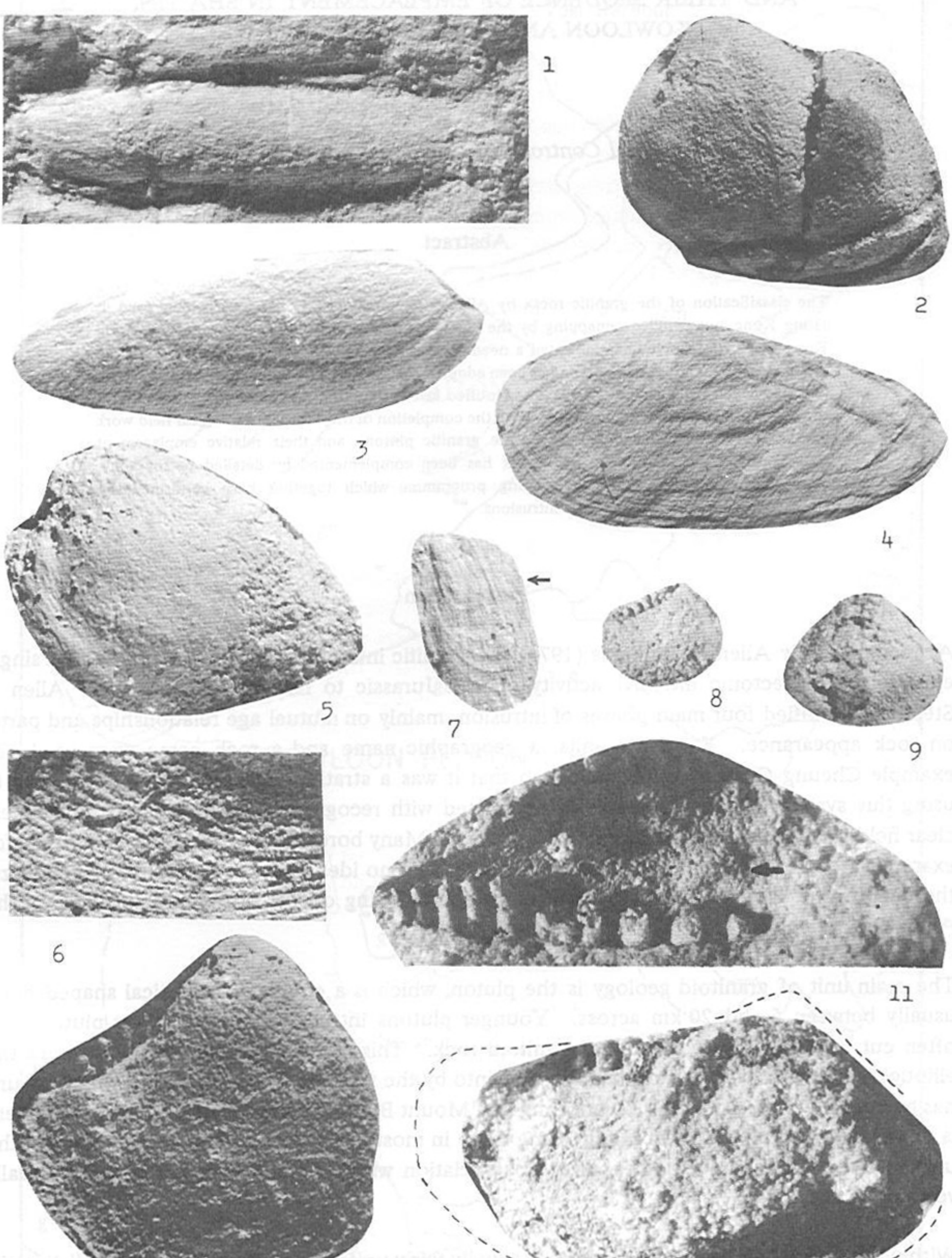
Explanation of Plate 1

(All specimens illustrated on this plate are collected from the "Plover Cove Formation", east of Plover Cove Reservoir, New Territories, Hong Kong)

Figure 1	*Orthonota guangdongensis* Zhang
	Lateral view of spread valves of composite mold (x 6.5); Bed 5
Figure 2	*Eoschizodus* cf *inflatus* (Roemer)
	Left-lateral view of internal mold (x 2.8); Bed 1
Figure 3	*Sanguinolites* sp 1
	Right-lateral view of composite mold (x 6); Bed 5
Figure 4	*Sanguinolites* sp 2
	Left-lateral view of composite mold (x 5); Bed 5
Figures 5, 6	*Goniophora* (*Goniophora*) sp cf G (G) *rheana* Beushausen
5	Left-lateral view of internal mold (x 3.6); Bed 1
6	View of sculpture of left external mold (partly) (x 6); Bed 1
Figure 7	*Paracyclas rugosa* (Goldfuss)
	Left-lateral view of composite mold (x 5); Bed 5
Figures 8, 9	*Nuculoidea minuta* Pojeta & Zhang
8	Left-lateral view of internal mold (x 5); Bed 1
9	Left-lateral view of internal mold (x 5); Bed 1
Figure 10	*Deceptrix guangxiensis* Zhang
	Right-lateral view of internal mold (x 5.6); Bed 1
Figures 11, 12	*Pseudonuculana zhaoi* Pojeta & Zhang
11	Right-dorsal view showing hinge teeth of posterior row and two scars (arrows) (x 6)
12	Right-lateral view of internal mold (x 4); Bed 1

Plate 1



Geological Society of Hong Kong Newsletter Vol 8 Pt 1 p 18-26

THE CLASSIFICATION OF GRANITIC ROCKS IN HONG KONG AND THEIR SEQUENCE OF EMPLACEMENT IN SHA TIN, KOWLOON AND HONG KONG ISLAND

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Abstract

The classification of the granitic rocks by Allen & Stephens (1971) has been widely used in Hong Kong, but detailed remapping by the Geotechnical Control Office as part of the Hong Kong Geological Survey has indicated a need for a revised classification. The division of the granites using the grain size criteria has been adopted for the new 1:20 000 geological map series and this enables the rock to be readily identified in both outcrop and hand specimen without the need for age relation implications. With the completion of the 1:20 000 geological field work in Spring 1990, a detailed picture of the granitic plutons and their relative emplacement sequences has emerged. The field work has been complemented by detailed petrography, geochemistry and an isotope age-dating programme which together have confirmed the stratigraphic history of the granite intrusions.

Introduction

As recognised by Allen & Stephens (1971) the granitic intrusions of Hong Kong form a single episode of late tectonic intrusive activity of Late Jurassic to Early Cretaceous age. Allen & Stephens identified four main phases of intrusion, mainly on mutual age relationships and partly on rock appearance. For most units, a geographic name and a rock name were used, for example Cheung Chau Granite, indicating that it was a stratigraphic unit. The drawbacks to using this system involve the problems associated with recognising the unit, impossible unless clear field relations with other granites are present. Many borehole logs in Hong Kong read for example 'Needle Hill Granite' but leave the reader with no idea of the rock texture or grain size; the decision for assigning the rock unit name simply being on the borehole's location on the Allen & Stephens (1971) 1:50 000 geological map.

The main unit of granitoid geology is the pluton, which is a circular or elliptical shaped body usually between 5 and 20 km across. Younger plutons intruded alongside older plutons will often cut into and digest the older granitoid rock. This can be seen in Figure 1 where the elliptical-shaped Sha Tin Pluton has been cut into by the younger Kowloon pluton which in turn has been partly digested by the Kwun Tong and Mount Butler Plutons. The pluton development is not seen to its full extent in Hong Kong since in most cases we are only able to observe the upper part of the intrusive bodies, often in association with the 'roof or capping' rocks, usually volcanic strata.

Within the individual plutons, the granite is usually fairly uniform and outcrops display distinctive textural and petrological characteristics. Detailed field mapping has thus allowed the geologist to clearly define the pluton boundaries, and at these boundaries the age relationship criteria have been established.

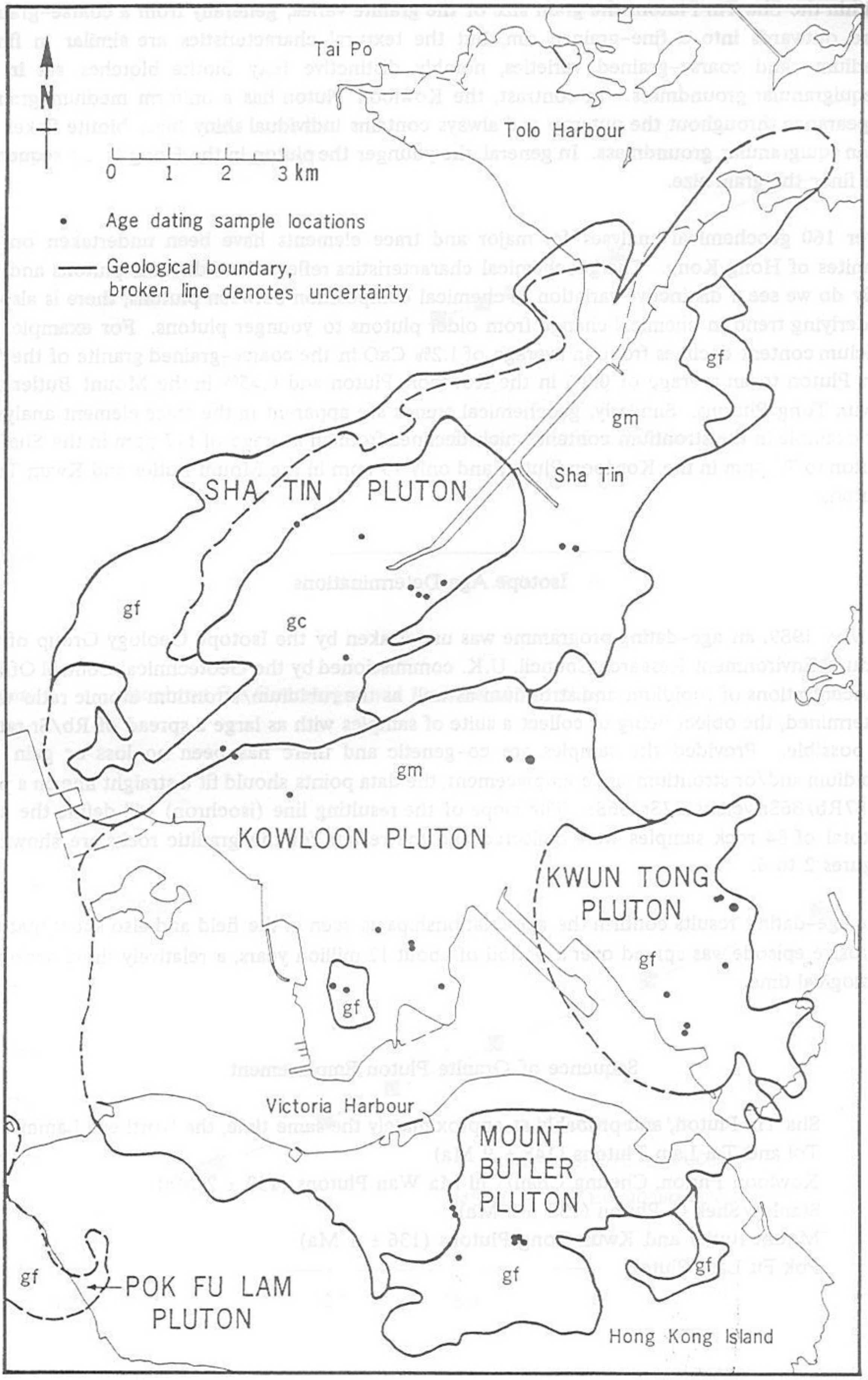

Figure 1 Granite Plutons of Sha Tin, Kowloon and North Hong Kong Island

Within the Sha Tin Pluton, the grain size of the granite varies, generally from a coarse-grained core outwards into a fine-grained rim, but the textural characteristics are similar in fine-, medium- and coarse-grained varieties, notably distinctive felty biotite blotches set in an inequigranular groundmass. In contrast, the Kowloon Pluton has a uniform medium-grained appearance throughout the outcrop and always contains individual shiny black biotite flakes set in an equigranular groundmass. In general, the younger the pluton in the Hong Kong sequence, the finer the grain size.

Over 160 geochemical analyses for major and trace elements have been undertaken on the granites of Hong Kong. The geochemical characteristics reflect the individual plutons and not only do we see a distinctive variation in chemical composition between plutons, there is also an underlying trend in chemical change from older plutons to younger plutons. For example, the calcium content declines from an average of 1.2% CaO in the coarse-grained granite of the Sha Tin Pluton to an average of 0.9% in the Kowloon Pluton and 0.45% in the Mount Butler and Kwun Tong Plutons. Similarly, geochemical trends are apparent in the trace element analyses, for example in the strontium content which declines from an average of 117 ppm in the Sha Tin Pluton to 75 ppm in the Kowloon Pluton and only 15 ppm in the Mount Butler and Kwun Tong Plutons.

Isotope Age Determinations

In May 1989, an age-dating programme was undertaken by the Isotope Geology Group of the Natural Environment Research Council, U.K. commissioned by the Geotechnical Control Office. Concentrations of rubidium and strontium as well as the rubidium/strontium atomic ratio were determined, the object being to collect a suite of samples with as large a spread of Rb/Sr ratios as possible. Provided the samples are co-genetic and there has been no loss or gain of rubidium and/or strontium since emplacement, the data points should fit a straight line on a plot of 87Rb/86Sr versus 87Sr/86Sr. The slope of the resulting line (isochron) will define the age. A total of 84 rock samples were collected and the results for the granitic rocks are shown in Figures 2 to 6.

The age-dating results confirm the age relationships as seen in the field and also show that the intrusive episode was spread over a period of about 12 million years, a relatively short period in geological time.

Sequence of Granite Pluton Emplacement

1. Sha Tin Pluton, and probably at approximately the same time, the Northern Lamma, Po Toi and Tai Lam Plutons (148 ± 9 Ma)
2. Kowloon Pluton, Cheung Chau/Chi Ma Wan Plutons (139 ± 2 Ma)
3. Stanley/Shek O Pluton (138 ± 2 Ma)
4. Mount Butler and Kwun Tong Plutons (136 ± 1 Ma)
5. Pok Fu Lam Pluton

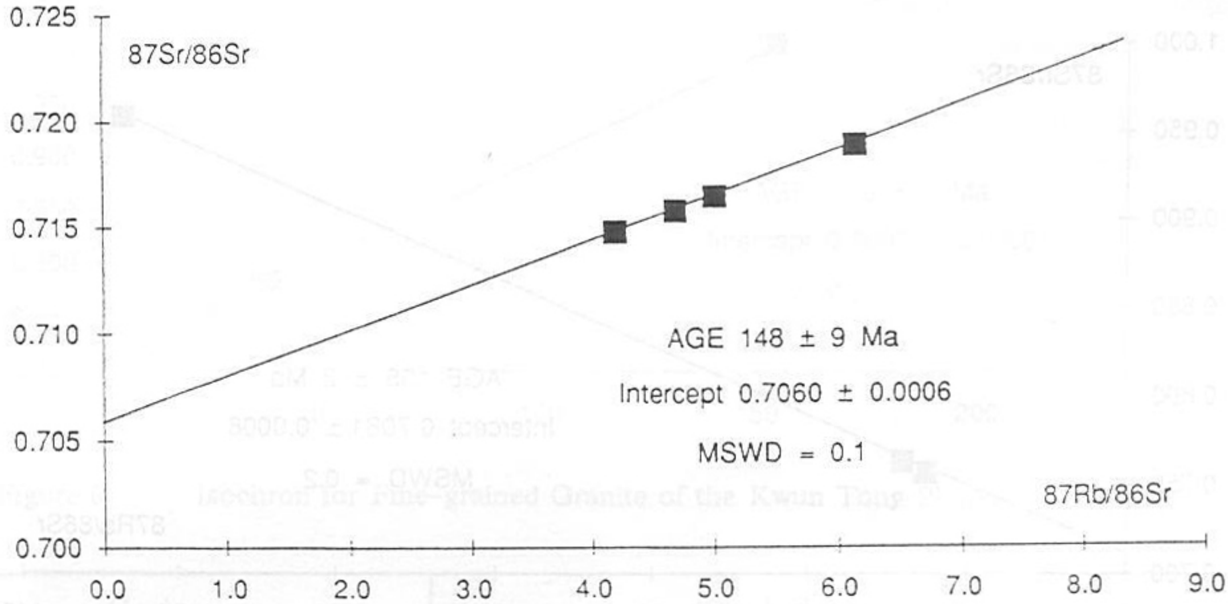

Figure 2 Isochron for Coarse-grained Granite of the Shatin Pluton

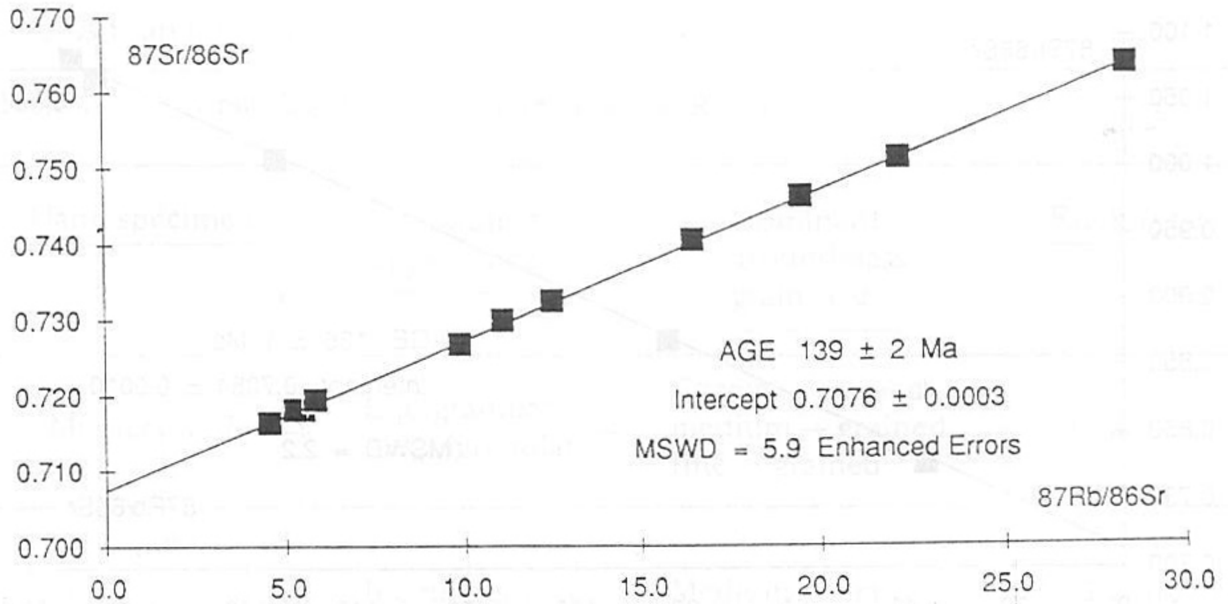

Figure 3 Isochron for Medium-grained Granite of the Kowloon Pluton

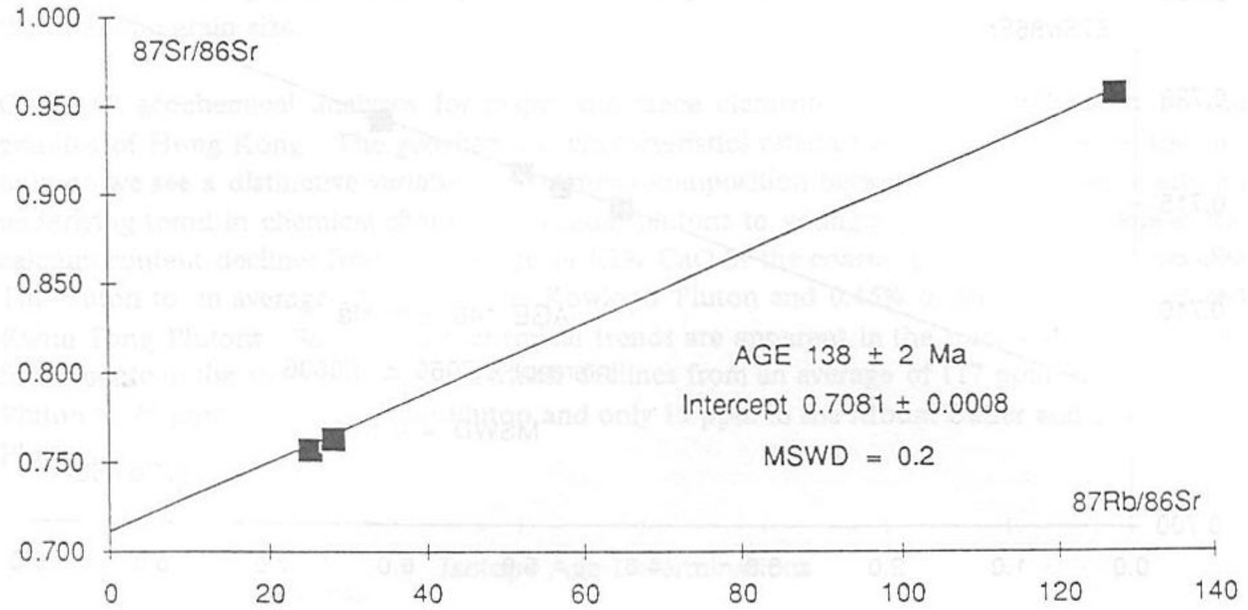

Figure 4 Isochron for Medium-grained Granite of the Stanley/Shek O Pluton

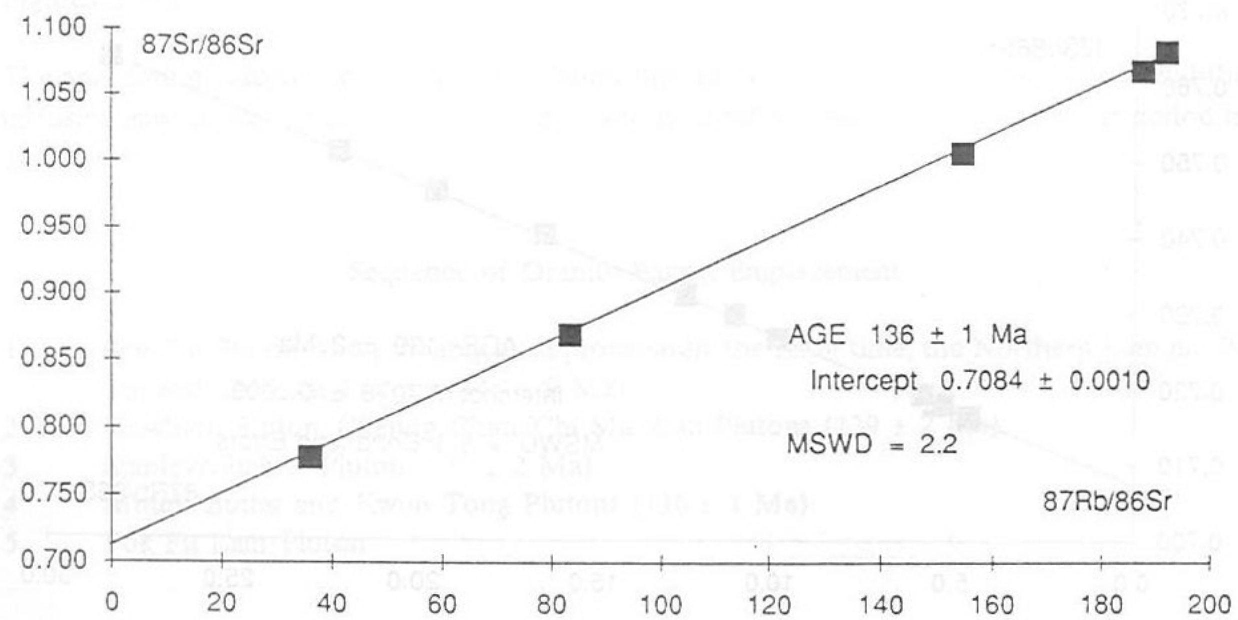

Figure 5 Isochron for Fine-grained Granite of the Mount Butler Pluton

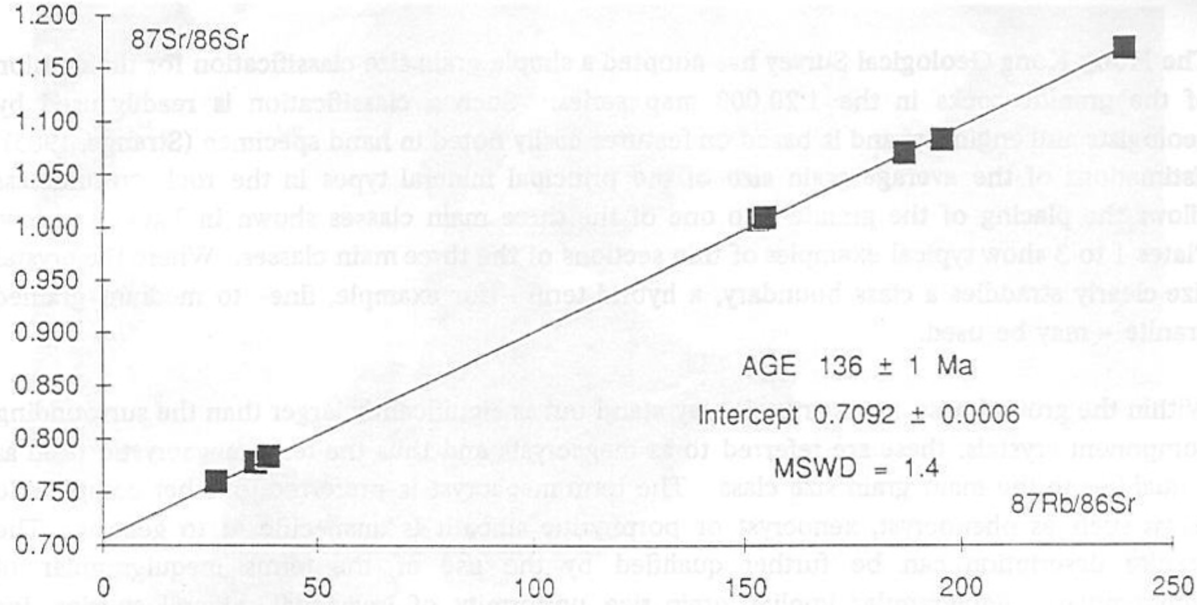

Figure 6 **Isochron for Fine-grained Granite of the Kwun Tong Pluton**

Grain size	Rock description
Above 20 mm	Very coarse-grained (pegmatitic) granite
6 to 20 mm	Coarse-grained granite
2 to 6 mm	Medium-grained granite
0.06 to 2 mm	Fine-grained granite
Less than 0.06 mm	Rhyolite

Table 1 **Grain Size Classification for Plutonic Rocks**

Hand specimen		Groundmass appearance		Dominant groundmass grain size		Rock type
Megacrysts ?	→	Equigranular inequigranular	→	Coarse – grained medium – grained fine – grained	→	Granite
Example: Megacrystic		Inequigranular		Medium – grained		Granite

Table 2 **Procedure for Describing Granitic Rocks, with Examples**

Grain Size Classification

The Hong Kong Geological Survey has adopted a simple grain size classification for the division of the granitic rocks in the 1:20 000 map series. Such a classification is readily used by geologists and engineers and is based on features easily noted in hand specimen (Strange, 1985). Estimations of the average grain size of the principal mineral types in the rock groundmass allows the placing of the granite into one of the three main classes shown in Table 1 below. Plates 1 to 3 show typical examples of thin sections of the three main classes. Where the crystal size clearly straddles a class boundary, a hybrid term - for example, fine- to medium-grained granite - may be used.

Within the groundmass, some crystals may stand out as significantly larger than the surrounding component crystals; these are referred to as megacrysts and thus the term megacrystic used as a qualifier to the main grain size class. The term megacryst is preferred to other comparable terms such as phenocryst, xenocryst or porphyritic since it is unspecific as to genesis. The granite description can be further qualified by the use of the terms inequigranular of equigranular. Equigranular implies grain size uniformity of individual mineral species, for example all the quartz crystals in one sample of a similar grain size and all the alkali feldspar crystals of roughly equal grain size (see Plates 2 and 3). Inequigranular granite contains conspicuous variation in grain size and usually represents a modification of the original primary texture (Plate 4), see section below.

Modification of the granite

The detailed field mapping and subsequent petrographical studies have confirmed that in parts of Hong Kong the original primary granite texture has been altered by a process of infiltration of later stage granitic fluids, possibly whilst the original magma was still in a hot semi-solidified state. This patchy modification produces an inequigranular texture with occasional remnants of the original primary granite fabric (plate 4). Such modification of the granite is widespread in the Northern Lamma Pluton and the Tsing Shan and Tai Lam Plutons of the Western New Territories.

Conclusions and Recommendations

The geologist in the field, for example whilst logging cores will not be in a position to identify immediately the age of the granite, and should not refer back to the superseded Allen & Stephens (1971) system of naming the granites. Instead, the much simpler grain size classification described in this paper should be adopted. The procedure as summarized in Table 2 is recommended. If you are certain which pluton the sample occurs and it is typical of the granite in that pluton, then the additional qualifier 'of the .... Pluton' can be added. As an example, the description could be 'equigranular medium-grained granite of the Kowloon Pluton'.

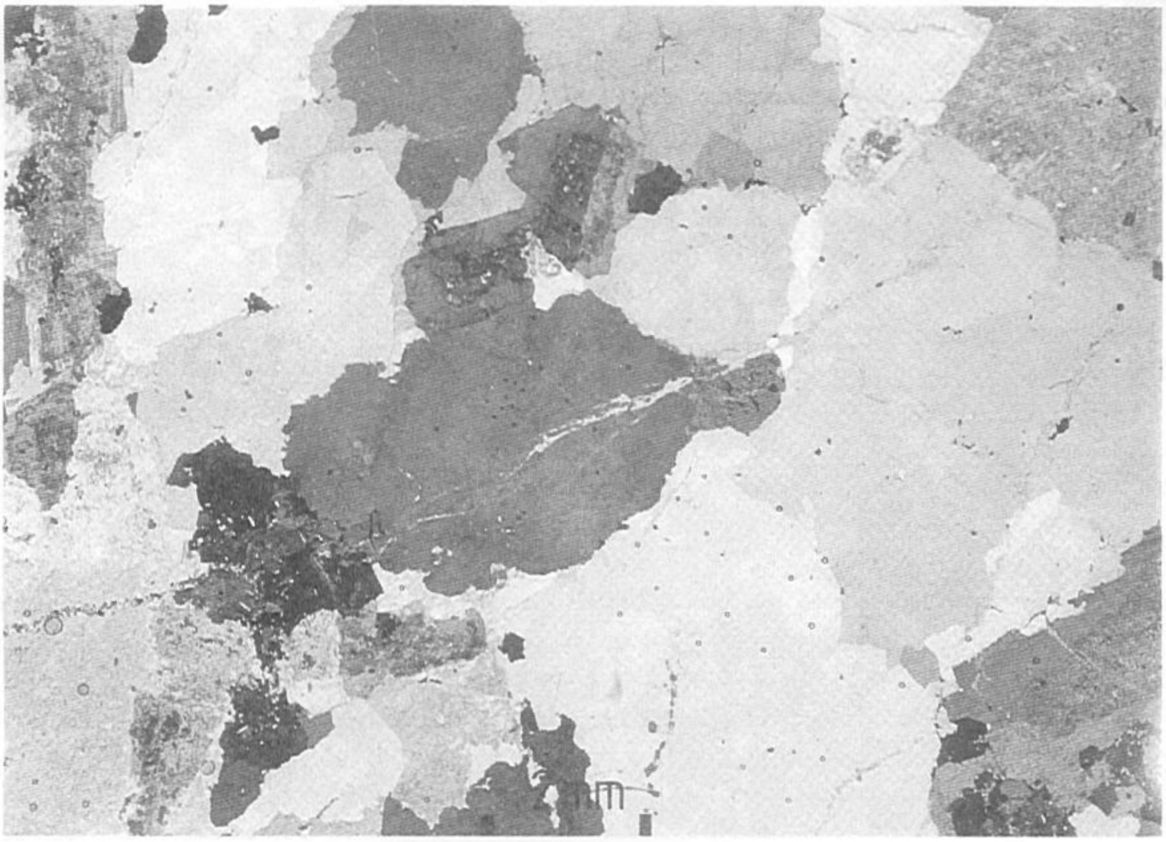

Plate 1 Thin Section of Coarse-grained Granite (HK620) from Sheung Keng Hau, Sha Tin Pluton; 2 mm scale shown

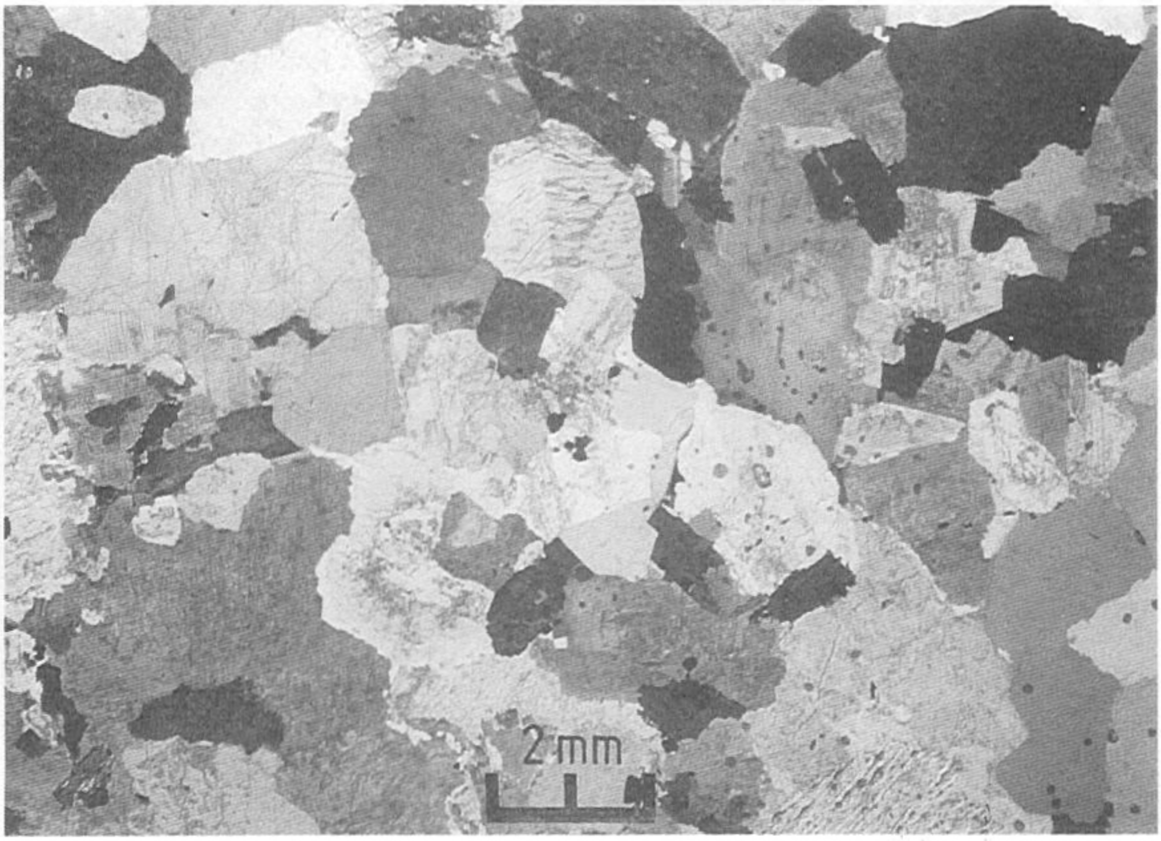

Plate 2 Thin Section of Medium-grained Granite (HK4237) from Wan Chai, Kowloon Pluton; 2 mm scale shown

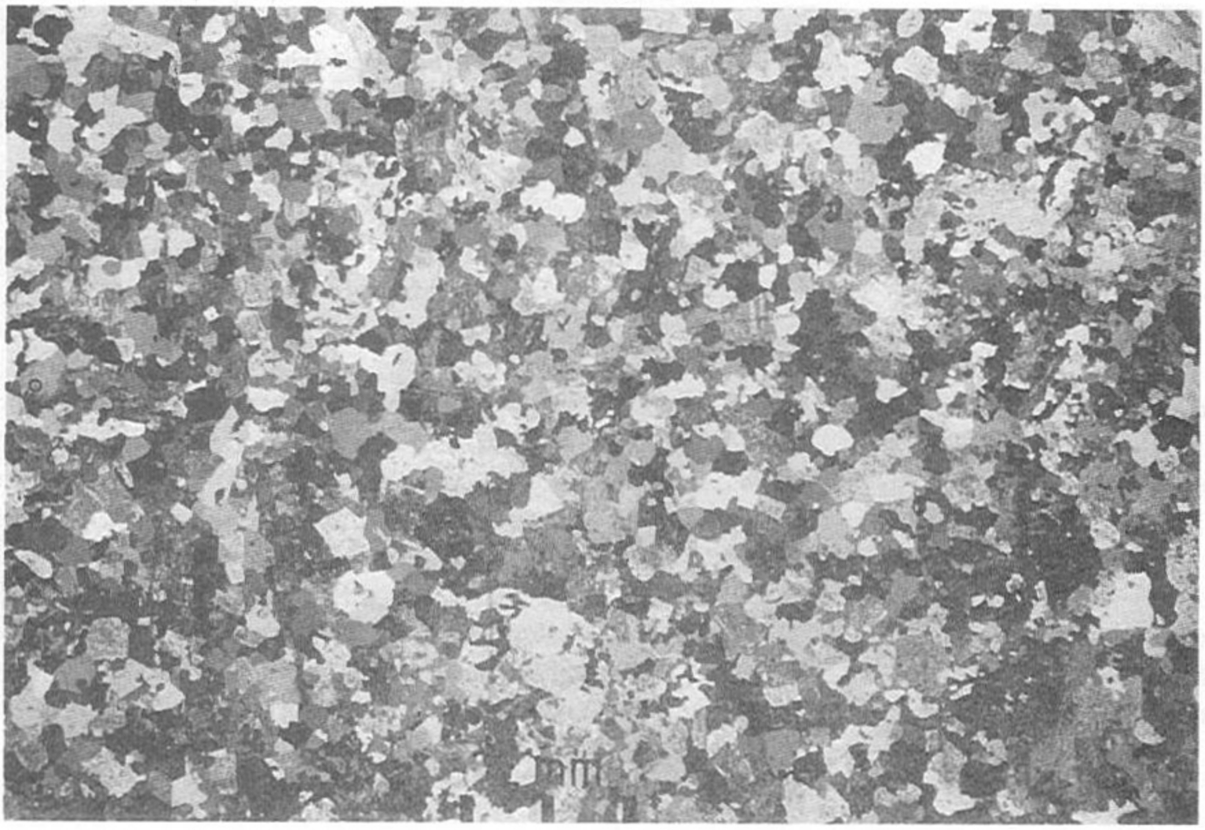

Plate 3 Thin Section of Fine-grained Granite (HK580) from Shun Lee, Kwun Tong Pluton; 2 mm scale shown

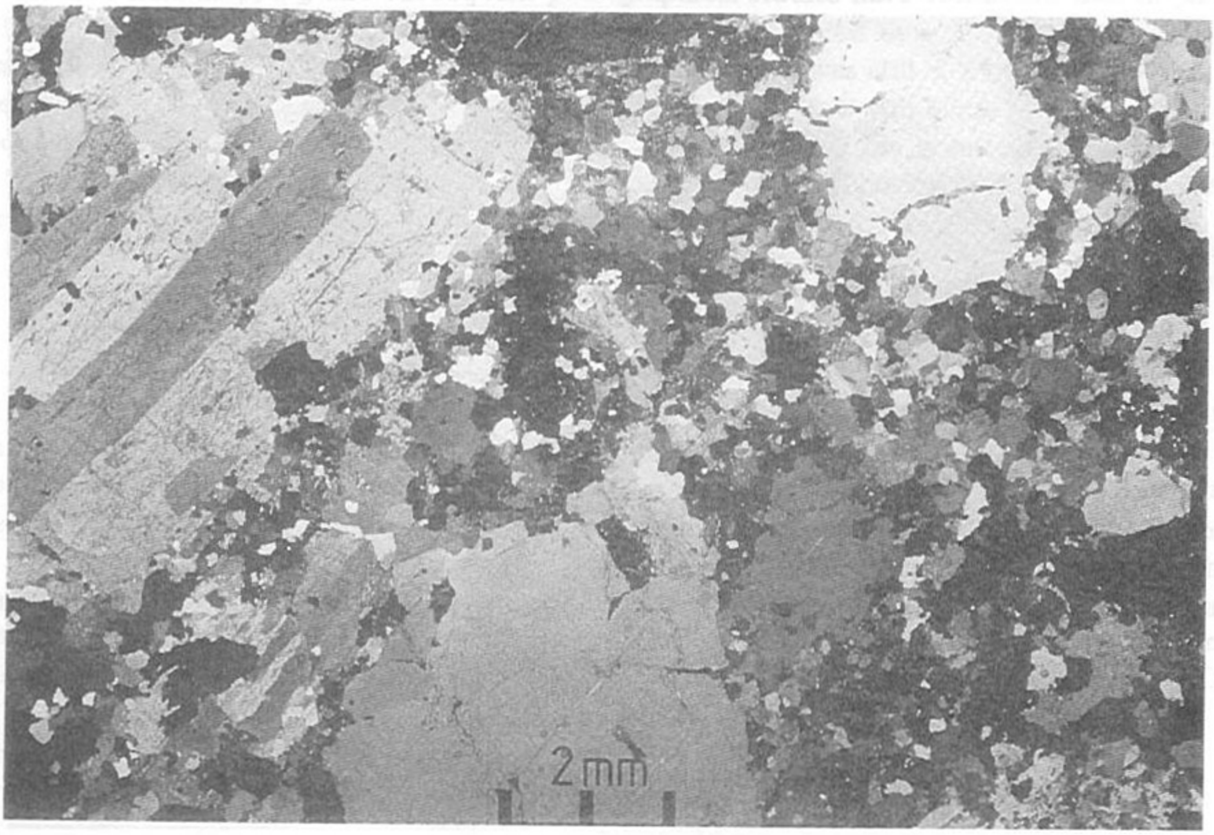

Plate 4 Thin Section of a Modified Coarse-grained Granite (HK807) from Tsang Tai Uk, Showing Fine-grained Interstitial Texture; 2 mm scale shown

Acknowledgements

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Geological Society of Hong Kong Newsletter Vol 8 Pt 1 p 28-34

PRELIMINARY STUDIES ON VOLCANIC ROCKS OF MESOZOIC-CENOZOIC AGE IN THE SANSHUI BASIN OF GUANGDONG PROVINCE

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The Sanshui basin west of Guangzhou is a fault-depression basin of Cretaceous-Eogene age, about 120 km long and 77 km wide and with an area of 3 300 km^2 (Figure 1). The formation, shape and evolution of the basin is controlled by regional tectonics. Three sets of northeast, east and northwest faults form a complex of irregular graben structures. Within the basin are found beds of Cretaceous-Eogene age more than 6 000 metres thick, of fresh water and continental origin, covered by Quaternary deposits (Table 1). Interspersed with the sedimentary strata, and especially those of Eocene age, are many occurrences of basaltic, andesitic, trachytic and rhyolitic volcanic rocks, both lavas and pyroclastics.

The volcanic rocks of the basin have been found in boreholes and exposures along a north-south axial line. Most of the information comes from boreholes, but there are 23 separate surface exposures. There is an overall total thickness of more than 2 000 metres. Comparison of borehole cores together with stratigraphic evidence suggests 13 stages of vulcanicity comprising over 100 eruptions. Details of the stages are given in Table 2. The volcanic rocks exposed at the surface mostly belong to Stages 10 and 13. It will be seen from Table 2 that the main concentration of recorded eruptions is in stages 9-10 (Late Eocene-Oligocene), with 30 in stage 10 alone. Rocks formed in stage 10 are trachyte-trachyandesites and co-genetic pyroclastics. The maximum thickness exceeds 1 000 m. There are two eruption centres, Xiqiaoshan and Libianshan. The former, located between Dakonfeng and Shiyanyuan, is a layered cone 287 metres high having an area of 15 km^2 (Figure 2). Three eruptive cycles have been recognised, of pyroclastics, trachyte lavas and agglomerate. At the Libianshan vent, only trachytic agglomerate may be seen.

The volcanic rocks of stage 13 (the latest one) are alkalic basalts, tephrite and basanite. Wangjieshan, near Foshan, is a hill 51 metres high made of basalt with columnar jointing. The columns are more steeply dipping in the centre than at the sides, giving a fan-shaped appearance. This indicates that the viscosity of the magma increased as gases escaped and the magma chamber lost its explosive force. The lava seems to have been pushed out of the vent little by little in the manner of toothpaste squeezed out of a tube. The lava finally blocked the vent and vulcanicity ended.

According to geophysical data, the thickness of the crust in the Sanshui Basin is 36-37 km. Sedimentation and volcanic activity were controlled by three sets of faults, trending respectively northeast, northwest and east. Long, steady and extensive sinking made possible the accumulation and preservation of the great thickness of Cretaceous and Eogene sediments and volcanic rocks.

The volcanic rocks in the basin are bimodal rhyolite-basalt associations, of a type associated with rifting. The presence of alkaline and tholeiitic basalts and olivine andesitic trachyte suggests a continental origin and we believe the Sanshui basin was an inland rift in the early Cenozoic. Beginning from the later Yanshan movement (Cretaceous, 140–70 Ma) the temperatures in the upper mantle rose as the result of subduction of oceanic crust under the South China continental margin. The upper mantle rocks were partly melted, forming magma which forced its way upward through the fracture zone to form the volcanoes. Further eruptions occurred in the Early Cenozoic (70–26 Ma), after subduction had ceased and as the crust slowly cooled and contracted. The alkalinity of the eruptions increased with time as the crust thickened and the magma assimilated more country rock.

Acknowledgments

The authors thank Professor Huang Yu Kun and Mne Han Qiuxiang for their help in preparing the paper.

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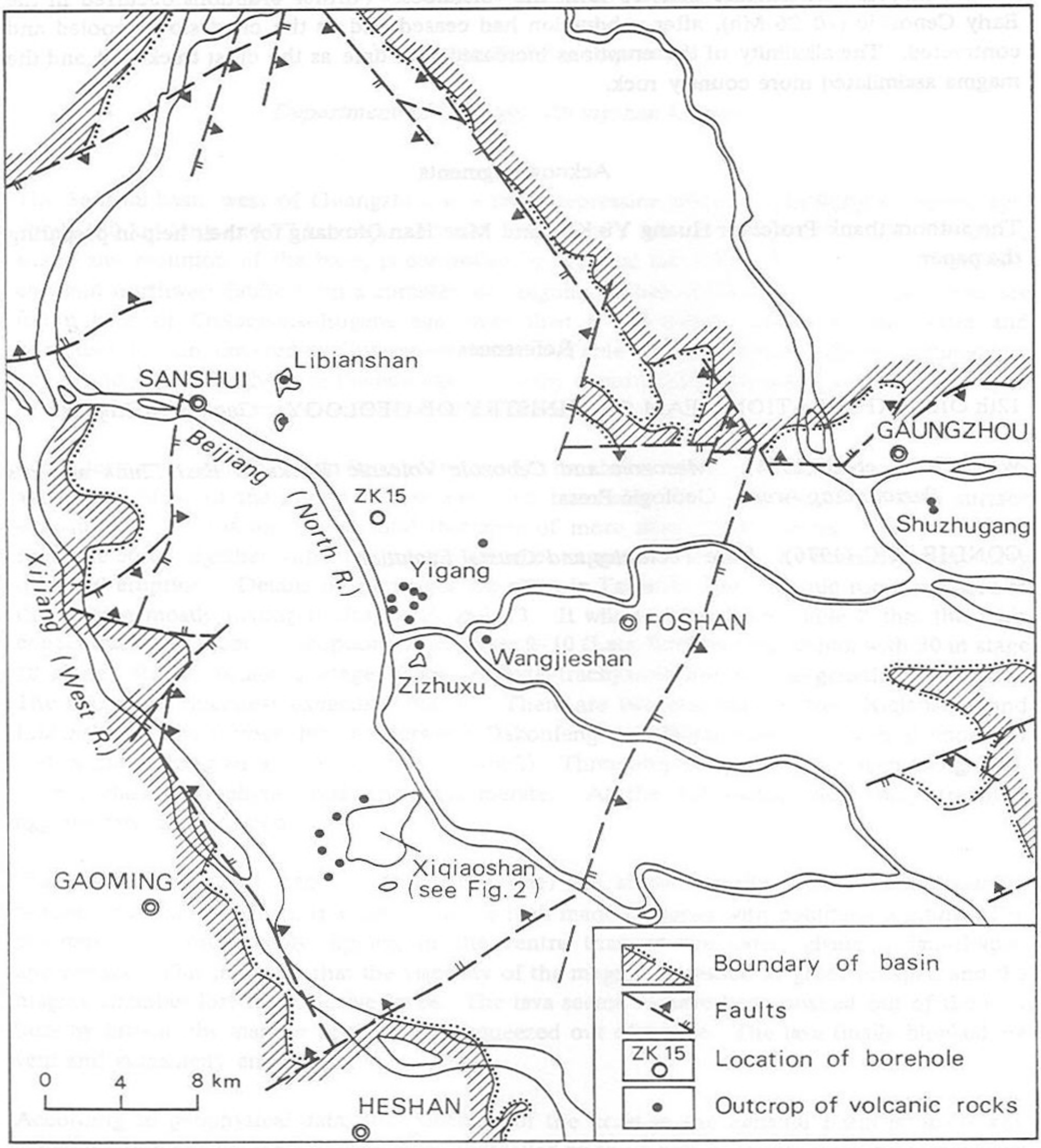


Figure 1 Location of the Sanshui Basin, Guangdong Province

Earthem	System	Series	Group	Symbol	Thick (m)	Sedi. facies	Petrographic characters
Ceno-zoic	Quater-nary			Q	5	delta and alluvial	sand and pebble, clay and mud
	Terti-ary	Eocene -- Oligo-cene	Hua-yong	E2-3b	1804	middle: pluvial	brownish yellow-brown conglomerate sandwiching sandstone, siltstone and mudstone, basalt
						upper: alluvial	greyish-grey alternation of conglomerate and siltstone, containing Tectochara, Ostracoda
						middle: alluvial	graywacke-mudstone sandwiching rhyolitic porphyry, basalt, trachyte and pyroclastic rocks, containing Tectochara, Ostracods and Fish fossil
						bottom: alluvial, pluvial	rhythmic unit of grey conglomerate and sandy mudstone, containing Tectochara, Ostracoda, Lamellibranchia and Gastropoda
		Eocene	Xibu	E2x	991	upper: alluvial	rhythmic unit of graywacke and mudstone, containing Tectochara, Ostracoda, Lamellibranchia, Gastropoda
						bottom: littoral and lacustrine	alternation of grey siltstone, sandstone, containing Tectochara, Ostracoda, Lamellibranchia, Fish fossil
		Paleo-cene --- Eocene	Buxin	E1-2b	1276	primary shallow and deep lacustrine facies and alluvial facies	mostly dark grey mudstone, muddy siltstone and fine sandstone, partly sandwiching limestone, oilshale, gypsum mudstone, gypsum bed and turbidite sandstone, being the most important oil-collective and oil-bearing stratum in the basin, containing Tectachara, Ostracoda, amellibranchia, gastrapoda, Estheria, Foraminiferida and Fish fossil
Meso-zoic	Creta-ceous	upper	Da-long-shan	K2d	363 --- 884	upper: littoral and lacustrine	dark grey mudstone and siltstone, containing Algae, and Anthozoa
						bottom: pluvial to alluvial	rhythmic unit of grey and purple conglomerate and silty mudstone, containing Tectochara, Ostracoda and Gastropada
			San-shui	K2s	0--722	upper: lacustrine	mostly brown silty mudstone, containing Tectochara, Ostracoda, Lamellibranchia, Dinosaurian eggs
						bottom: pluvial to lacustrine	rhythmic unit of grey sandy conglomerate and sandy mudstone, with a little gypsum, containing Tectochara, Ostracoda
		lower	Bai-ho-tong			littoral to lacustrine	alternation of brown silty mudstone and siltstone, sandwiching gypsum bed, containing ostracoda, Estheria and Lamellibranchia
	Tria-ssic	upper	Xiao-ping	T3x	328 --- 570	alternate facies of marine and continental	rhythmic unit of graywacke, sand and pebble

Table 1 **Strata in the Sanshui Basin**

Phase	Epoch	Number of Eruption	Rocks	Thickness (m)	Distribution	K-Ar Age * (m.y.)
13	3-4 E2-3h	3	alkali basalt, tephrite, basanite	11.06	exposures at Jingxinggang, Wangjieshan	
12	2 E2-3h	3	trachytic pyroclastic rocks	9.00-- 84.00	in bore holes in Huayong district	
11	2 E2-3h	3	basalt, alkali basalt	1.74-- 29.50	in bore holes at Lianzhi-tang and Tongshentang	
10	2 E2-3h	30	trachyte, trachy ande-site and their pyro-clastic rocks	0.80-- >1000.00	in bore holes in middle of the basin and exposures at Xiqiaoshan, Libianshan	45
9	2 E2-3h	17	basalt and basaltic pyroclastic rocks	2.00-- 277.70	in bore holes in middle of the basin	
8	2 E2-3h	9	rhyolite and rhyolitic pyroclastic rocks	4.91-- 384.50	in bore holes at Zumaying and Xiaotang	
7	1 E2-3h	5	basaltic pyroclastic rocks, partly basalt	1.50-- 72.00	in bore holes in middle of the basin	
6	2 E2x	5	basaltic pyroclastic rocks, partly basalt	1.00-- 86.00	in bore holes in middle of the basin	
5	1 E2x	7	trachyte, rhyolite and rhyolitic pyroclastic rocks	0.50-- 281.50	in bore holes in middle of the basin	51
4	2-3 E1-2b	12	basalt and andesitic pyroclastic rocks, partly basalt and andesite	0.85-- 220.50	in bore holes in middle of the basin	
3	1 E1-2b	1	rhyolite and pyrocla-stic rocks	0.80-- 3.37	in bore holes at Liuxi and Gaofang	
2	K2s	4	basalt	0.87-- 55.50	in bore holes at Shiwei-tang, Tangcun, Zumaying and Xiaotang	61
1	K1b	1	rhyolitic porphyry rhyolite		exposures at Xuozhonggang, Fenggang near Guangzhou and in bore holes at Zumaying	83

(* acc. Summary of Isotopic Ages in China, 1979, 1981)

Table 2 Phases of Volcanism in the Sanshui Basin

No.	Depth (m)	Rocks	Rhythm
1	0.00--246.00	sand and pebble	
2	246.00--248.93	trachytic lithic and crystal fragment tuff, with volcanic mudballs and trachytic lithic fragments	
3	2.40.93-304.49	felspathic lithic sandstone with trachytic and rhyolitic fragments	III
4	304.49--349.06	trachytic crystal and lithic tuff with trachytic, rhyolitic and basanitic fragments	
5	349.00--494.30	clay rocks, micritic dolomite, silt-stone--sandstone--sandy conglomerate	II
6	494.30--552.28	basalt	
7	552.28--558.40	tuffaceous siltstone	
8	558.40--564.30	rhyolitic breccia tuff--tuffite	
9	564.30--570.00	rhyolite	
10	570.00--589.90	rhyolitic volcanic breccia and tuff	
11	589.90--616.90	tuffaceous sandstone and siltstone	
12	616.90--689.94	rhyolite	I
13	689.94--870.92	rhyolitic volcanic breccia and tuff	
14	870.92--947.65	tuffaceous conglomerate, sandstone, mudstone sandwiching two layers of micritic limestone	
15	947.65--956.37	rhyolitic lithic and crystal tuff	
16	956.37--1006.47	sand and pebble, mudstone	

N.B. Rhythm I corresponds to Phase 8 in Table 2, Rhythm II to Phase 9 and Rhythm III to Phase 12 (Phases 10 and 11 absent).

Table 3 Log of Borehole Zk15 (for location see Figure 1)

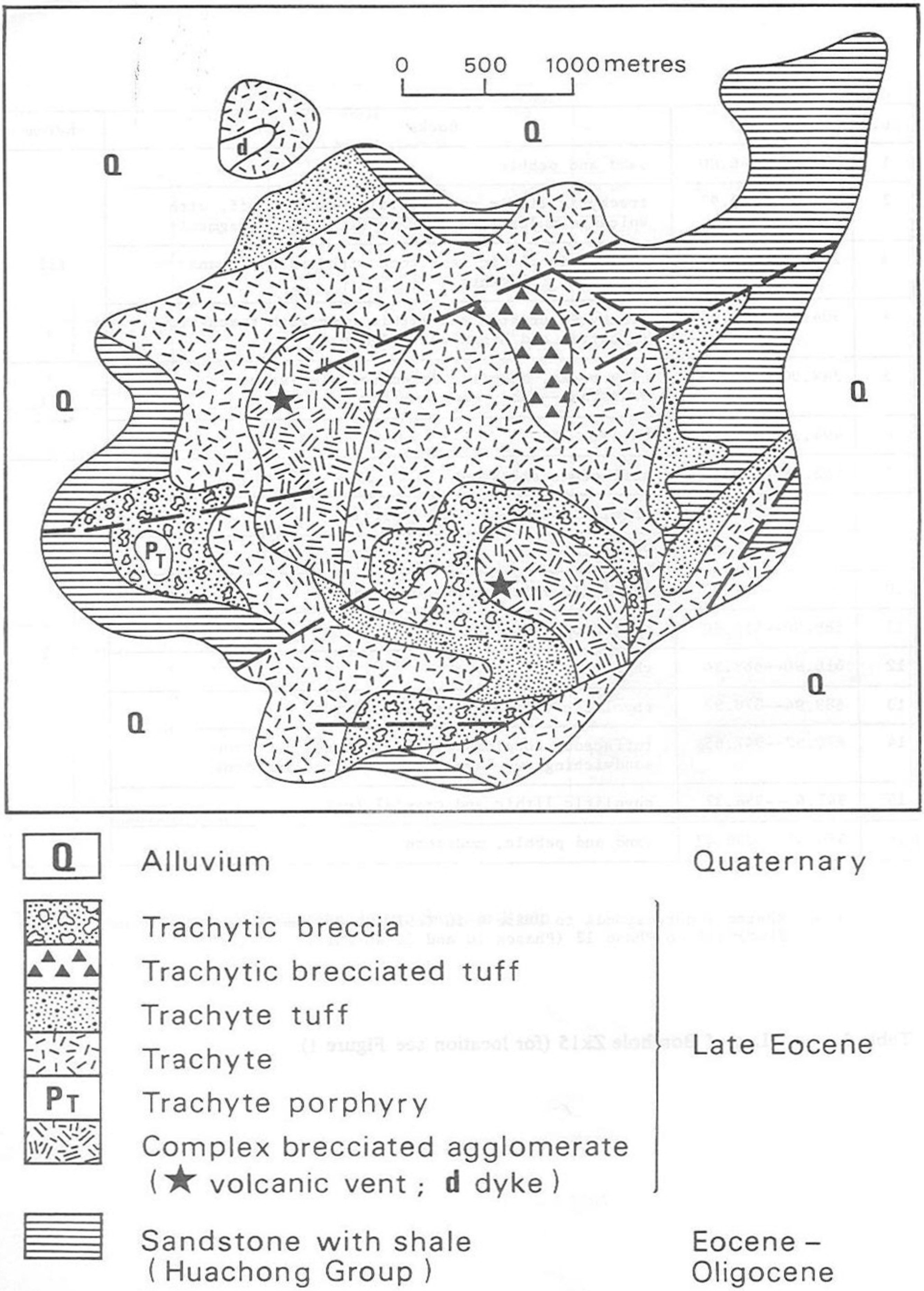


Figure 2 Geological Map of the Layered Cone of the Xiqiaoshan Eruptive Centre

Geological Society of Hong Kong Newsletter Vol 8 Pt 1 p 35-36

REVISION OF AGE OF THE STRATA ALONG THE SHORELINE AT NAI CHUNG FERRY PIER, NAI CHUNG, HONG KONG

P S Nau

Department of Geography and Geology
University of Hong Kong

The fossil-bearing strata exposed along the shoreline at Nai Chung Ferry Pier were first assigned to the Tolo Channel Formation of Lower Jurassic age by C M Lee and P S Nau (Addison 1986 p 23). They were later ascribed to Upper Triassic by Nau, mainly based on a poorly preserved ammonite *Sinoceltites* sp collected in 1986. However, a better ammonite found later has given a reliable biostratigraphic age for the strata.

Early in 1987 the writer found this ammonite about 2 m southeast of the site of the first one. It has been identified as *Arietites* cf *pinguis* (Quenstedt) by G X He, Nanjing Institute of Geology and Palaeontology, Academia Sinica (having formerly been identified as *Arietites* cf *semicostatus*, Nau, 1988). This ammonite indicates that the age of the strata is Lower Jurassic (Sinemurian) rather than Upper Triassic. There are also some more Lower Jurassic bivalves found recently; these have been identified as follows (the first one by J H Chen, Nanjing Institute of Geology and Palaeontology, Academia Sinica, and the others by Professor Q H Wu and G C Li, both of the Department of Geology, Zhongshan University):

Parainoceramus matsumotoi Hayami
Mytilus lamellosus Terquem
Hiatella cf *rotunda*
Modiolus sp
Pseudocardinia sp
Thracia sp

It is also considered that the ammonite formerly named as *Sinoceltites* sp is probably *Arietites* sp. Moreover, the ammonite *Hongkongites hongkongensis* of Lower Jurassic age has also been found near the Nai Chung Pier (M Atherton, oral communication 1988). Conclusively, the age of the fossil-bearing strata is Lower Jurassic (Sinemurian).

Acknowledgments

Thanks are due to J H Chen, Nanjing Institute of Geology and Palaeontology, Academia Sinica, and Professor Q H Wu and G C Li, Zhongshan University for their help in identification of fossils.

References

ADDISON, R (1986). *Geology of Sha Tin, 1:20 000 Sheet 7.* Geotechnical Control Office, Hong Kong. 85 p. (Hong Kong Geological Survey Memoir No 1)

NAU P S (1986). Upper Triassic strata along the shoreline at Nai Chung Ferry Pier, Nai Chung, New Territories, Hong Kong. *Geological Society of Hong Kong Newsletter* Vol 4 No 1 p 7-12

NAU P S (1982). A note on fossils in Hong Kong. *Annals, Geographical Geological and Archaeological Society, Hong Kong University* No 16 p 23-29

Geological Society of Hong Kong Newsletter Vol 8 Pt 1 p 36

'HOW SAFE IS DAYA BAY?' - A FURTHER DISCUSSION

M J Atherton

Hong Kong Polytechnic

In the December 1989 Newsletter there appeared an excellent account of the work done by Prof Ding and the Guangdong Bureau of Seismology in their careful research into the seismicity of the Daya Bay region.

Prof Ding clearly explains why the faults near Daya Bay are considered to be not capable faults as they have shown no movement within the last 35 000 years, ie they do not displace Quaternary soils age dated from 700 000 to 150 000 BP.

Prof Liu, however, in his paper "Active Faults along the coast from Pearl River to Honghai Bay" considers all his faults to be capable, giving an estimated movement rate, and commenting on their engineering stability, eg "... important structures should not be built on weakly active fault zones". This suggests to me that he is worried that they may move during the life of an engineering structure, ie they are capable faults by definition.

Both Prof Ding and Prof Liu agree that there are small earthquakes of magnitude 1 and 2 in this region. If they are not due to small movements along active fault lines, what else are they due to?

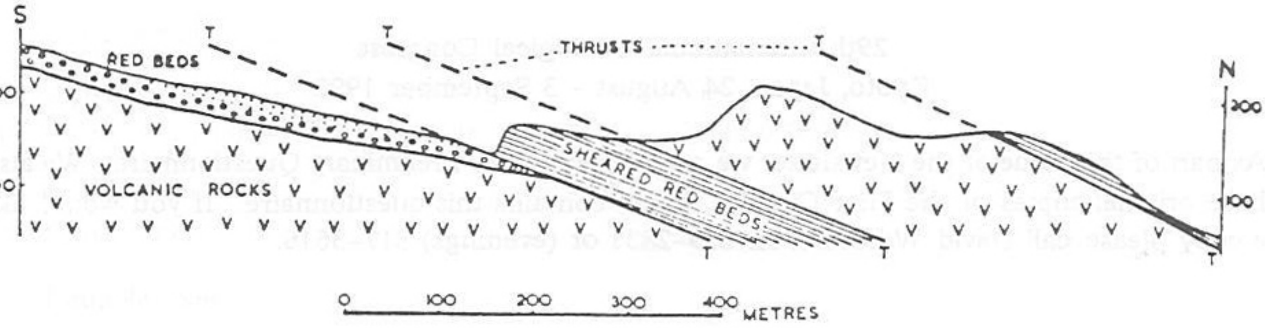
The 1918 earthquake near Nanao of magnitude 7.25 is estimated to have produced an intensity of VI in Shenzhen and VII in Hong Kong. No records exist for the Daya Bay region as far as I know, but it is 50 km nearer Nanao than Hong Kong and the shock would surely have been greater than that felt in Shenzhen or Hong Kong, perhaps approaching VIII.

REPORT ON A FIELD TRIP TO NAM CHUNG
SUNDAY 18 FEBRUARY 1990

M J Atherton

Hong Kong Polytechnic

Some twenty members and friends set off from Kowloon Tong by bus to Luk Keng where we were led by M J Atherton to the Nam Chung valley. It was a lovely day with good views across Starling inlet to Sha Tau Kok and China. We soon reached the Nam Chung river which cuts through the Port Island Formation in a spectacular series of potholes, waterfalls, rapids and plunge pools. Near Lo Lung Tin we reached the great thrust described in the memoirs of the geologists Williams, Ruxton, and Allen and Stephens. The Allen and Stephens geological map shows only one thrust plane but there are at least three as illustrated in the section below. At a small bridge across the river near Lo Lung Tin, the lower thrust plane is exposed, veneered by a thin hard skin of polished mylonite overlain by crushed and sheared red beds containing elongated streaked out pebbles in the form of flattened discs. We continued up river towards Kwai Tau Leung before walking down the river section of exposed Port Island Formation. Time permitted a return via another tributary of the Nam Chung river at Skek Pan Tam and Lam Uk where the contact between the Port Island Formation and underlying volcanics can be seen.



Section across Nam Chung River near Lo Lung Tin (B P Ruxton (1960). Geology of Hong Kong. *Quarterly Journal of the Geological Society of London* Vol 115 p 233-260)

ANNOUNCEMENTS

Volcanic Studies Group

At the Annual General Meeting of the Geological Society of Hong Kong on 18 May it was proposed that a Volcanic Studies Group be set up as a specialist group within the Society. The aim of the group would be to promote interest in general topics of volcanic geology, igneous petrology and geochemistry. With the wide range of volcanic rock types and field occurrences on Hong Kong there is considerable scope for local field trips and discussion topics.

Interested members are asked to contact Dr Rod Sewell, Hong Kong Geological Survey, Geotechnical Control Office (telephone 369-9374, FAX 369-0007).

Seismicity in Eastern Asia
Hong Kong, 23 - 26 October 1991

The conference will address aspects of seismicity, tectonic geology, seismic hazards and earthquake countermeasures, with an emphasis on the problem of seismicity and earthquake hazards reduction in Eastern Asia and neighbouring areas.

The conference is organized by the Geological Society of Hong Kong with the support and cooperation of the Guangdong Seismological Society. The first circular and further details can be obtained from K W Lee, Charles Haswell and Partners (Far East) Ltd, 3/F Bay Tower, 2-4 Sunning Road, Causeway Bay, Hong Kong.

29th International Geological Congress
Kyoto, Japan, 24 August - 3 September 1992

As part of this issue of the Newsletter we are reprinting the Preliminary Questionnaire. We also have original copies of the First Circular, which contains this questionnaire. If you would like a copy please call David Workman on 859-2831 or (evenings) 817-3616.

ADDENDA

WU Q J & NAU P S (1989). The characteristics of fossil plants and age of the strata of Ping Chau Island, Mirs Bay, Hong Kong. *Geological Society of Hong Kong Newsletter* Vol 7 Pt IV page 8. The fragmentary tortoise collected by Nau should be referred to as Plate 2; 8.

NAU P S & YIM W W S (1988). Fission track dating of zircons from granitoid rocks of Hong Kong. *Geological Society of Hong Kong Newsletter* Vol 6 page 12. The last two sentences of the first paragraph should read; "The two dated samples are a medium-grained Cheung Chau Granite <u>(sample FT1, Grid Reference KV12007385) and a medium-grained Tai Po Granodiorite</u> (sample FT2, Grid Reference KV12455870) (Figure 1). Fission track dating was carried out by the external detector method (EDM)." The omitted part of the text is underlined.

29TH INTERNATIONAL GEOLOGICAL CONGRESS
KYOTO, JAPAN, 24 August—3 September 1992

PLEASE RETURN THIS FORM TO:

PRELIMINARY QUESTIONNAIRE

IGC-92 OFFICE
P.O. BOX 65
TSUKUBA, IBARAKI 305, JAPAN

BEFORE 15 JULY 1990

Please complete this questionnaire in capital letters and check the boxes.

NAME Ms. ☐ Mr. ☐ ____________________
(Family Name) (Given Name)

ORGANIZATION: ____________________ TITLE: ____________________

ADDRESS: ____________________
____
(City) (Postal Code) (Country)

My attendance at the Congress is ☐ Very probable ☐ Probable ☐ Unlikely

In 1992, I plan to register as ☐ Participating member ☐ Accompanying member ☐ Student member ☐ Non-attending member

Numbers of accompanying persons: Adults ________ Children ________

CLASS OF HOTEL DESIRED: (Per day, including tax and service charge)	A (¥25,000-15,000)	B (¥15,000-12,000)	C (¥12,000-9,000)	D (¥9,000-5,000)	Dormitory
Number of single rooms					
Number of double rooms					

CLASS OF JAPANESE INN DESIRED (Per day and per person including tax and service charge, breakfast and dinner included in A, B and C)	A (¥25,000-15,000)	B (¥15,000-10,000)	C (Minshuku) (¥10,000-8,000)	D (¥6,000-5,000)
Number of single rooms				
Number of double rooms				

Currency exchange rate as of March 1990 is US$1.00=¥150.

Scientific Program

Symposia: Please list symposia numbers for which you might submit abstracts. Use numbers in the First Circular.

Oral Presentations ________ 1st ________ 2nd ________ 3rd ________ 4th ________ 5th

Poster Sessions ________ 1st ________ 2nd ________ 3rd ________ 4th ________ 5th

If you might present papers not covered in symposia listed in the First Circular, please write the titles and topical fields.

____

____

Short Courses and Workshops: Which topics are you interested in and wish to participate in ? Please note the themes or fields of interest to you.

____

____

Field Trips: Please list the numbers of field trips which you might attend. Use the numbers in the First Circular.

Field Trip A (Pre-Congress) ________ 1st ________ 2nd ________ 3rd

Field Trip B (During-Congress) ________ 1st ________ 2nd ________ 3rd

Field Trip C (Post-Congress) ________ 1st ________ 2nd ________ 3rd

Are there any areas not covered in the First Circular that are of special interest to you?

____

____

______________________________ Signature ________________ Date

GEOLOGICAL SOCIETY OF HONG KONG PUBLICATIONS LIST

BULLETIN No 1 (1984). 177 p. Ed W W S Yim. Geology of surficial deposits in Hong Kong

BULLETIN No 2 (1985). 236 p. Ed I McFeat-Smith. Geological aspects of site investigation

BULLETIN No 3 (1987). 600 p. Ed P G D Whiteside. The role of geology in urban planning

MARINE GEOLOGY OF HONG KONG AND THE PEARL RIVER MOUTH. (1985). 96 p. Eds P G D Whiteside and R S Arthurton

MARINE SAND AND GRAVEL RESOURCES OF HONG KONG. (1988). 221 p. Eds P G D Whiteside and N Wragge-Morley

ABSTRACTS No 1. 79 p. Abstracts of papers presented at the meeting on Geology of Surficial Deposits in Hong Kong, September 1983 - OUT OF PRINT

ABSTRACTS No 2. 50 p. Abstracts of papers presented at the conference on Geological Aspects of Site Investigation, December 1984

ABSTRACTS No 3. 51 p. Abstracts of papers presented a meeting on Sea-level Changes in Hong Kong During the Last 40 000 Years, May 1986

ABSTRACTS No 4. 65 p. Abstracts of papers presented at the conference on The Role of Geology in Urban Development, December 1986

ABSTRACTS No 5. 79 p. Abstracts/Extended Abstracts of six papers presented at a meeting on Future Sea-level Rise and Coastal Development, April 1988

ABSTRACTS No 6. 58 p. Abstracts of papers presented at the conference on Karst Geology in Hong Kong, January 1990

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Vol 5 (4 issues) 1987   Vol 6 (1 issue) 1988

Vol 7 (4 issues) 1989

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Cover Photograph: Basalt dykes cutting equigranular medium-grained granite of the Kowloon Pluton at Diamond Hill Quarry (83906E 82274N). Courtesy of P J Strange (see article in this issue)

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