geological society of hong kong

NEWSLETTER

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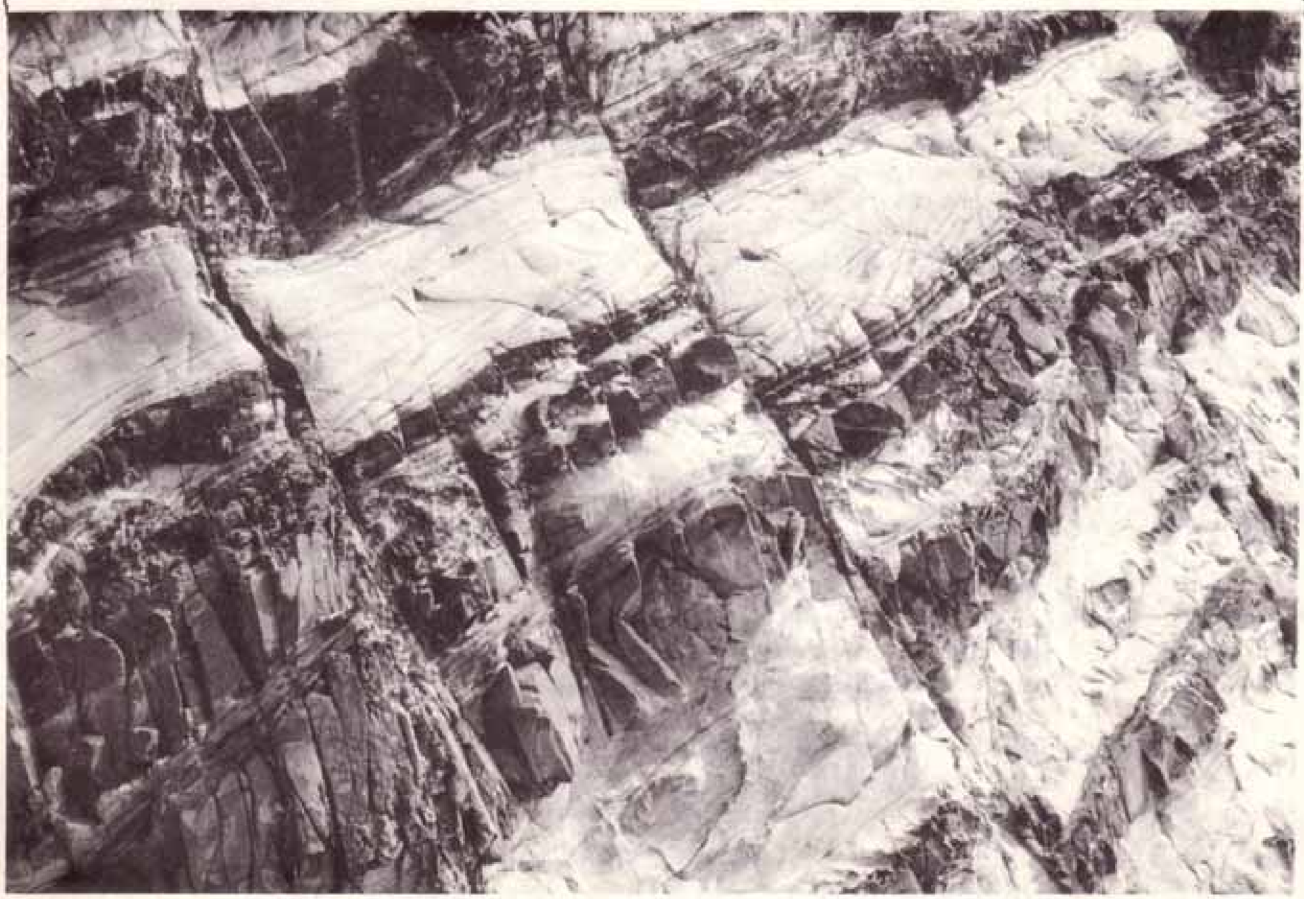
Vol. 4 No. 2, June 1986



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Cover Photo : Faulted sequence of cross-bedded tuffaceous sands and chert-like fine ash tuffs in the Repulse Bay Formation at Lai Chi Chong, Tolo Channel. (Scale x 0.15)

RESULTS OF A PALAEONTOLOGICAL INVESTIGATION OF CHEK LAP KOK BOREHOLE (B13/B13A) NORTH LANTAU

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ABSTRACT

Palynological and foraminiferal analyses of nine samples from a 30 metre sequence of Holocene and Late Pleistocene sediments at Chek Lap Kok, North Lantau, show four contrasting environments. At the base, grey muds contain pollen that indicate deposition in a temporary lake surrounded by lowland evergreen subtropical forest. Pollen assemblages from grey muds higher in the sequence record a strand-line mangrove association, succeeded landwards by broadleaved evergreen forest. Near the top of the Late Pleistocene sequence a sample of grey clays yielded an association dominated by fern spores, characteristic of river basins. Samples from the base of the Holocene sequence, the only ones to contain foraminifera, indicate deposition in a sublittoral environment with pine/oak forest on the adjacent land area.

QUATERNARY STRATIGRAPHY OF HONG KONG OFFSHORE

The sequence of superficial materials identified offshore in Hong Kong is tripartite and from the top comprises :

(a) Marine muds - usually grey and shelly; sand may dominate in areas affected by strong currents.

(b) Terrestrial alluvium - mainly sands, silts and clays with gravel bands, often mottled yellow-ochre and red; includes wood and leaf fragments.

(c) Weathered bedrock.

This sequence was described by Berry and Ruxton (1960) and Holt (1962) and has since been substantiated from detailed examination of sections at High Island (Kendall, 1975), Sha Tin (Whiteside, 1984) and Victoria Park (Willis and Shirlaw, 1984).

Investigations for the proposed Replacement Airport at Check Lap Kok (RMP Encon, 1982) reported the existence of a lower marine deposit, up to 15m thick, within the alluvial sequence, thus dividing the alluvium into upper and lower units. The so called Lower Marine Clay was determined to be variable in strength and thickness, and included a large proportion of interbedded granular material and highly dessicated and mottled layers in contrast to the Upper Marine Clay that was found to have very uniform properties (Siu et al., 1983; Fung et al., 1984). Subsequently, Yim and his co-workers have reported

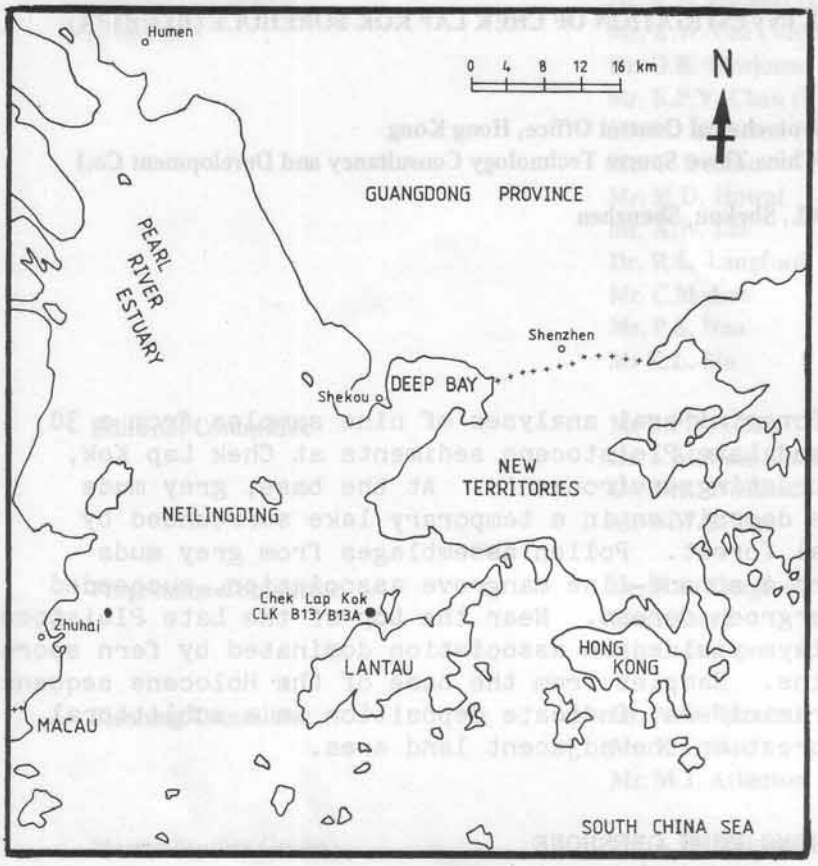


Figure 1

Location of the Stratigraphic Borehole B13/B13A at Chek Lap Kok, North Lantau.

their identification of an inferred lower marine deposit at Chek Lap Kok (Yim, 1984a; Yim and Li, 1983), at High Island (Yim 1984a, 1984b) and at Lei Yue Mun Bay (Yim 1984a; Wang and Yim, 1985).

This paper arises out of work on the offshore Quaternary sequence carried out by the Geological Survey Section of the Geotechnical Control Office, as part of their detailed remapping of the Territory.

The Quaternary sequence described from a borehole at Chek Lap Kok (North Lantau) was considered by Shaw (1985) to be representative of the stratigraphic sequence seen in other boreholes from Hong Kong waters. The sequence comprises 29 metres of Quaternary deposits in which marine Holocene grey shelly muds overlie a Late Pleistocene sequence of oxidised mottled clays, silts and sands alternating with partly laminated, grey organic muds. Seven radiocarbon dates from this lower sequence, in adjacent bor les at Chek Lap Kok, have given dates ranging from16,420 ± 660 to 36,480 ± 830 years B.P. (RMP Encon in : Yim, 1984a). From the presence of macro-fossils there is no doubt of the marine origin of the upper grey muds but, in the absence of macro-fossils, the depositional environment of the lower grey deposits is less clear. In the sequence beneath the marine deposits the presence of oxidised mottled sediments, some with rootlets, indicates periods of emergence while the grey organic silts and clays suggest reducing conditions as a result of periods of submergence. These environmental fluctuations could have been produced either by changes in sea-level or as a consequence of shifting channel patterns in a proto-Pearl River system over an extensive sub-aerial plain. Evidence from other boreholes in the same drilling programme shows these alternations to be widespread and led Shaw (1985) to favour a link with sea-level fluctuations.

SAMPLING PROCEDURE

The borehole at Chek Lap Kok is one of several continuously sampled holes from Hong Kong waters logged by one of us (R.S.) for stratigraphic purposes (Figure 1). It is the first borehole to be subjected to systematic micropalaeontological and palynological analyses.

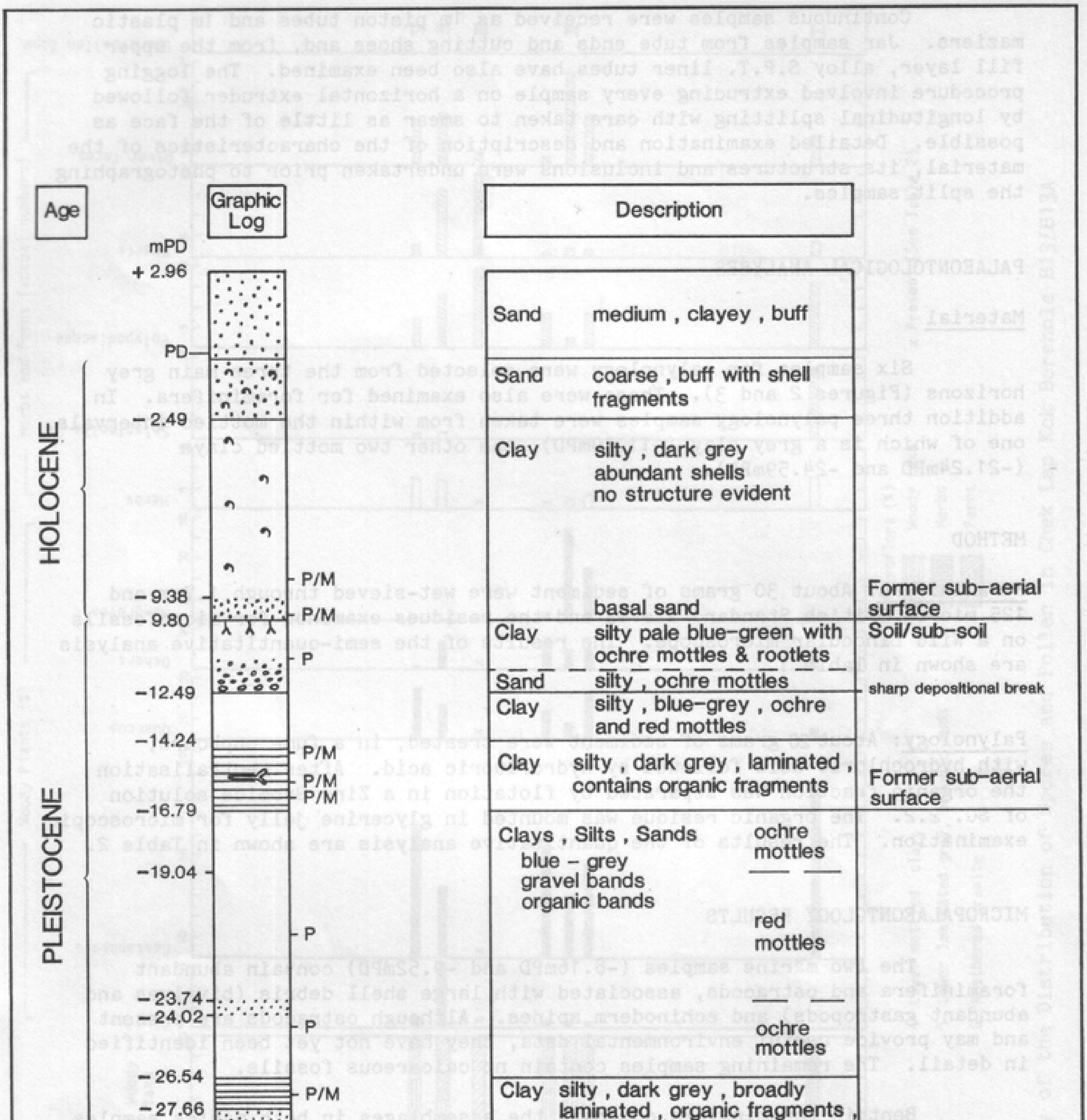


Figure 2 - Chek Lap Kok Borehole B13/B13A Summary Log Showing Details of the Sampled Horizons

Continuous samples were received as 1m piston tubes and 1m plastic maziers. Jar samples from tube ends and cutting shoes and, from the upper fill layer, alloy S.P.T. liner tubes have also been examined. The logging procedure involved extruding every sample on a horizontal extruder followed by longitudinal splitting with care taken to smear as little of the face as possible. Detailed examination and description of the characteristics of the material, its structures and inclusions were undertaken prior to photographing the split samples.

PALAEONTOLOGICAL ANALYSES

Material

Six samples for palynology were selected from the three main grey horizons (Figures 2 and 3). These were also examined for foraminifera. In addition three palynology samples were taken from within the mottled intervals, one of which is a grey clay (-11.10mPD), the other two mottled clays (-21.24mPD and -24.59mPD).

METHOD

Foraminifera: About 30 grams of sediment were wet-sieved through 1.7mm and 125 micron British Standard Sieves and the residues examined for microfossils on a Wild Binocular microscope. The results of the semi-quantitative analysis are shown in Table 1.

Palynology: About 20 grams of sediment were treated, in a fume cupboard, with hydrochloric acid followed by hydrofluoric acid. After neutralisation the organic fraction was separated by flotation in a Zinc Bromide solution of SG. 2.2. The organic residue was mounted in glycerine jelly for microscopic examination. The results of the quantitative analysis are shown in Table 2.

MICROPALAEONTOLOGY RESULTS

The two marine samples (-8.16mPD and -9.52mPD) contain abundant foraminifera and ostracods, associated with large shell debris (bivalves and abundant gastropods) and echinoderm spines. Although ostracods are present and may provide useful environmental data, they have not yet been identified in detail. The remaining samples contain no calcareous fossils.

Benthic foraminifera dominate the assemblages in both marine samples with only very rare planktics (Globigerina). The dark grey shelly clay at -8.16mPD contains abundant and diverse benthic foraminifera; Ammonia, Elphidium and Milliolids (Table 1), which indicate sublittoral depositional environment. The common occurrence of Ammonia becarii suggests deposition in waters not deeper than 30m.

The shelly, sandy clay at -9.52mPD also contains abundant bivalve and gastropod shell debris as well as wood fragments. The foraminiferid assemblage is sparser and less diverse, with specimens commonly abraded. The decline in abundance and diversity and the abrasion of specimens suggest deposition in shallower water and conditions of higher energy than for the previous sample.

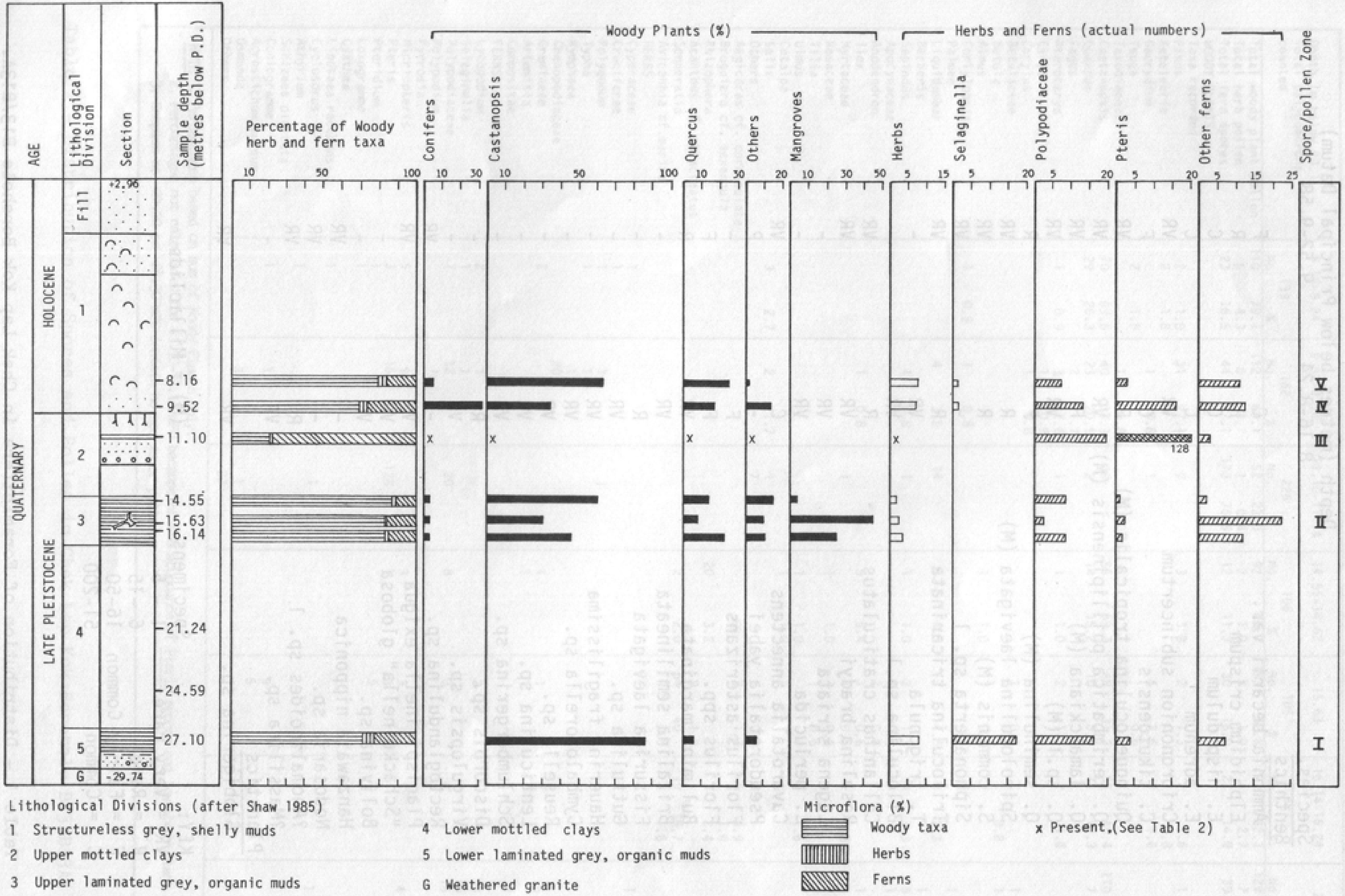


Figure 3 - Summary of the Distribution of Spores and Pollen in Chek Lap Kok Borehole B13/B13A

Species.	Depth (metres below Principal Datum) 8.16-8.24	9.52-9.58
Benthics		
Ammonia becarii var.	C	F
Elphidium crispum	F	R
E. hispidulum	C	C
E. adrenum	C	C
Cribrononion subincertum	VR	VR
C. tikutoensis	C	F
Quinqueloculina tropicalis (M)	R	VR
Q. kerimbatica phillipinensis (M)	VR	VR
Q. lamarckiana (M)	F	VR
Q. sp.1 (M)	VR	VR
Q. seminulina (M)	F	R
Spiroloculina laevigata (M)	R	VR
S. communis (M)	R	VR
Siphonaperta sp. 1	-	VR
Triloculina tricarinata	R	VR
T. trigonula	VR	-
Biloculina sp.1	VR	-
Cellanthus craticulatus	R	VR
Rosalina bradyi	VR	VR
Lagena striata	VR	-
L. perlucida	VR	-
Cavarotalia annectens	C	VR
Pseudorotalia yabei	-	P
Florilus asterizans	F	-
Florilus spp.	F	F
Bulimina marginata	VR	R
Brizalina semilineata	VR	-
Fissurina laevigata	R	-
Guttulina sp.	VR	-
Hauerina fragilissima	VR	-
Cymbaloporella sp.	VR	-
Reusella sp.	VR	-
Lenticulina sp.	VR	-
Schlumbergerina sp.	VR	-
Discorbis sp.	R	-
Virgulopsis sp.	VR	-
Rectoglandulina sp.	-	VR
Planispirinella exigua	VR	VR
"Schackoinella" globosa	VR	-
Bolivina sp.	VR	-
Hanzawaia nipponica	-	VR
Nodosaria sp.	-	VR
?Anomalinoides sp. 1	R	VR
?Massilina sp.	VR	-
Planktics		
Globigerina sp.	VR	VR

KEY: Specimens (M) = Milliolids

VR = Very rare 1 - 5
R = Rare 6 - 15
F = Fairly Common 16-50
C = Common 51-200

Table 1 - Distribution of Foraminifera in Chek Lap Kok Borehole B13/B13A.

Depth (m below PD.)	8.16-8.24		9.52-9.58		11.10-11.14		14.55-14.62		15.63		16.14-16.24		27.10	
Total palynomorphs counted	139		162		226		106		185		147		176	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total woody plant pollen	110	79.1	112	69.1	52	23.0	92	86.7	153	82.8	121	82.3	129	73.2
Total herb pollen	6	4.3	6	3.7	1	0.4	2	1.0	2	1.0	4	2.7	7	3.9
Total fern spores	23	16.5	44	27.1	173	76.5	12	11.3	30	16.0	22	14.9	39	22.1
WOODY PLANTS														
Taxa recorded														
Pinus	2	1.8	31	27.1	9		3	3.2	2	1.3	2	1.6	1	0.7
Keteleeria	2	1.8									1	0.8		
Dacrydium			1	0.8	1				4	2.6	2	1.6		
Tsuga	2	1.8							1	0.6				
Taxodiaceae			1	0.8										
Castanopsis	70	63.6	40	33.3	15		55	59.7	48	31.3	55	45.4	110	85.2
Quercus	29	26.3	23	20.5	2		14	15.2	10	6.5	15	12.3	7	5.4
Fagus			2	1.7										
Pterocarya	1	0.9	3	2.6	1		1	1.0	2	1.3	2	1.6		
Carya			1	0.8										
Corylus			1	0.8										
Betulaceae									1	0.6			1	0.7
Betula											1	0.8	1	0.7
Alnus							1	1.0	1	0.6				
Corlylopsis	1	0.9	1	0.8										
Palmae													1	0.7
Liquidambar			4	3.5	14		4	4.3	7	4.5	4	3.3		
Berberis													1	0.7
Sapindus			1	0.8	1		1	1.0	2	1.3	4	3.3	5	3.8
Apocynaceae									1	0.6			1	0.7
Anodendron									1	0.6				
Ilex			1	0.8			5	5.4	1	0.6			1	0.7
Myrtaceae					1				1	0.6	1	0.8		
Rosaceae							1	1.0	1	0.6				
Tilia									1	0.6				
Ulmus							1	1.0			2	1.6		
Catalpa							1	1.0						
Salix	3	2.7	2	1.7	1									
Others					7									
Aegiceras cf. corniculata									2	1.3	6	4.9		
Bruguiera cf. sexangula											2	1.6		
Rhizophora							20	3.2			3	2.4		
Acanthus cf. ebracteatus									2	1.3				
Sonneratia							2	2.0	64	40	19	15.7		
Avicennia cf.marina									4	2.5	2	1.6		
HERBS														
Cyperaceae	1												1	
Cruciferae	1													
Polygonum	1		1		1									
Typha	1		1											
Nymphaea			1											
Chenopodiaceae			20								1			
Gramineae	2						1		1		2		5	
Artemisia							1		1					
Compositae													1	
FERNS														
Lycopodium	2		1						2				1	
Selaginella	1		1										16	
Polypodiaceae	7		12		20		8		3		6		16	
Polypodium			1								2			
Pyrrosia											1			
Hicriopteris	5		9				3		3		7		4	
Pteris	3		16		128		1		3		1			
Pteridium	1								5		1			
Loxogramme	1													
Cyathea											1			
Lindsaea recedens	1													
Cyclosorus					1						1		1	
Athyrium	1													
Schizaea digitata											1			
Coniogramme	1		1						9					
Acrostichum aureum									5		1			
Osmunda			3		1								1	
Others					23									

NOTE 1. Percentages based on sum of Woody Plants only.
2. Percentages not calculated for 11.10–11.14 mPD because of the abundance of Pteris spores and low Woody Plant total.
3. Samples at -24.20 to -24.30 mPD contain no spores or pollen.

Table 2 - Distribution of Spores and Pollen in Chek Lap Kok Borehole B13/B13A.

PALYNOLOGY RESULTS

Samples from the grey horizons, including the grey clay from within the upper mottled unit (-11.10mPD), contain abundant microfloras. The two samples of mottled clay (-21.24mPD and 24.59mPD) both lack palynomorphs.

From differences in the relative abundance of taxa in the productive samples, five distinct spore/pollen associations ("zones") can be recognised in ascending order (Figure 3).

I Castanopsis - Selaginella - Polypodiaceae Zone.

II Castanopsis - Sonneratia Zone.

III Pteris Zone.

IV Pinus - Castanopsis - Fern Zone.

V Castanopsis - Quercus Zone.

I Castanopsis - Selaginella - Polypodiaceae Zone

Sample : -27.10mPD: Lower laminated grey, organic muds (Shaw, 1985).

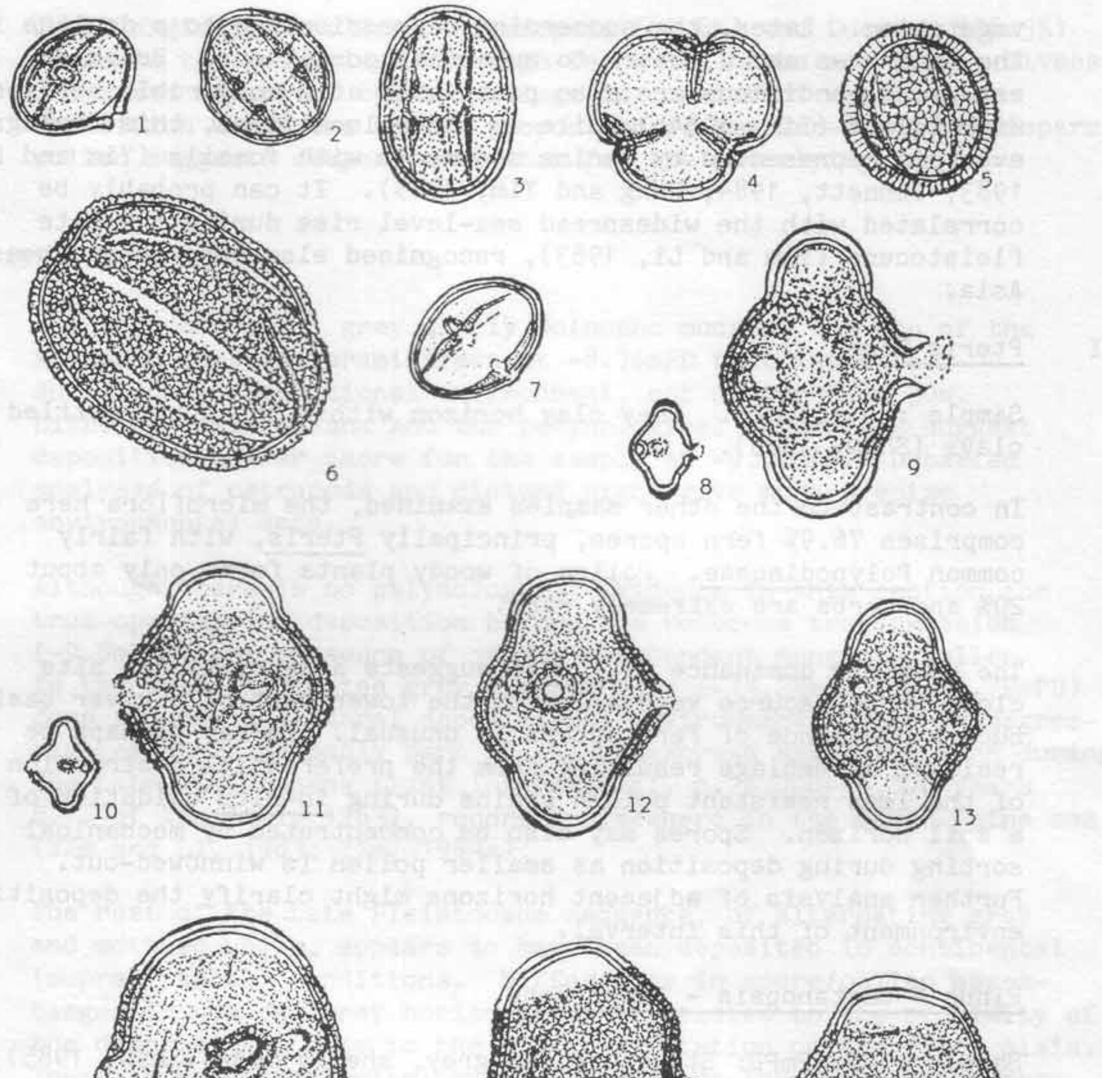
The microflora comprises 73.2% woody plant pollen, 3.9% herbs and 22.1% fern spores. Diversity is low. Castanopsis - type pollen, which probably includes Lithocarpus, is dominant (85.2%) and the spores of Selaginella and Polypodiaceae are fairly common. There is no palynological evidence for a marine or littoral depositional site. The dominance of Castanopsis-type and lack of diversity, particularly the absence of peat swamp types, suggest that deposiion may have occurred in a temporary lake or pool in or near lowland evergreen subtropical forest dominated by Castanopsis/Lithocarpus, with limited or no fluvial input.

II Castanopsis - Sonneratia Zone

Sample : -16.4mPD, -15.63mPD, -14.55mPD. Upper laminated, grey organic muds (Shaw, 1985).

The microflora comprises 82.3 - 86.7% woody plant pollen, 1 - 2.7% herbs and 11.3 - 16% fern spores. Although the pollen of Castanopsis remains common (31.3 - 59.7%) and Quercus forms 6.4 - 15.2%, the most significant feature of this association is the presence of mangrove pollen, primarily Sonneratia with minor amounts of Aegiceras, Bruguiera, Rhizophora, Acanthus and Avicennia (Figure 4). Mangroves form 26.2% of the assemblage at the base of the interval (-16.14mPD), rise to a peak of 46.4% at -15.63mPD and decline to 5.2% at -14.55mPD. The lower two samples also contain spores of Acrostichum aureum, a fern species that grows in association with mangroves. The absence of back-mangrove taxa suggests that this was a strand-line vegetation that was not receiving any appreciable fluvial input from the immediate hinterland.

This grey clay unit with mangrove pollen is underlain by mottled clays that, at -16.79mPD, contain hair-like rootlets and were considered by Shaw (1985) to mark a former subaerial surface. It can be inferred from the palynological data that the subaerial surface was inundated by saline water allowing mangroves to become established while Castanopsis and other angiosperm pollen continued to be blown-in from the surrounding broadleaved evergreen forest. Conditions stabilised, allowing the full development of the mangrove



1. Bruguiera cf. B. sexangula 2-4. Rhizophora 5. Avicennia cf. A. marina
6. Acanthus cf. A. ebracteatus 7. Aegiceras corniculata 8-17. Sonneratia spp.
18, 19 Acrostichum aureum (Figs. 8, 10, 17 x 330, Other Figs. x 1000)

Figure 4 - The Mangrove Association from Spore/Pollen Zone II, Chek Lap Kok Borehole B13/B13A (Drawn by Zhou Kunshu).

vegetation. Later, the succeeding regression led to a decline in the mangroves and a return to subaerial conditions. Brackish, esturaine conditions are also postulated at a comparable horizon at High Island (Yim, 1984b) while in other localities, this transgressive event is represented by marine sediments with fossils (Yim and Li, 1983; Bennett, 1984; Wang and Yim, 1985). It can probably be correlated with the widespread sea-level rise during the late Pleistocene (Yim and Li, 1983), recognised elsewhere in Southeast Asia.

III <u>Pteris Zone</u>

Sample : -11.10mPD. Grey clay horizon within the upper mottled clays (Shaw, 1985).

In contrast to the other samples examined, the microflora here comprises 76.9% fern spores, principally <u>Pteris</u>, with fairly common <u>Polypodiaceae</u>. Pollen of woody plants forms only about 20% and herbs are extremely rare.

The complete dominance of <u>Pteris</u> suggests a depositional site close to the source vegetation on the lower part of a river basin. such a dominance of fern spores is unusual. It may perhaps be residual assemblage resulting from the preferential destruction of the less resistant pollen grains during <u>in-situ</u> oxidation of a soil horizon. Spores may also be concentrated by mechanical sorting during deposition as smaller pollen is winnowed-out. Further analysis of adjacent horizons might clarify the depositional environment of this interval.

IV <u>Pinus - Castanopsis - Ferns Zone</u>

Sample : -9.52mPD: Structureless grey, shelly muds (Shaw, 1985).

Here woody plant pollen is 69.1%, herbs 3.7% and fern spores 27.1%. Although there is faunal evidence that this sample is marine, no marine palynomorphs were recorded. This is not unusual in near-shore deposits where much plant debris, including spores and pollen, is transported into the marine environment by rivers.

The percentage of bisaccate pollen (Pinus) reaches its peak (27.1%). It is associated with common <u>Castanposis</u> and <u>Quercus</u> (33.3% and 20.0% respectively) and with fairly common fern spores including <u>Pteris</u>. The higher proportion of <u>Pinus</u> pollen may be the result of a change in the vegetation, particularly since no mangrove pollen, which is usually transported offshore (Muller 1959), was recorded. However, an abundance of bisaccate pollen is often encountered in transgressive and/or shallow marine sediments (Allen, 1982). The presence of fairly common, larger fern spores (<u>Pteris</u>, <u>Polypodiaceae</u>) transported by rivers, is also usual in near-shore deposits. As in underlying samples, the high proportions of <u>Castanopsis</u> and <u>Quercus</u> come from the regional forest vegetation. This association is therefore characteristic of a nearshore deposit, close to a river mouth. Presumably transport was northwards, by rivers flowing from the higher ground that now forms Lantau Island.

V <u>Castanopsis - Quercus Zone</u>

Sample : -8.16mPD; Structureless grey, shelly muds (Shaw, 1985)

Woody plant pollen forms 79.1% of the assemblage, herbs are 4.3% and fern spores 16.5%. No marine taxa were recorded.

Small angiosperm pollen, Castanopsis (63.6%) and Quercus (26.3%) dominate the assemblage although ferns and herbs are fairly diverse. The mixed nature of the assemblage is consistent with marine deposition while the higher proportion of smaller-sized angiosperm pollen suggests deeper water than for the underlying sample.

SUMMARY AND CONCLUSIONS

1. The structureless, grey shelly Holocene muds at the top of the sequence contain foraminifera at -8.16mPD that indicate a sublittoral depositional environment, not deeper than 30m. Lithology, microfauna and the palynological assemblage suggest deposition nearer shore for the sample at -9.52mPD. Detailed analyses of ostracods and diatoms might give more precise environmental data.

2. Although there is no palynological evidence in this section for true open marine deposition before the Holocene transgression (-9.8mPD), the presence of common to abundant mangrove pollen in the upper laminated grey organic muds (-14.24mPD to -16.79mPD) does suggest a littoral depositional environment. This transgressive event is probably part of the widespread sea level rise during the Late Pleistocene (last interglacial, c.28,000-30,000 years B.P. of Yim & Li, 1983), recorded elsewhere in the South China sea (Yim and Li, 1983; Yim, 1984a).

3. The rest of the Late Pleistocene sequence, of alternating grey and mottled units, appears to have been deposited in continental (supralittoral) conditions. Differences in spore/pollen assemblages in the two grey horizons may be related to the proximity of the depositional site to the source vegetation on the flood plain. There is no palynological evidence that the lower laminated grey organic muds (sample at -27.10mPD) are either marine or littoral.

ACKNOWLEDGEMENTS

This paper is published with the approval of the Director of Engineering Development, Hong Kong Government. The continuous sample studied was provided by the Civil Engineering Office of the Engineering Development Department.

The palaeontologists thank the management of Paleoservices China Ltd. and China Three Sources Technology Consultancy and Development Co. for allowing them time to work on this publication.

We would also like to thank Russell Arthurton for his encouragement and critical review of the stratigraphic section of this paper, and Dr. John Ince for his constructive comments on the palynological sections.

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HIGH LEVEL BEACH ROCK ON HONG KONG ISLAND

P.J. Strange,

Geotechnical Control Office,
H.K. Government

INTRODUCTION

During the recent geological remapping of Hong Kong Island, small patches of high level beach rock have been noted at a number of localities. These deposits consist of cemented sand and granules occupying small hollows in the cliffs at heights ranging from 1m to 20m above present day sea level.

At first glance the deposits resemble man made concrete, but closer examination reveals no evidence of an artificial origin. It is postulated that these deposits are tempestites - results of severe storms, with material thrown high onto rock ledges and accumulating in hollows where cementation subsequently takes place. Their age is most likely very recent and some are believed have formed in 1948-1949.

In the following text, the prefix HK, refers to samples archived in the Geological Survey Collection. Grid references are based on the Hong Kong metric grid.

GENERAL DISTRIBUTION AND LITHOLOGY

The location map (Figure 1) shows the main areas where high level beach rock has been noted, and the locations of thin sectioned samples (HK3648, 4095 0822) near Stanley Prison, and (HK5001, 3789 0952) on Tau Chau.

The beach rock occurs in small hollows and cracks, often along weathered joint zones, at an average height of 3.5m above sea level. In some areas, for example on Tau Chau, Repulse Bay (3785 0952) it is found as low as 1m above high water mark. At Big Wave Bay, however, beach rock occurs at a height of almost 20m. The deposits are always discontinuous and found only in sheltered hollows up to 50cm across and away from normal present day wave action (Plate 1). In some cases the beach rock has been broken up and the resulting hollows filled with uncemented sand, granules and small pebbles, and from time to time water.

The thin section of the sample from Stanley (HK3648) shows abundant grains of granule and sand size closely packed with a very fine, indeterminate matrix, possibly calcareous (Plate 2). Many of the smaller grains are angular and broken. Although most grains are composed of quartz, there are occasional microperthite (alkali feldspar), plagioclase and iron oxide grains. Sample HK5001, from Tau Chau, contains abundant calcareous broken shell fragments, many rounded by wave action. The matrix is very fine quartz and calcite. A few small lithic grains and subrounded quartz crystals are also present.

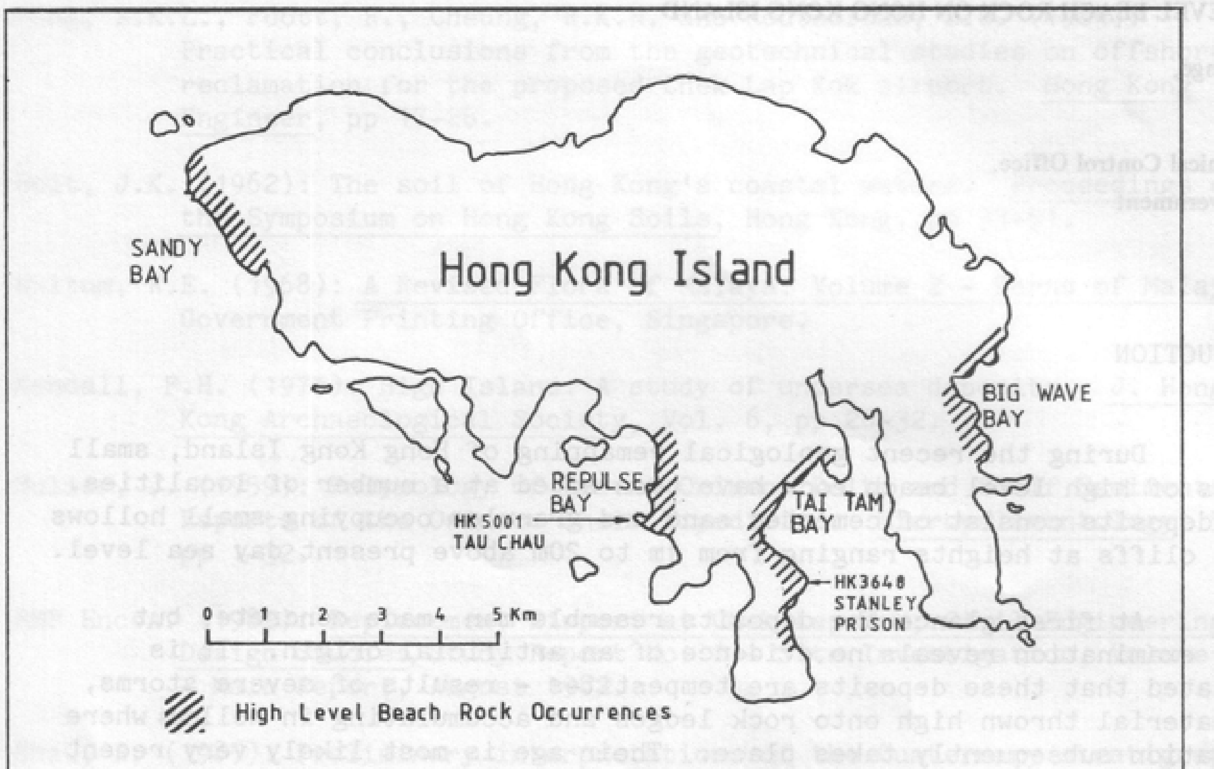

Figure 1 – Location map showing high level beach rock on Hong Kong Island

In hand specimen, some larger lithic fragments are seen, and these are generally fine ash tuff pebbles. At Tau Chau, there is great variation in pebble size, diameters ranging from 1 to 5cm, with the largest pebbles cemented into the top part of the deposit (Plate 3). The composition of the beach rock usually reflects the in-situ geology, resulting in a predominance of quartz granules where the beach rock rests on granite cliffs and tuff fragments where the rock occurs in area of volcanic rock. Shell fragments are abundant in the Repulse Bay area, and it is probable that here the calcareous material has broken down to provide the cementing agent. Generally, the beach rock found on the eastern side of Hong Kong Island is coarser than that occurring on the more sheltered, western part of the island.

An interesting feature of the beach rock at Tau Chau and on the nearby South Bay peninsula is the presence of an inscription in the rock, apparently produced by a stick like object while the deposit was still in an uncemented state. The inscribed dates are September 1950. Both occurrences are now hard cemented beach rock at about 3-4m above high water mark.

DEPOSITIONAL ENVIRONMENT

The deposits do not provide evidence of higher sea levels but are most probably the results of severe storms, where a combination of temporary high water levels and strong wave action have thrown the material up to high levels where it has become trapped in cracks and hollows in the cliff face. It is suggested that on exposed coasts, as at Big Wave Bay, even at heights of 20m, it is possible for small pebbles and granules to be deposited in severe storms. Following a storm, the deposits are likely to have been washed away by rain, except for those trapped in hollows. Cementation by calcite may have occurred during subsequent dry spells, the lime being derived from shell fragments. In places the lower deposits have been broken up by further storm action and new deposits laid down.

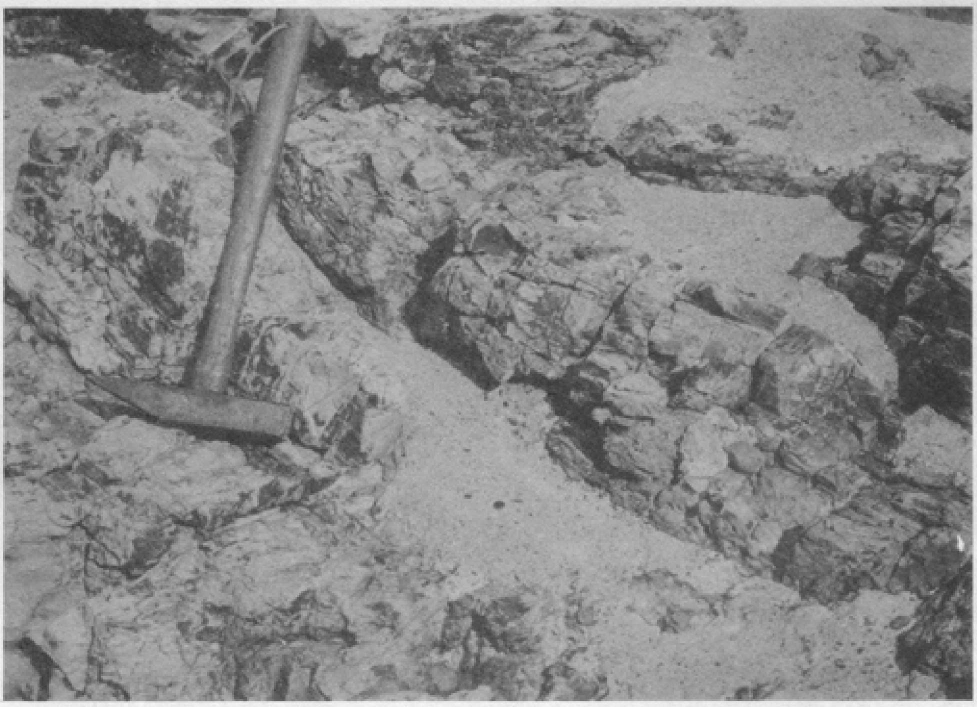

Plate 1 - High Level Beach Rock at Tau Chau, Repulse Bay.
Patches of Beach Rock infilling hollows and cracks in weathered tuffs of the Ap Lei Chau Formation.

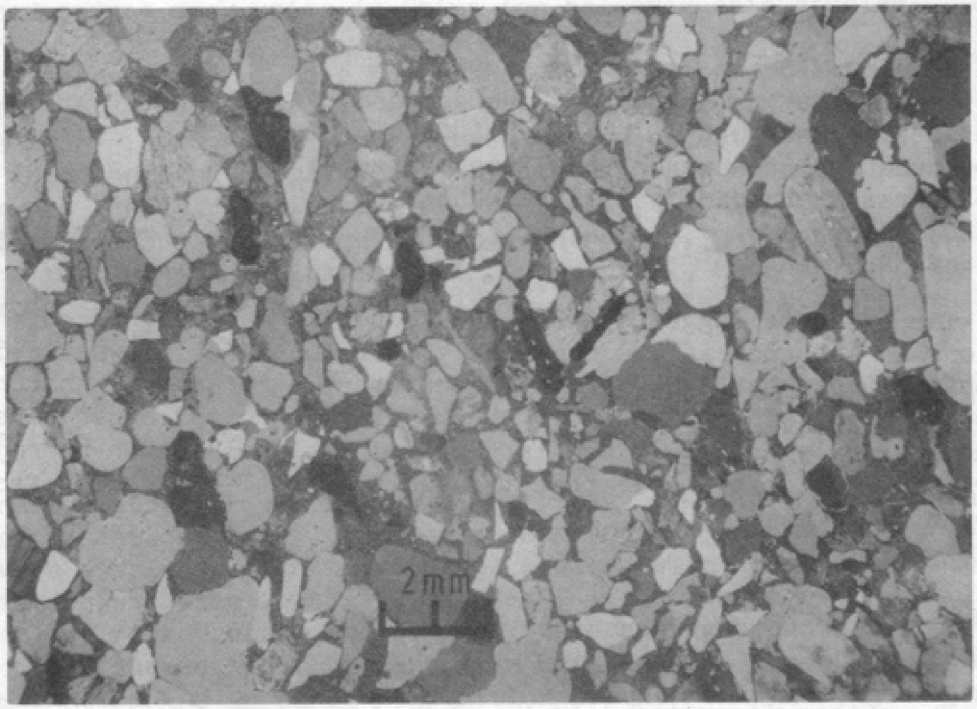

Plate 2 - Photomicrograph of Beach Rock, 4m above sea level, near Stanley Prison (HK3648).
XPL Plus $\frac{1}{4}$ Plate.

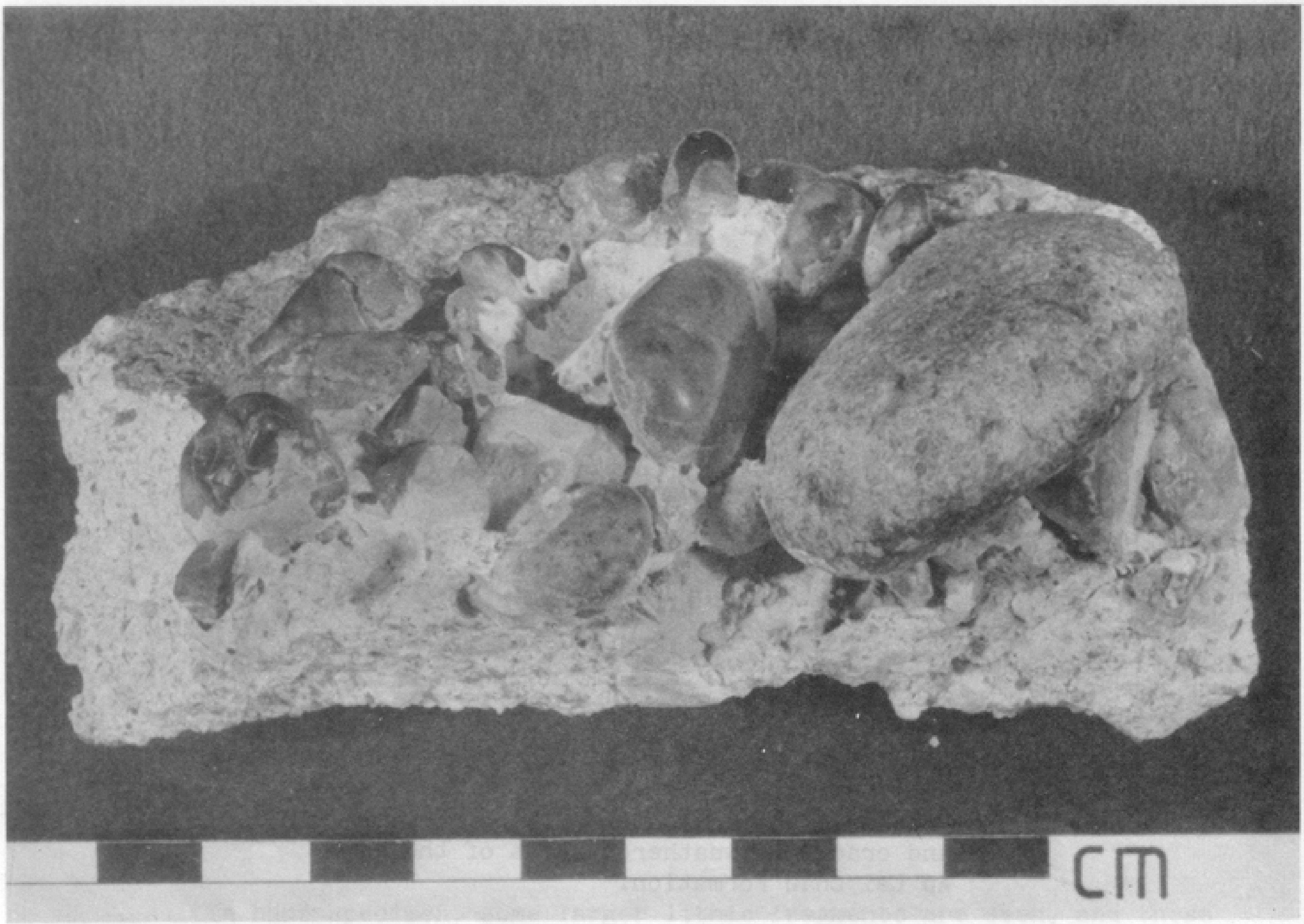

Plate 3 - Sample of Beach Rock from Tau Chau, Repulse Bay. The pebbles are composed of fine ash tuff of the Ap Lei Chau Formation; the underlying finer material contains abundant shell fragments.

The evidence suggests that these deposits are very recent; the inscriptions in the rock at Tau Chau imply that the material was laid down shortly before September 1950. Royal Observatory records show that no severe storms occurred in 1950, but in 1948 storms of Force 8 and above were recorded in mid and late July and early and late September, and another storm in September 1949. It is probable that the Tau Chau deposit results from one of these storms.

ACKNOWLEDGEMENTS

The author is grateful to Mr. R.S. Arthurton, Senior Geotechnical Engineer, Hong Kong Geological Survey, for reviewing this paper and suggesting improvements to the text. Acknowledgement is made to the Director of Engineering Development, Hong Kong Government, for permission to publish this paper.

PALEOMAGNETIC RESEARCH IN HONG KONG

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The study of paleomagnetism has proved a useful means of unravelling the history of the earth's geomagnetic field and determining wandering paths of continents. Not all rock formations, however, are suitable for paleomagnetic studies. The age of the rock unit being studied must be known and a detailed understanding of local structures is essential because the usefulness of the magnetic record yielded by the rock unit often depends on prior knowledge of its tectonic history.

The tectonic framework of China is now known to resemble a mosaic of microplates sutured together along exhumed fault boundaries (Zhang et al., 1984). The eastern part of China comprises two continental blocks - South China and North China - joined together along the Tsinling Mountains. A key problem concerning the tectonics of China is the time of collision between these two continental blocks. There are differing views on the age of the Tsinling Mountains. Zhang, Liou and Coleman (1984), for instance, suggest that they were formed during the late Paleozoic, while Lin, Fuller and Chang (1982) suggest a Mesozoic collision between North and South China blocks. A comparison of the polar wander paths of the two blocks offers a solution to the controversy. Despite the efforts of several palemagnetic groups in determining the polar wander path of China, however, published paleomagnetic results on the subject are scanty, partly because of the difficulties in finding good source rock units in China for paleomagnetic studies.

The territory of Hong Kong, though small, provides an excellent locality for studying the polar wander curve of the South China block. This is because there is no known major thrust system or suture zone separating Hong Kong from the Yangtze platform, so paleomagnetic results obtained from the former are probably indicative of the tectonic motion of the latter. The rock formations exposed in Hong Kong, therefore, may contain crucial information on the tectonic history of South China. Moreover, conducting paleomagnetic sampling in Hong Kong allows geologists to bypass some logistic problems which may be encountered in China.

The first paleomagnetic study in Hong Kong was conducted in the late 1970s by a group of Japanese scientists led by J. Nishida (Nishida et al., 1980). Nishida's group collected samples from 6 sites in the Cretaceous Port Island Formation, 2 sites in the intrusive rocks, and 7 sites in the Repulse Bay Formation (only 3 of the latter reported on). The samples were measured with a spinner magnetometer and treated with alternating-field demagnetization stepwise up to 800 oersteds. The paleomagnetic result from the Repulse Bay Formation is particularly interesting because the three sites reported on all showed a dual polarity in the magnetic directions, indicating a stable magnetism and an early acquisition of the remanent magnetism. The magnetic direction of the Port Island Formation showed a declination of 10.8^{o} and an inclination of 31.2^{o}, Nishida and his co-workers contended that this may be representative of the Cretaceous direction for Hong Kong; but the result bears no fold test and very little evidence suggestive of the time of acquisition is presented. Nevertheless, the measurements yielded a Jurassic direction useful for reconstructing the polar wander curve of South China. Unfortunately their work was not published in English and has generally been overlooked outside Japan in spite of the significant result obtained from the Repulse Bay volcanics.

In 1982 I collected some samples from Hong Kong for a paleomagnetic study in an effort to determine the polar wander path of South China. I sampled the Permian marine siltstones (Tolo Harbour Formation), the Cretaceous (?) red beds (Port Island Formation), and some dolerite dykes thought to be Late Cretaceous. In a second sampling expedition in 1985, I collected more samples from the Port Island Formation as well as the intrusive rocks exposed in different parts of Hong Kong. The specimens were measured with a cryogenic superconducting magnetometer and treated with both alternating-field and thermal demagnetization. In the article, I present the current status of my paleomagnetic research in Hong Kong and its preliminary tectonic inferences. The technical details of the demagnetization methods are not discussed in this paper; an introduction to the methods of paleomagnetic is given by McElhinny (1973).

The sampling sites in Ma Si Chau are located in an intensely folded outcrop of the Permian Tolo Barbour Formation. The rocks are mainly dark-coloured, pyritous sandstones and mudstones, sometimes slightly metamorphosed. The metamorphism was probably associated with plutonic intrusion during the Jurassic Yenshanian orogeny (Allen and Stephens, 1971). Thermal demagnetization of 10 sandstone specimens from the Tolo Harbour Formation reveals the presence of at least three magnetic components - one with a shallow inclination of about 10° below 100°C, a second one with a blocking temperature near 350°C and a third one with a blocking temperature at 550°C. The second and third components, which show similar directions, probably reside respectively in an oxidized titanohematite phase and magnetite. The directions at 550°C are chosen to represent the stable direction of the specimens (Fig. 1). The in-situ directions generally cluster about the present field and fail a fold test, suggesting either a remagnetization by the present field or a post-deformation acquisition, probably during the Jurassic metamorphism. If the magnetism was acquired during the Jurassic metamorphism, the result indicates that the sampling site was already located at the present latitude during the Jurassic.

Thirty specimens collected from 7 sites in the Port Island Formation were measured and demagnetized thermally up to 700°C or in an alternating field stepwise up to 1000 oersteds. The results from determinations of isothermal remanent magnetism and thermal demagnetization both suggest the presence of hematite as the principal magnetic carrier. A vectoral analysis of the magnetic result delineates a similar magnetic component in each of the specimens measured. This characteristic magnetic direction clusters together before applying the title correction but show considerable scatter after, thus also indicating a post-deformation acquisition of the remanent magnetism. The mean magnetic direction (Fig. 2) obtained before the tilt correction is D=16°, I=46°. Assuming a simple geomagnetic dipole field, the inclination suggests that the magnetism was acquired at a latitude of 30°N in a geomagnetic field with a normal polarity, and therefore implies a 7° post-deformation southward migration of Hong Kong.

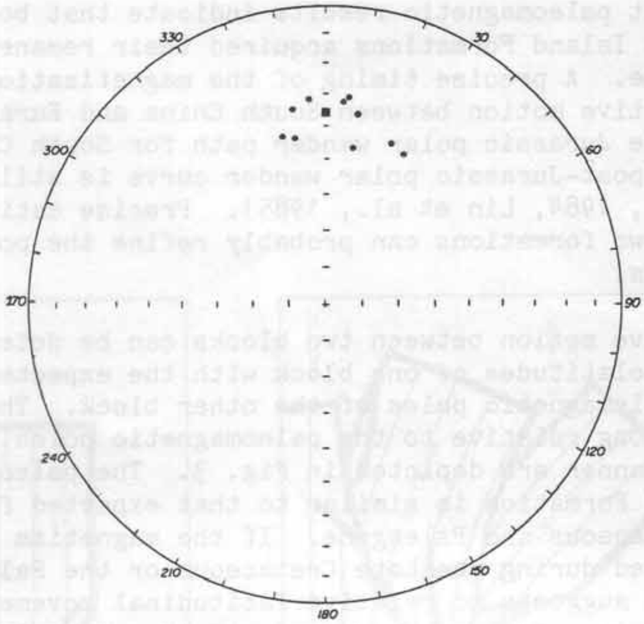

Fig. 1 Equal-area projection of in-situ direction of the natural remanent magnetism (NRM) in the Tolo Harbour Formation. The square is the expected geomagnetic field direction for Hong Kong.

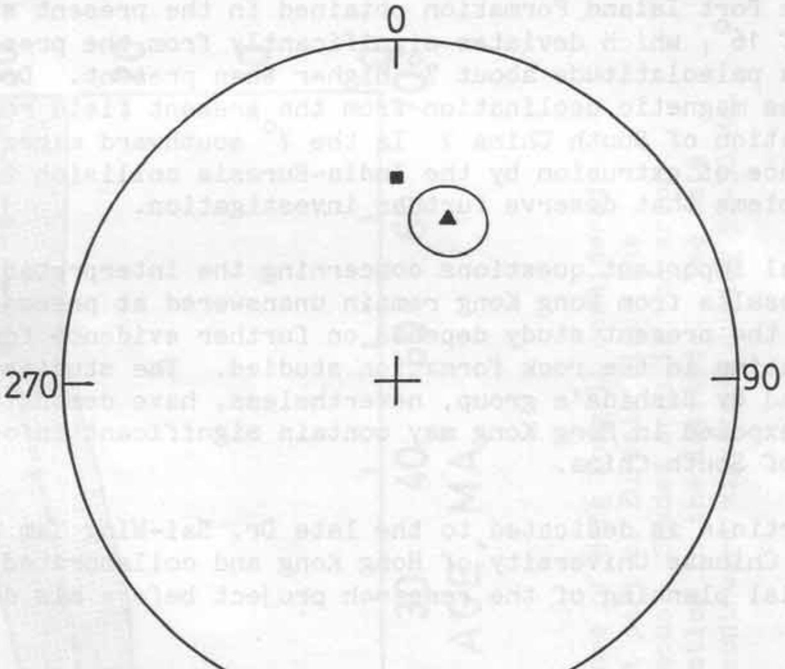

Fig. 2 Mean in-situ NRM direction of 7 sites in the Port Island Formation. The square is the expected geomagnetic field direction for Hong Kong; triangle the mean NRM direction, and oval the 95%-confidence circle.

The current paleomagnetic results indicate that both the Tolo Harbour and the Port Island Formations acquired their remanent magnetism in post-deformation time. A precise timing of the magnetization is crucial for determining the relative motion between South China and Eurasia. Presently, the Permian to Middle Jurassic polar wander path for South China is well determined, but the post-Jurassic polar wander curve is still poorly constrained (Chan et al., 1984, Lin et al., 1985). Precise dating of the magnetic acquisition in the two formations can probably refine the post-Jurassic plate motion of South China.

The relative motion between two blocks can be determined by comparing measured paleolatitudes of one block with the expected latitudes computed from the palemagnetic poles of the other block. The expected latitudes for Hong Kong relative to the paleomagnetic poles of Eurasia calculated in this manner are depicted in Fig. 3. The paleolatitude obtained from the Port Island Formation is similar to that expected for Hong Kong during the Late Cretaceous and Paleogene. If the magnetism in the Port Island Formation was acquired during the Late Cretaceous or the Paleogene, the paleomagnetic result suggests no relative latitudinal movement of South China with respect to Eurasia. On the other hand, if the magnetism is a very recent acquisition, it implies a recent 7° southward migration of Hong Kong relative to Eurasia. A group of French geologists has postulated a model of extrusion tectonics for the India-Eurasia collision (Tapponnier et al., 1982). The model suggests that since the collision, the South China and Indochina blocks have been extruded eastward and have undergone a clockwise rotation (Fig. 4). Paleomagnetic results from Indochina have confirmed the presence of 24° clockwise rotation since the Cretacous (Achache et al., 1983). The paleomagnetic direction of the Port Island Formation obtained in the present study indicates a declination of 16°, which deviates significantly from the present field direction, and a paleolatitude about 7° higher than present. Does this 16° difference in the magnetic declination from the present field represent also a clockwise rotation of South China ? Is the 7° southward migration of Hong Kong a consequence of extrusion by the India-Eurasia collision ? These are some of the problems that deserve further investigation.

Several important questions concerning the interpretation of the paleomagnetic results from Hong Kong remain unanswered at present. The significance of the present study depends on further evidence for the timing of the magnetization in the rock formation studied. The studies conducted by the author and by Nishida's group, nevertheless, have demonstrated that the formations exposed in Hong Kong may contain significant information on the tectonics of South China.

This article is dedicated to the late Dr. Sai-Wing Tam who was a lecturer at the Chinese University of Hong Kong and collaborated with me during the initial planning of the research project before his death.

ACKNOWLEDGEMENTS

The palemagnetic measurements in this study were conducted at the Magnetics Laboratory at Stanford University. Continuing measurements are now being done at the University of Minnesota. Help from the paleomagnetic groups at the two universities is gratefully acknowledged. The author also thanks Dr. D.R. Workman and Mr. P.S. Nau, both at the University of Hong Kong,

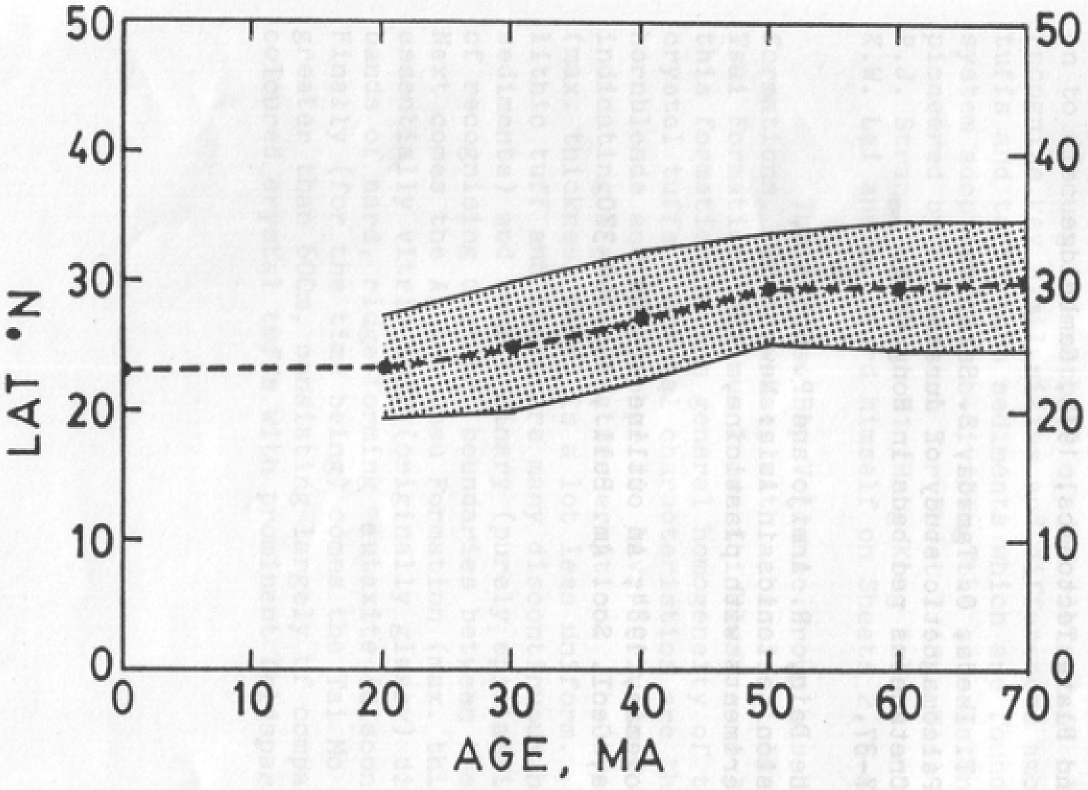

Fig. 3 Paleolatitudes of Hong Kong if considered as an intact part of Eurasia since the Late Cretaceous. Shaded area is the error of determination in the latitude. The data indicate a southward migration during 50-30 Ma.

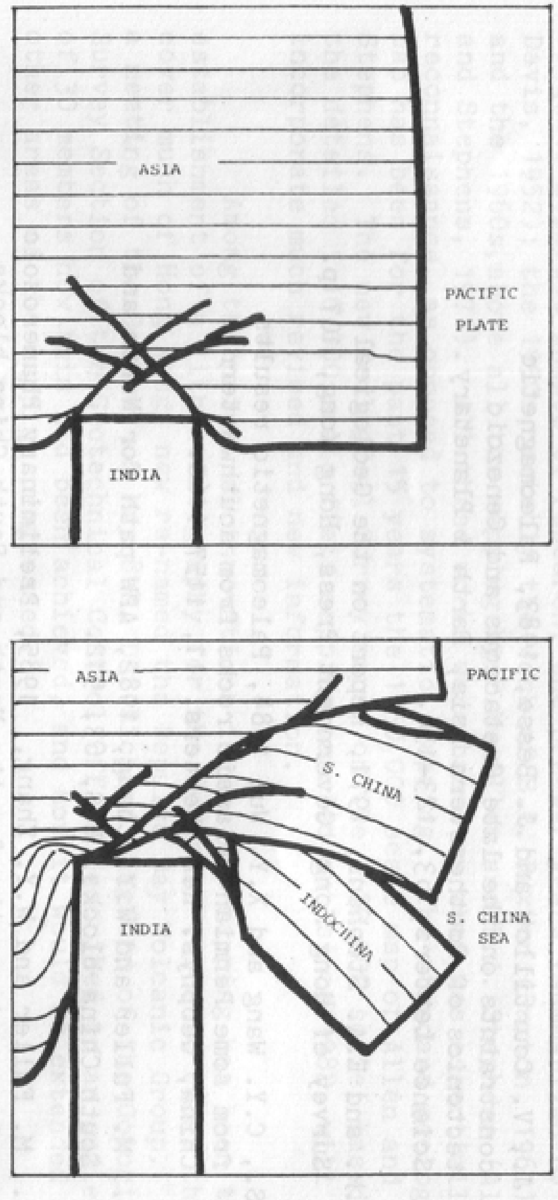

Fig. 4 Extrusion tectonics of India-Eurasia collision. S. China and Indochina blocks are extruded eastward and undergo clockwise rotations according to the model (After Tapponnier et al., 1982).

for useful discussion on the geology of Hong Kong, Dr. R.T.A. Irving for providing an abstract in English of Nishida et al.'s paper, and Mr. R.S. Arthurton for helpful comments on an earlier version of this article. The current study is funded by the US National Science Foundation under contract EAR-8501364.

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LECTURE ON THE NEW CLASSIFICATION OF THE REPULSE BAY VOLCANIC GROUP' MAY 8, 1986

Geology in Hong Kong is on the brink of a new era, which will begin with the publication in mid-1986 of the first map sheet and memoir of the new systematic government geological survey. It is not fanciful to talk of 'eras' because geology has advanced in Hong Kong mainly by means a series of quite separate phases of research; the pre-war years (summarized by Davis, 1952); the 1950s, notably the work of B.P. Ruxton (Ruxton, 1960); and the 1960s, above all the mapping by P.M. Allen and E.A. Stephens (Allen and Stephens, 1971). All these works were based on what was essentially reconnaissance, as opposed to systematic, mapping. The standard geological map has been for the past 15 years the 1:50,000 scale map of Allen and Stephens. The new Geological Survey maps, on the 1:20,000 scale, based on the detailed 1:10,000 scale field mapping carried out since 1982, will incorporate much revised and new information.

Among the principal innovations in the new mapping has been the establishment of a lithostratigraphy for the Jurassic volcanic rocks that cover much of Hong Kong, new re-named the Repulse Bay Volcanic Group. At a meeting of the Society on May 8th, Dr. Richard Langford of the Gological Survey Section of the Geotechnical Control Office described to an audience of 30 members how this had been achieved, and how it would be extended to other areas as the mapping progressed.

Dr. Langford first outlined the mechanism of eruption of the overwhelmingly dominant pyroclastic materials of the succession. He went on to discuss the methods of describing and classifying tuffs and how to recognize key similarities and differences among the enormous variety of tuffs and tuffaceous sediments which are found. Then, he outlined the system adopted for sub-dividing the succession lithostratigraphically, pioneered by R. Addison for Sheet 7 (Sha Tin) and further developed by P.J. Strange on Sheet 11 (Hong Kong Island and Kowloon), and R.S. Arthurton, K.W. Lai and Langford himself on Sheets 2, 5 and 6, Western New Territories).

The Repulse Bay Volcanic Group has been divided so far into four formations. At the base, with a basal epiclastic breccia, is the Yim Tim Tsai Formation (maximum known thickness some 330m). The main feature of this formation is the general homogeneity of the dominant ash and lapilli crystal tuffs. Special characteristics are the presence of magmatic hornblende and of porphyritic lava inclusions with diffuse margins indicating high-temperature eruption. The overlying Shing Mun Formation (max. thickness 600m) is a lot less uniform. There is a good deal of lithic tuff and there are many discontinuous beds of tuffite (tuffaceous sediments) and some ordinary (purely epiclastic) sediments; the difficulty of recognising distinct boundaries between these types was pointed out. Next comes the Ap Lei Chau Formation (max. thickness 800m) which is essentially vitric tuff (originally glassy) distinguished by prominent bands of hard, ridge-forming eutaxite (discontinuously banded welded tuff). Finally (for the time being) comes the Tai Mo Shan Formation, max thickness greater than 600m, consisting largely of comparatively uniform, dark-coloured crystal tuffs with prominent feldspar pyroclasts.

None of the foregoing means one can necessarily recognize a particular formation on the basis of a single outcrop of a particular type of rock, but the general features of the four formations are sufficiently distinct and extensive for the field relations to be established and the units mapped. The mapping is being extended, soon to Sai Kung and eventually to Lantau, where other formations, above, below or within the sequence described above, may perhaps be identified. In particular, the well-known rhyolithic rocks of High Island, with conspicuous lavas, seem to be a unit younger than the Tai Mo Shan Formation.

In conclusion, Dr. Langford referred to the problems of mapping the Repulse Bay Volcanic Group in areas of faulting and shearing, where the rocks become highly altered in narrow, elongate strips or in zones a kilometre or more wide. This alteration, typically to banded sericite schist in more extreme cases, can be seen in many parts of Hong Kong but most notably in the general vicinity of the major fault zone running from Lowu to Tuen Mun.

After questions, with the evening well advanced but no-one in a hurry to leave, the meeting was brought to a close with a vote of thanks to the speaker for an extremely interesting presentation.

D.R. Workman

LANDPLAN III

Over fifty abstracts have been accepted now for inclusion in the Symposium and even though the abstract deadline is well past there are still a few late arrivals coming in. The session themes which will be adopted will depend on actual attendance at the symposium but at this stage eight themes have been identified from the abstracts so far accepted. There are :

Geological Framework for Urban Planning
Engineering Geology and Site Investigations
Slope Stability
Seismicity and Earthquake Risk
Environmental Management
Hydrogeology and Groundwater Resources
Use of Underground Space
Geological Education

It is currently expected that some papers will be presented personally by the authors while others will be presented in the form of a technical poster display.

Arrangements for the workshop training courses and for the site visits are now well in hand. Most important however at this stage is that those wishing to attend the symposium should now register if they have not already done so. Registration forms and copies of the second circular can be obtained from the Conference Secretary, Geological Society of Hong Kong, Department of Geography & Geology, University of Hong Kong, Pokfulam Road, Hong Kong.

RECENT LIBRARY ACQUISITIONS

The Society now has and in most cases continues to receive a number of journals acquired by donation or exchange. These mostly go back to the establishment of the Society in 1982, or in a few cases earlier. They are concerned mainly with geology of China or engineering geology in general. The main titles are :-

- Engineering Geology
- Quarterly Journal of Engineering Geology
- Bulletin of the International Association of Engineering Geology
- Geotechnical Engineering (Journal of the South-east Asian Geotechnical Society)
- Acta Geologica Sinica
- Journal of the Central-South Institute of Mining and Metallurgy (Changsha)
- Geotectonica et Metallogenica (Changsha)
- Journal of the Hunan Science and Technology University
- Geology of Fujian (Quarterly)
- Journal of the Changchun College of Geology

Some Other Recent Acquisitions :-

Geological map of the area around Guilin (2 sheets, 1:50 000), 1981.

Geological map of Taiwan (4 sheets, 1:250 000), 1974.

Tectonic map of Taiwan (1 sheet, 1:500 000), 1978, with explanatory text in Chinese and English, 1982.

Metamorphic facies map of Taiwan (1sheet, 1:500 000), 1983, with explanatory text in Chinese and English, 1983.

Miscellaneous papers on the geology of Taiwan (details on request).

Geology for Urban Planning - selected papers on the Asian and Pacific region, 41 p. United Nations, 1985.

Role of Geology in Planning and Development of Urban Centres in Southeast Asia - proceedings of LANDPLAN II, Kuala Lumpur, 1984. (B.K. Tan and J.L. Rau, Eds.) Association of Geoscientists for International Development, Report Series, No. 12, 1986, 92 p.

Diwa (Geodepression) Theory, by Chen Guoda (in Chinese), Changsha Institute of Geotectonics, Academia Sinica, 1985, 368 p. (soft cover).

Analysis of Underground Rock Mass Stability (in Chinese), by Wang Sijing, Yang Zhifa and Liu Zhuhua, 1984. Science Publishing House, Beijing, 282 p. (soft cover).

Coast and Sea Floor (in Chinese) by Liu Yixuan, 1982, Marine Publishing House, 275 p. (soft cover).

The Recent Earth Movements of the Island Arcs of the West Pacific (in Chinese) by Huang Yukun, 1985. Science Publishing House, Beijing, 166 p. (soft cover).

Applied Karstology and Cavernology (in Chinese) by Zhang Yingjim, Miao Zhongling, Mao Jianguan and Zhang Dian, 1985. Gui Zhou Province Renmin Publishing House, 287 p. (soft cover)

Study on Karst Development and Water Resources Assessment in Luota Area, Hunan (in Chinese) by the Research Group of Luota Karst Geology, 1984. Ministry of Geology and Mineral Resources, Geological Memoirs, Series 6, Vol. 1, 237 p. + 9 p. English Abstract (hard cover). 1:50 000 bilingual map of geology, geomorphology, hydrology and planning (4 sheets).

Abstracts of the International Symposium on Oil Development Environment of the South China Sea (4-7 December 1985, Guangzhou), Society of the S. China Sea Environment of Petroleum Development.

At present, the Society's holdings of books and journals are kept in a locked cupboard at the Department of Geography and Geology, HKU, to which access can be gained by any member by contacting Mr. P.S. Nau (5-8592832), Mr. W.W.S. Yim (5-8592829) or Dr. D.R. Workman (5-8592831). We cannot mail materials to memebrs but they can be borrowed any time on the basis of personal collection and return.

Any suggestions as to how and where this collection might conveniently be permanently housed and maintained for maximum benefit to members should be addressed to the General Committee for consideration.

Suitable unwanted books and journals, especially serials that can be donated on a regular basis if they are no longer required after initial use, are most welcome, as are separates of any papers published by members, receipt of any of which will be acknowledged in the Newsletter.

MEMBERSHIP NEWS

Honorary Degree for Dr. Stephen Hui

We are pleased to report that Hon. Member Stephen S.F. Hui, E.M., Geol. E. (Col. Sch. of Mines), Hon. L.D. (Hong Kong), has received further recognition of his services to earth science from his Alma Mater, the Colorado School of Mines. At the Commencement Ceremony on May 10th, the School conferred on Dr. Hui the Honorary Degree of Doctor of Engineering. The Society extends its hearty congratulations to Dr. Hui.

Visit by Prof. Chen Guoda (Hon. Member)

As reported elsewhere in this issue, Prof. Chen Guoda visited Hong Kong in May and gave a lecture to society members (for the reason stated, this event could not be notified to all members).

New Members

The Society welcomes the following new members who have joined since the issue of the last Newsletter :

Chan Yue Yu (Miss), Kwan Sai Hung,
Leung Wai King (Miss), Mak Yuk Ngun (Miss),
Ngan Lung, Shepherd Glenn L. (Dr.),
Shiu Mei Yin (Miss), Wong Bong Lap (St),
Yiu Chin.

* * * * *

Members new and old are reminded that receipt of a personal copy of this Newsletter mailed by the Soceity constitutes confirmation of receipt of subscription, since it is only sent to fully paid-up members. Non-receipt on the other hand could be due to various causes ! If you find that you have not received a personally addressed copy, please let the society know and re-confirm your mailing address, and we will look into it.

VISIT OF PROFESSOR CHEN GUODA

The distinguished Chinese geologist Prof. Chen Guoda (Hon. member) paid a short visit to Hong Kong in May. Prof. Chen is Vice-Chairman of the Central-South Institute of Technology (until recently Institute of Mining and Metallurgy) in Changsha, as well as the Director of the Institute of Geotectonics of the Academia Sinica.

During his visit Prof. Chen gave an extremely interesting illustrated lecture at Hong Kong University, in English, on his well-known 'Diwa' or 'Geodepression' theory of tectonic evolution, especially as applied to Mesozoic-Cenozoic China. Prof. Chen also presented the Society with a copy of the 1:4 000 000 tectonic map of China based on this theory as well as some background papers and books (see also 'Recent Library Acquisitions' in this issue).

We regret that many members of the Society received no notice of this meeting. The Society itself did not receive confirmation of the visit until a few days beforehand.

It is difficult to summarize a westerner's view of the Diwa Theory in a few lines but there seems little doubt that it could conveniently be expressed in plate tectonics terms without losing anything essential. As such it seems to be a very interesting case of scientific theories based on quite separate experience arising and existing side by side, each with its own terminology but essentially quite compatible even though differences of emphasis inevitably exist. The 3-fold linear progression geosyncline-platform-diwa does not exactly equate with anything in plate tectonics terminology but counterparts can presumably be found for most of the stages in the general plate tectonics cycle: rifting - passive margin development-active margins - collision - uplift-rifting, with 'diwa' representing all the phases of continental deformation following collision and preceding fragmentation - whether actual fragmentation has occurred or not (in the case of post-Mesozoic China, not). What seems to be missing from "Diwa Theory" is the effect of plate collisions, i.e. plate margin orogenesis, but this may be a lack of understanding on the part of this writer. Any comments from readers on this or other ideas developed in China and their 'western' interpretation would be welcomed.

This was a most stimulating talk and those fortunate enough to have heard it learned much about the tectonics of China.

D.R. Workman

MEETING ON SEA-LEVEL CHANGES IN HONG KONG DURING THE LAST 40,000 YEARS

The half-day meeting at the University of Hong Kong on 31st May was attended by more than 100 persons. Six papers were presented. In the first session, chaired by P.G.D. Whiteside, a brief introduction to the subject under discussion by Dr. D.R.Workman of Hong Kong University was followed by a paper by A. Brimicombe (Engineering Terrain Evaluation Ltd.) entitled "4,000 to 6,000 years BP - a higher relative sea-level in Hong Kong ?". The next speaker was M.D. Howat (Mass Transit Railway Corp.), on the topic "Sea-level changes deduced from excavation and tunnelling in Western District, Hong Kong Island". W.W.-S.Yim (Hong Kong University) closed this session by proposing a sea-level curve for Hong Kong during the last 40,000 years.

After a break for refreshments, Professor C.J. Grant took over as Chairman for the second session. W. Meacham (Hong Kong Archaeological Society) re-opened the proceedings with an account of "Archaeological evidence on higher sea-levels in Hong Kong". This was followed by a paper from T.S. Cheng (Royal Observatory) on sea-level related studies at the Observatory. The final paper, by Dr. C.D.R. Evans (British Geological Survey), presented by R.S. Arthurton (Geotechnical Control Office), dealt with "Holocene marine sedimentation and erosion in Hong Kong - evidence from seismic profiles".

The meeting ended with a lively open forum. The papers and the discussion contained much new information and many provocative ideas, providing abundant food for thought on this important but still little-understood subject.

The collected extended abstracts of the six papers presented are available from the Society. The 51-page volume, Abstracts No. 3, is in the same 30 x 21.5 cm (A4) format as Abstracts 1 (1983) and 2 (1984). Besides the abstracts themselves, the volume contains Quaternary sea-level and time scale tables, a bibliography on sea-level changes, guidelines on treatment of sediment samples for paleoenvironmental research and information on current related local, regional and international activities. Copies of Abstracts No. 3 may be ordered using the detachable order form contained in this Newsletter. The cost is HK$15 ($20 overseas) including postage. Cheques should be made payable to the Geological Society of Hong Kong.

D.R. Workman

REPLY SLIP

Abstracts No.3   Sea Level Changes in Hong Kong During the Last 40,000 Years

Name ____

Address ____

____

I would like to order ________ copy/copies of Abstracts No. 3 at $15 per copy ($20 for overseas). I have enclosed a crossed cheque for HK$________________.

Signature ________________

Date ________________

REPLY SLIP

Joint HKGS - HKAS Boat Trip to Sha Chau

I/We wish to attend the Boat Trip to Sha Chau on Sunday, 31st August 1986.

Names(s) :

I/We enclose payment of $

(Cheque payable to Geological Society of Hong Kong - see under Forthcoming Meetings for cost and slip/cheque return address).

Contact Telephone No. ________________

If any proposed accompanying persons are under age 16, please give age in brackets.

FORTHCOMING MEETINGS

Joint HKAS-HKGS Boat Trip to Sha Chau

The HKAS has organised a 100-seat boat to go to Sha Chau, south-west of Castle Peak, on 31st August (Sunday). The HKGS has half the seats, and requests for places must be made to Dr. Langford, at the address below, before 22nd August :

c/o Geological Survey Section,
Geotechnical Control Office,
6/F, Empire Centre,
68 Mody Road,
Tsimshatsui East,
Kowloon.

Tel. No. : 3-667916

The boat leaves Blake Pier at 0900 hours and returns between 1700 and 1800 hours.

The trip will be cancelled if No. 3 typhoon signal is hoisted; telephone Dr. Langford on 5-722096 if No. 1 is hoisted.

Swimming is possible on two beaches; low tide is 0.6mPD at 1407 hours. The island is uninhabitted.

As well as the archaeological interest (3 Neolithic sites), there is the chance to look at a tombolo, quartz vein and granite type. You can make up your own minds about the possibility of raised beaches. For reference, see FROST, R.J. (1975), Sha Chau. Journal of the Hong Kong Archaeological Society, Vol. VI.

Cost : Adults $40; Children $30 (same as HKAS)

Cheques payable to "Hong Kong Geological Society".

Lin Fa Shan, near Tsuen Wan

A day's walk down through the stratigraphic sequence of the RBVG is planned for late-October or November.

Leader : Dr. Langford

試論香港新界荔枝莊村北岸岩層的年代(摘要)

鈕柏燊

在新界荔枝莊村北岸沿着荔莊輪渡碼頭以西的地段出露的岩層可分爲三個部分，即：上部火山岩岩層——Jip(U)，中部沉積岩岩層——Jis及下部火山岩岩層——Jip(L)。上部及下部火山岩均爲火山碎屑岩如火山礫凝灰岩，粗粒凝灰岩等。沉積岩岩層由頁岩、粉砂岩、砂岩及泥岩夾燧石層及凝灰岩等薄層組成。在上部火山岩岩層的底部產有矽化木化石。在沉積岩層上部的泥岩及下部的炭質頁岩中產植物化石。關於在沉積岩中的植物化石，在1943年已有記述。據記載，所發現的化石中其一鑑定爲Pterophyllum Kingianum Feistm,年代屬里阿斯世(下侏羅世)。作者在1984年於炭質頁岩及泥岩中採集的植物化石均屬Cladophlebis，其中泥岩中較完好的化石由中山大學地質系吳起俊教授鑑定爲Cladophlebis todioides Yang，年代屬下侏羅世。由於火山岩岩層與其下的吐露海峽組爲不整合接觸，作者推測上述火山岩及沉積岩岩層的年代可能屬晚下侏羅世，但年代的確證仍需進一步的工作。

學者訪問

李坤榮

我會名譽會員陳國達教授於今年五月十九日應我會邀請訪港，陳教授是中國科學院學部委員、長沙大地構造研究所所長、國際地科聯大地構造委員會副主席。1959年陳教授首創地窪學說，以此闡釋中國東部大地構造特徵。

五月十九日陳教授與他的助手梁述文先生抵港後，即到香港大學拜會了我會名譽秘書Dr. D. Workman。俟後參觀了港大地理地質系，並會見了系主任 C. J. Grant 教授。

次日陳教授由鈕柏燊先生陪同到香港政府土力工程處參觀，並拜會了我會主席Dr. A. D. Burnett，接着參觀了該處地質測量組。對所採集岩石標本進行觀察，並詳細了解1/20000地質測圖過程，同時與該組地質師進行了討論。

廿一日陳教授由黎權偉先生陪同往新界野外考察斷裂構造及具代表性地質剖面。當晚在港大厲樹雄科學館主講地窪學說，並與予會人仕進行討論。

廿二日遊覽了太平山頂和沙田新市鎮。

陳教授隔別香港達卅八年之久。這次舊地重遊，對本港發展印象頗深。離港前對我會安排表示深切謝意。

香港地質學會

1985－86年度常務委員會

投稿本會通訊簡則

概　則：請將所有稿件，查詢及通訊寄香港地質學會秘書收（煩香港大學地理地質系轉）。本會並不負責刊登在本通訊內文章之版權。如寄來的文章或資料有在過去曾引用過，或現時及將來可能會引用到的話，作者請於來稿時特別註明。

我們歡迎一些專門性的稿件，有趣事項的報導，書評或專題討論等。來稿以簡為主。雖然有些時候本會可作出例外，但普通稿件請以一千二百字為限。請盡量減少插圖及附表等，而所有圖表請另外分頁。

所有來稿必須清晰——英文稿用打字機打出，中文則以正楷謄寫。來稿需寄兩份。英文稿（包括援引）必須隔行，不可一紙兩面用；請用A4號紙張。中文稿則請用原稿紙。中英文稿每頁均必須有頁編號及作者姓名。

所有插圖請只寄影印本，待本會通知時始可將原版寄來，而必須註有來稿者姓名。圖表必須用黑色繪在描圖紙或滑面白紙或紙板上；所有綫條或字體之粗幼必須能縮影後仍可保持清晰，所有地圖必須附有公制比例，正北指向及如適用的話附有經緯綫座標。

援　引：來稿者須負責確定所有援引的準確性，而公報之簡寫須以現藏於倫敦地質學會圖書館內倫敦地質學會1978年出版之定期出版物目錄為準。

單行本：經本通訊刊出之稿件，本會不負責供免費單行本給作者，但可代向承印商洽商，使作者可向承印商購買單行本。

封面圖片：赤門海峽荔枝庄淺水灣組中
具交錯層理的凝灰質沙岩和
燧石狀細火山灰凝灰岩中的
斷裂序列。

香港地質學會

通　訊

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