geological society of hong kong

# NEWSLETTER

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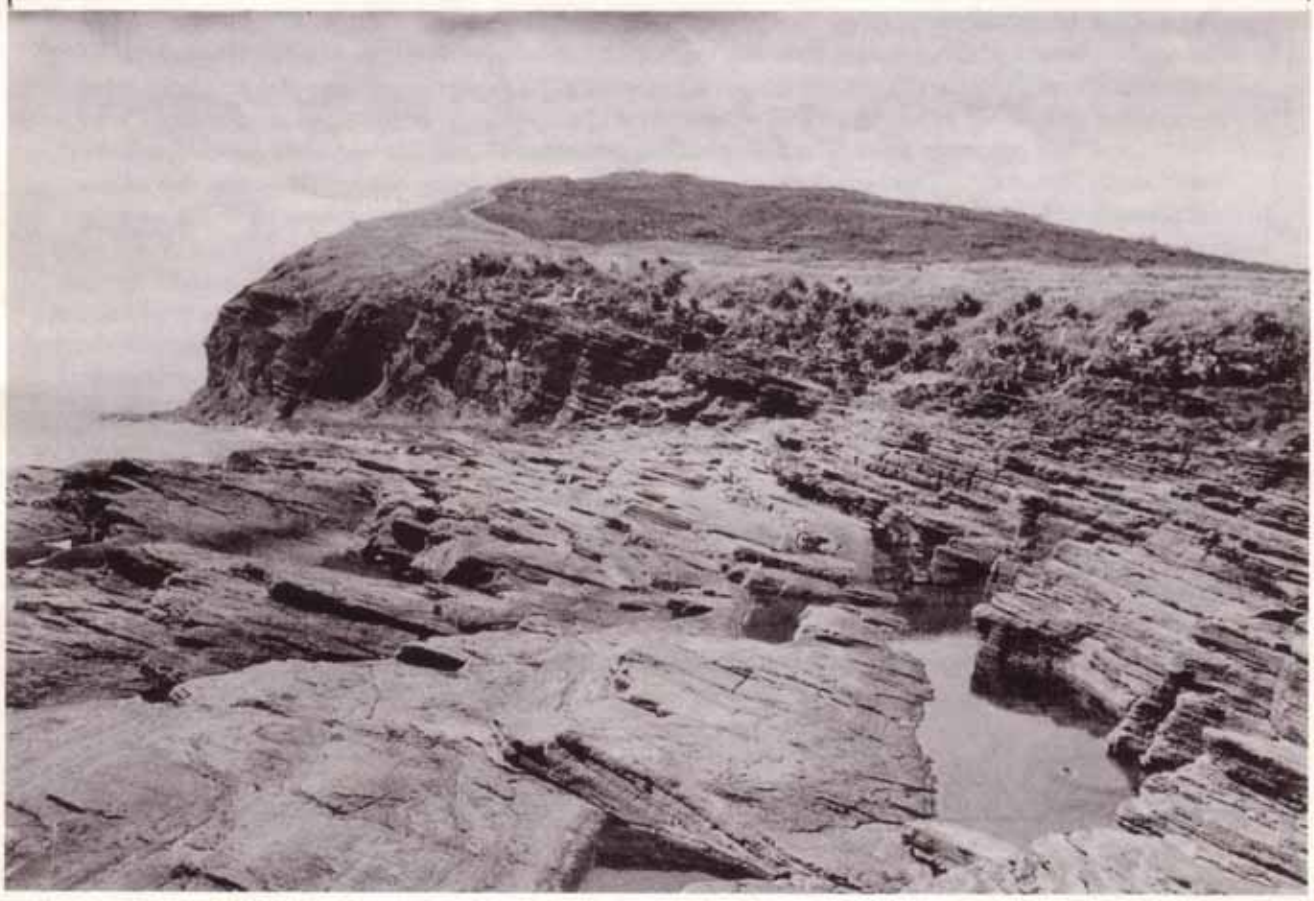

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*Cover Photograph : Dipping strata (mudstones and siltstones) on the south coast of Ping Chau, Mirs Bay.*

# AN EXPOSURE OF WELDED TUFF AT MOUNT KELLETT

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**University of Hong Kong**

## Introduction

Among the most common rocks in Hong Kong are various kinds of crystal tuff. In many cases, the tuffs show evidence of having been welded by fusion of original glassy fragments while still hot. Similar rocks elsewhere have been called welded tuffs (Mansfield & Ross, 1935; Gilbert, 1938) although it needs to be remembered that welding in tuffs, being "that process which promotes the union or cohesion of glassy fragments" (Smith, 1960), is a feature exclusive to glassy rocks, whereas in many areas, including Hong Kong, there is little or no glass left in the tuffs because of its conversion to quartz and other minerals by crystallization.

The first published reference to welded tuffs in Hong Kong was by Ruxton (1960). Allen and Stephens (1971) gave many localities where welded tuffs occur and Tam and Chan (1983) described occurrences in the eastern New Territories. To the author's knowledge only two photographs have been published which show that the welded tuffs of Hong Kong look like in exposure or hand specimen, one in Ruxton (a spectacular but not a representative example, from Ap Lei Chau) and one in Allen and Stephens. Attempts by the author to find good exposures of welded tuffs at several of the more accessible sites on Hong Kong Island mentioned by Allen and Stephens, including the type section at Repulse Bay, have been for the most part unrewarding, for various reasons: weathering and staining of old rock surfaces, construction and highway work since Allen and Stephens' survey, etc.

The purpose of this note is to outline some of the megascopic features of welded tuffs in Hong Kong by reference to an accessible roadside location which may serve as a representative example and where the appearance of the rock when fresh and on weathered joint surfaces can be studied. The section selected is a cutting in Mount Kellett Road, Hong Kong Island, immediately west of the entrance to the Matilda Hospital (Fig. 1 and Plate). As Fig. 1 shows, the exposure is near the middle of a mappable unit of welded tuff some 300 m wide on the ground at this point (P.J. Strange, pers. comm.).

## Description of the tuff

The tuff at the Mount Kellett Road locality is of a type which is very widespread across the length of Hong Kong Island and in the Clearwater Bay area. It is an extremely strong rock with randomly scattered angular fragments (phenocrysts) of quartz and feldspar in a very fine-grained (aphanitic) dark grey groundmass. Crystal fragments are mainly in the range 1-2 mm (coarse ash), with a maximum of 5 mm. Fig. 2 gives an idea of the proportion of phenocrysts, which is low relative to most crystal tuffs in Hong Kong.

There are many inclusions (lapilli and blocks) in the tuff. These are almost invisible in the fresh rock but can easily be seen on clean weathered surfaces (Fig. 2, Plate). A few lapilli are small, sub-rounded, roughly equidimensional and probably original fragments of crystalline volcanic rock. The majority of the inclusions, however, are markedly elongate (Fig. 3), and many have irregular outlines. Some have ragged ends (Plate). They are recognizable only because they have a different colour or colour tone from the rest of the rock. These lenticular and streaky inclusions are called fiamme (an Italian word, fiamma in the singular). Their presence gives the rock a distinctive discontinuous banding or foliation which is called eutaxitic structure (rocks with this distinctive structure are sometimes called eutaxites-von Fritsch and Reiss, 1868; Fisher and Schmincke, 1984). In the fresh rock the fiamme, where discernible, are lighter in tone than the rest of the rock, being a light to medium grey colour sometimes with a pinkish tint. On weathered surfaces, the rock is lighter in colour than the fiamme. In some outcrops the fiamme are picked out in relief (usually positive) by differential weathering. However, this is not the case at the Mount Kellett Road exposure.

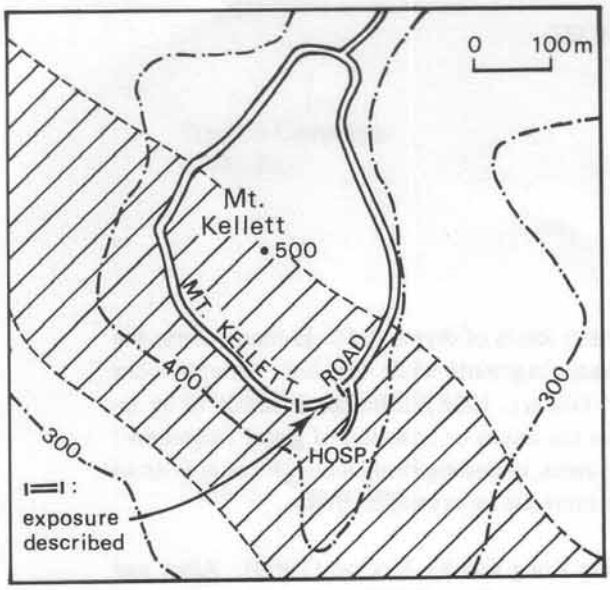



Fig. 1 Location map. Shaded area: eutaxitic welded tuff or "eutaxite" (from unpublished geological mapping by P.J. Strange, Geotechnical Control Office).

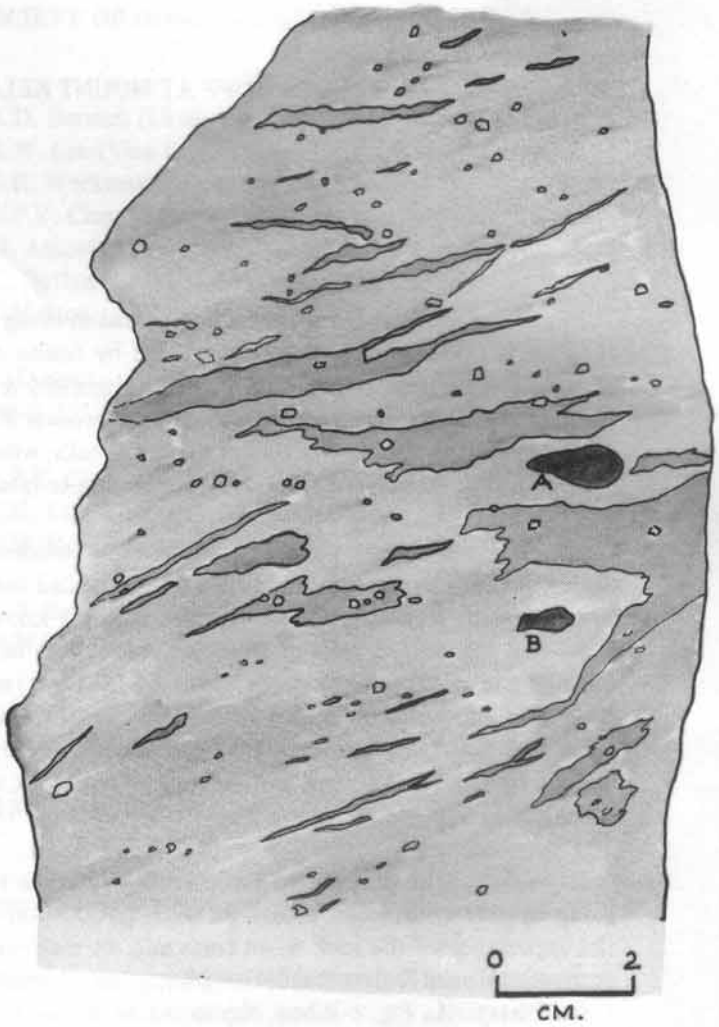



Fig. 2 Detail of a joint surface in welded tuff at Mount Kellett, showing fiamme and distribution of megascopic crystal fragments. A and B are non-pumice lithic lapilli.

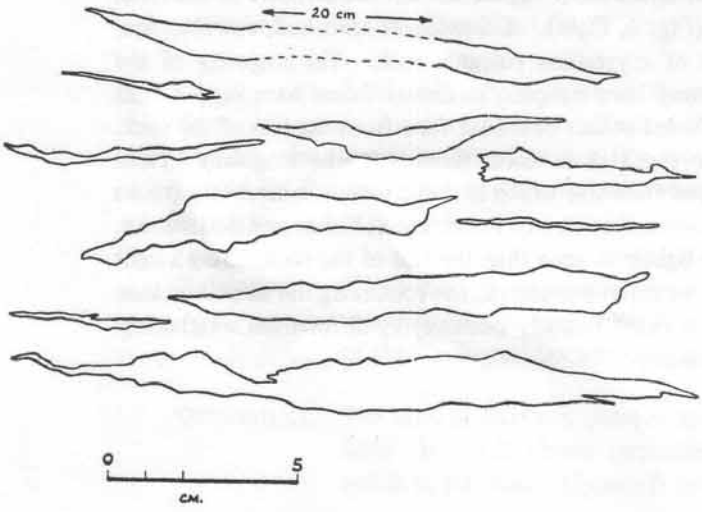



Fig. 3 Representative cross-sections of strongly flattened fiamme in welded tuff at Mount Kellett

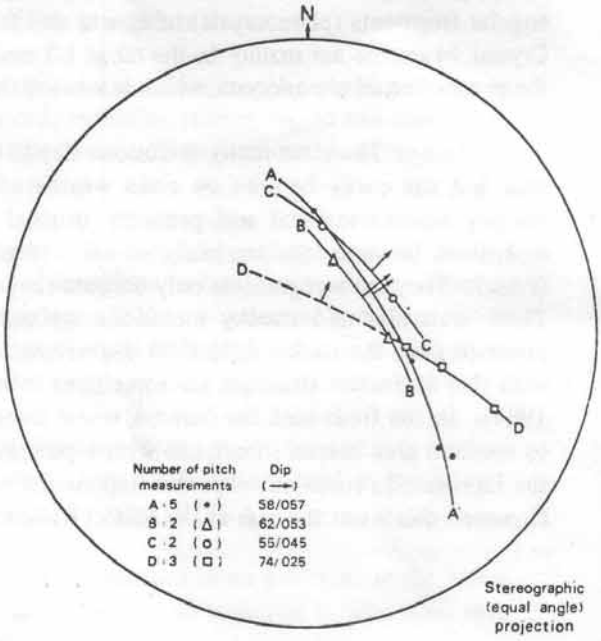



Fig. 4 Stereographic determination of dip of foliation from pitch on joint surfaces (4 cases)

Compaction, welding and devitrification of glassy and pumiceous tuffs

Fiamme result from the compaction and flattening of compressible fragments, most commonly of pumice, in the original pyroclastic deposit. This flattening generally takes place in or near to the horizontal plane, although there are known exceptions for example flattening against steep valley sides or even cliffs (Lowell & Chapin, 1972). The process of deformation and crystallization of pumice clasts in siliceous tuffs is one of gradual and progressive homogenization with the rest of the rock, first by conversion to a compact glass and eventually by crystallization to quartz and feldspar, to the point where all trace of the clasts may be obliterated (Ross and Smith, 1960). This process is accompanied by welding. With complete welding, all grain boundaries disappear and a homogeneous glass is formed. With time, the glass crystallizes the fiamme and host rock become increasingly alike in composition and appearance. In completely recrystallized tuffs, like the great majority of those in Hong Kong, flattening of the fiamme is the only evidence of original welding (Smith, 1960). Significant foliation without welding is rarely, if ever, produced (Fisher & Schminke, 1984).

Eutaxitic structure is most noticeable at some intermediate stage in the above process, when there is marked flattening of the clasts but still a mineralogical or at least a textural difference between clasts and groundmass. In certain densely welded parts of the Bishop Tuff, a Pleistocene ash flow in California (Gilbert, 1938; Ragan and Sheridan, 1972), the fiamme are composed of shiny black obsidian while the glassy rock itself is light brown. In the welded tuffs of Hong Kong, the process of transformation of pumice has gone well beyond this point and there is no discernible glass left. The eutaxitic structure as seen in the fresh rock is no more than a vague blotchy streaking of a slightly different tone of grey from the rest of the rock.

It should be noted that, as shown in Fig. 2, megascopic crystals are commonly present in the fiamme as well as the host rock, in sizes and proportions which may not be noticeably different. This also tends to obscure the banding.

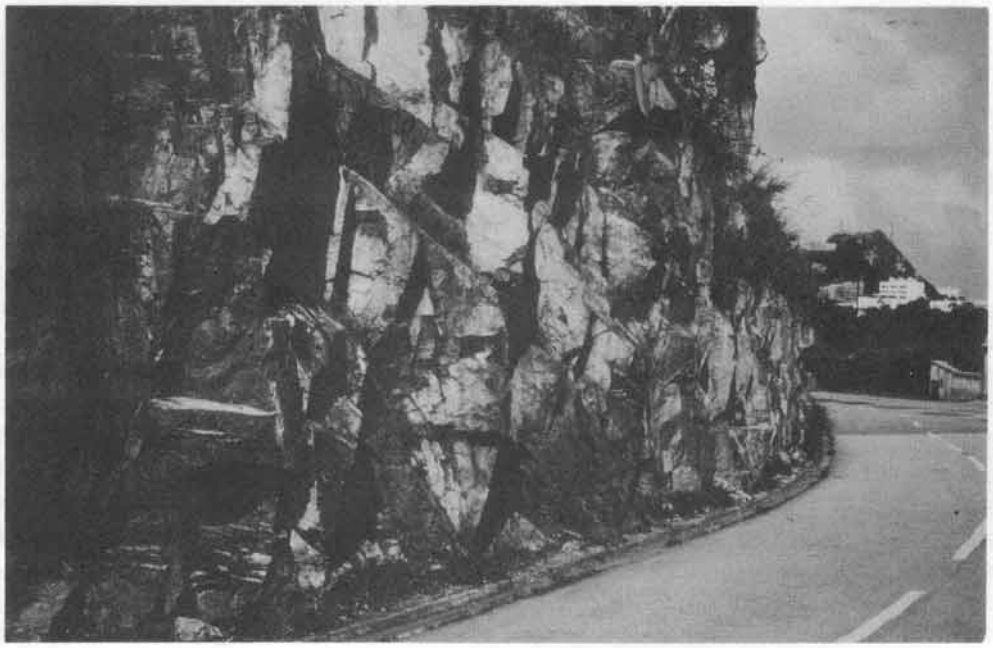
Eutaxitic structure as an aid in mapping and interpretation of welded tuffs

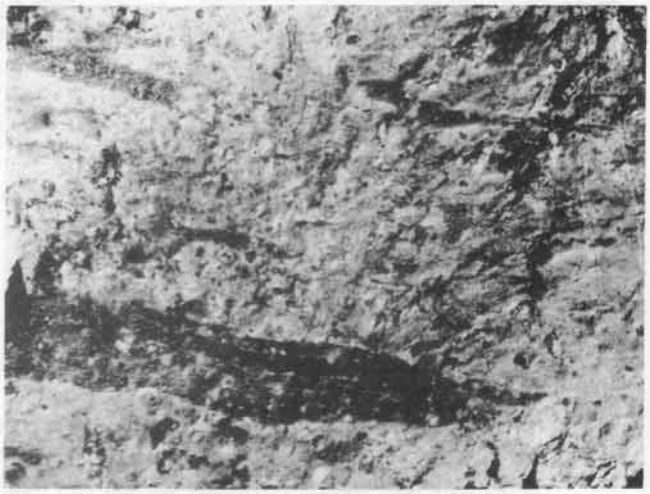
Eutaxitic structure is useful in that it can be used, with certain reservations, to give an idea of the dip of flow units (parallel to the foliation where the foliation was originally horizontal) and by the same token to determine the direction towards the top and base of the flows.

In detailed studies, flattening ratios can be used as a basis for zoning and estimating the thickness of ash flows and for determining whether more than one ash flow is present. Sudden lateral changes of flattening ratios have been used to map faults (Peterson, 1979).

The degree of flattening of the fiamme gives an indication of the intensity of the original welding. It has been observed that in the non-welded part of some ash flow tuffs, inequidimensional pumice fragments have an apparently random orientation (Ragan & Sheridan, 1972; Peterson, 1979). In such cases, the mean of length: height ratios measured on many fragments is close to unity. Ross and Smith (1960) observed however that during emplacement of ash flows there will be a tendency for pumice fragments to come to rest with their short dimensions in the vertical plane. Nevertheless, length: height ratios significantly greater than one are taken as evidence of compaction and welding.

The ratio of the dimension parallel to the flattening (horizontal dimension if the dip is zero) to the dimension perpendicular to the flattening is designated as the "apparent flatness" of a fragment (Peterson, 1979). The mean apparent flatness is called the flattening ratio. Apparent flatness values are affected by the relative position of the measured surface in a fragment. That is, a section through the centre of a disc-shaped fragment would give a different apparent flatness than a section passing near the margin. By measuring a large number of fragments, this effect is averaged out. Computed flattening ratios will not reflect the absolute amount of strain caused by the imposed stress, but the values obtained can still be used for making comparisons between one location and another or between different parts of a section.





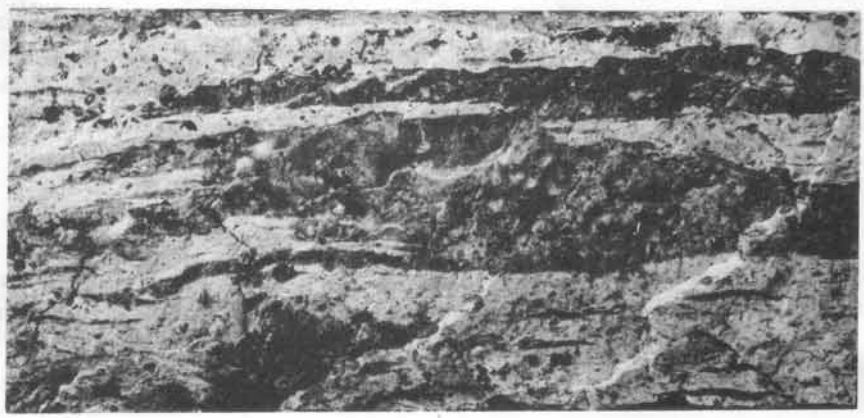
Top: The site, looking east (there is also a cutting, exposing the same rock, on the other side of the road)

Above: Large and small fiamme on a joint surface *

Left: A joint surface with elongate fiamme (dark lenses and streaks) *

Below: Streaky fiamme with ragged ends *

* natural size



* natural size

In flattening, horizontal: vertical dimension ratios of as much as 25 may be achieved by volume loss alone. Further flattening results from deformation at constant volume (Ragan and Sheridan, 1972). Tuffs with overall flattening ratios of less than 2 may be considered non-welded or incipiently welded, those with ratios 2-6 partly welded and those with ratios greater than 6 densely welded (Peterson, 1979).

In many welded tuffs, flattening ratios are similar in all planes perpendicular to the foliation. This indicates, bearing in mind the assumed randomness of original orientations in the plane parallel to the foliation, that the stretching was radial, and points to flattening under lithostatic pressure alone. However, elongation of the fiamme in a preferred direction in the plane of flattening is also common occurrence. Such a lineation is an indicator of probable mass laminar flowage after turbulent transport has ceased (Schminke & Swanson, 1967). The lineation thus formed defines the path along which such flowage occurred.

Orientation and dimension measurements on fiamme at the Mount Kellett Road Section

At the Mount Kellett Road section, and in many other exposures of welded tuff in Hong Kong, orientations, flattening ratios and elongations of fiamme cannot be determined by direct measurements because surfaces parallel to and perpendicular to the foliation are lacking. In such cases the investigator has to make do with the available joints, which can of course be at any angle to the foliation. However, there is usually quite a wide range of smooth, planar joints available for measurements. Joints at high angles to the foliation will give a close approximation to the flattening ratio. Joints at high angles to each other and at angles to the foliation which are not widely different will usually give an idea whether the fiamme are elongated in a preferred direction in the foliation plane or not, and if so, approximately what the direction is.

When the dip cannot be measured directly, it can be obtained from the pitch of the trace of the foliation on two (or preferably three) adjacent joint surfaces. At the Mount Kellett exposure this gives somewhat variable dips in the range $55^{o}$-$75^{o}$ to a direction of between N25E and N60E (Fig. 4). A dip determination from pitch measurements on three intersecting joint surfaces and two nearby ones gave a dip of approximately 50/057 (A on Fig. 4), and this may be taken as representative.

Long axes of the cross sections of fiamme on any one joint surface were without any observed exception oriented in the same general direction. Measurements of long axis: short axis ratios on 73 fiamme on joint surfaces at medium to high angles to the foliation revealed only two instances of a ratio less than 2, sixteen between 2 and 6 and the remainder more than 6. The maximum measured ratio was 60 (180 x 3 mm). This leaves no doubt that the tuff has been welded, and mostly, if not entirely, densely welded.

To obtain a preliminary idea of whether the fiamme appeared to be elongated in a preferred direction in the plane of flattening, a number of fiamme were measured on three intersecting joint surfaces at high angles to each other (angles AB $73^{o}$; BC $87^{o}$; AC $67^{o}$) and at medium to high angles to the foliation.

| | Dip of Joint | Angle to foliation (A on Fig. 4) * | Pitch of foliation trace on joint | Number of fiamme measured | Av. dimension ratio (long axis: short axis) | Max. ratio | Min. ratio |
|---|---|---|---|---|---|---|---|
| A | 75/290 | 70 | $47^{o}$ from 020 | 26 | 8.4 : 1 | 30 | 1.6 |
| B | 86/215 | 41 | $24^{o}$ from 125 | 21 | 13.0 : 1 | 34 | 2 |
| C | 29/116 | 46 | $79^{o}$ from 206 | 15 | 25.5 : 1 | 60 | 11 |

* angle here means dihedral angle

Differences in different directions of the order shown in the table suggest linear stretching, most likely due to flow in a roughly northwesterly or southeasterly direction in this case. More detailed measurements would be needed to determine whether this is representative of the exposure as a whole.

## Conclusions

The tuff exposed at Mount Kellett Road immediately west of the extrance to the Matilda Hospital has a foliation (eutaxitic structure) resulting from the preferred orientation of lenticular inclusions, or fiamme. The foliation, while not very obvious in the fresh rock, is clearly visible on clean, slightly weathered joint surfaces.

Assuming that the shape of the fiamme is the result of flattening and stretching in or close to the horizontal plane, as is the general case in such rocks, the present orientation of the foliation indicates that the tuff dips to the northeast at a high angle.

The degree of flattening of the fiamme, as revealed by long axis: short axis ratios on joint surfaces at medium to high angles to the foliation, shows that the tuff has been strongly welded.

The fiamme exposed on one group of three intersecting joints appear to be elongated in the plane of foliation with long axes aligned in a roughly NW-SE direction. This apparent linear stretching is suggestive of laminar flow of the tuff towards the northwest or southeast, perhaps shortly after its initial emplacement.

## Acknowledgements

The author is grateful to R.S. Arthurton and P.J. Strange of the Geotechnical Control Office for suggesting a number of improvements to the text. The latter also kindly provided information upon which Fig. 1 is based from his unpublished 1:10,000 geological mapping for the new Geological Survey of Hong Kong.

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## RECENT DEVELOPMENTS IN HONG KONG STRATIGRAPHY

Speakers at the meeting at Hong Kong Polytechnic on 20 May were C.M. Lee, K.W. Lai, P.S. Nau and M.D. Howat. Principal speaker C.M. Lee outlined an interpretation of the stratigraphy of Hong Kong (Table 1) based on his own studies in Hong Kong and knowledge of Guangdong geology, which differed in several respects from the standard column of Allen & Stephens (1971) and recent review of Bennett (1984). Lee's column utilizes a number of new, informal formation names arising from his recognition of various new units and sub-sivisions in the column.

K.W. Lai reviewed the stratigraphy of the Lok Ma Chau Formation and equivalent succession in Guangdong. He also referred to the Kat O Formation, and reported that lithologically similar red beds in Guangdong, formerly thought to be Tertiary, had recently yielded dinosaur eggs.

P.S. Nau referred to fossil plant evidence for the age of the strata on Ping Chau in Mirs Bay, concluding that an Upper Triassic-Lower Jurassic age appeared the most likely but remained an open question. However, C.M. Lee suggested a possible correlation between the Ping Chau beds and the Eocene Buxin Formation of Shansui Country, central Guangdong.

M.D. Howat described a Holocene near shore deposit in Western District, with both a marine and terrestrial facies, which does not fit the Quaternary stratigraphic model of Yim (1984), illustrating his talk with some interesting slides of exposures in tunnels and excavations.

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**Yim, W.W.S.**, 1984. Evidence for Quaternary environmental changes from sea-floor sediments in Hong Kong. The Evolution of the East Asia Environment, v. 1, p. 137-155. Centre of Asian Studies, University of Hong Kong.

**Table 1** Correlation between the stratigraphic column of Central-East Guangdong province, the stratigraphic column established for Hong Kong by Allen and Stephens (1971), its modification by Bennett (1984) and a column recently proposed by Lee (1984) - see **Explanatory notes**

| System | Series | Stage | Central-East Guangdong Province | Hong Kong | | |
|---|---|---|---|---|---|---|
| | | | | C.M. Lee (11. 1984) | J.D.Bennett(1984) | Allen & Stephens (1971) |
| Quaternary | Recent Holocene | | Continental & Littoral deposits | Continental & Littoral deposits | X | Continental & Littoral deposits |
| | Pleistocene | | Continental & Littoral deposits | Continental & Littoral deposits | Kat O Formation | Kat O Formation |
| Tertiary | Neogene | | Continental deposits | | | |
| | Oligocene | | Huayong Formation | | | |
| | Eocene | | Xibu F. | | | |
| | | | Buxin F. | | | |
| | Palaeocene | | Daliangshan F. | | | |
| Cretaceous | Upper | | Danxia F. | Kat O Formation 9 | | |
| | | | Nanxiong F. | Port Island F. (on Port Is.) 9 | | |
| | Lower | | Guancaohu F. | Pat Sin Ling F. 9 | Port Island F. | Port Island F. |
| Jurassic | Upper | | Gaojiping Group | Repulse Bay F. 8 | | |
| | Middle | | Zhangping Group | | Repulse Bay F. | Repulse Bay F. Tai O F. |
| | Lower | Liassic | Jinji F. | Tolo Channel F. | Tai O F. Tolo Channel F. | Bluffhead F., Lok Ma Chao F. Tolo Channel F |
| Triassic | Upper | Rhaetic | Xiaoping F. | Sham Chung F. 7 | | |
| | Middle | | Huangfen Group | | | |
| | Lower | | Daye Group | | | |
| Permian | Upper | | Dalong F. | Central Island F.6 | | |
| | | | Long tan F. | | | |
| | Lower | | Gufeng F. or Maogou F. | Tolo Harbour F. 5 | Tolo Harbour F. | Tolo Harbour F. |
| | | | Qixia F. | Ledge Point F. | | |
| Carboniferous | Upper | | Chuanshan F. | | | |
| | Middle | | Huanglong F. | | | |
| | Lower | Visean | Zimenqiao M. | | | |
| | | | Ceshui M. | Lok Ma Chao F. or Tai O F. 4 | | |
| | | | Shidengzi M. | YuenLong F. 3 | Lok Ma Chao F. | |
| | | Tournacian | Menggongau M. | | | |
| Devonian | Upper | | Maozifeng F. | | | |
| | | | Tianziling F. | | | |
| | Middle | | Laohuau F. | Plover Cove F. 2 | | |
| | | | Guitou G. | Harbour Island F. 2 | Bluffhead F. | |
| | Lower | | | | | |
| Silurian | Upper | | Lingxia G. | | | |
| | | | Wentoushan G. | | | |
| | Lower | | Liantan G. | | | |
| Ordovician | Upper | | Longtouzhai G. | | | |
| | Middle | | Changkengshui F. | | | |
| | Lower | | Xiahuangkeng F. Xinchang F. | | | |
| Cambrian | Upper Middle Lower | | Bacun G. | FungWongWat F. ? 2 | | |
| Proterozoic | Sinian | | Sinian | | | |

**Explanatory notes by C.M. Lee on his stratigraphic column in Table 1**

1. The stratigraphic column in Table 1 was presented at a symposium in Guangzhou on the Mesozoic-Cenozoic stratigraphy and palaeontology of Guangdong Province and its vicinity, 13-18 November 1984, organized by the Stratigraphy and Palaeontology Committee of the Geological Society of Guangdong Province.
2. The Bluff Head Formation is suggested to be divisible into three parts, called the Fung Wong Wat formation, Harbour Island formation and Plover Cove formation. Placoderm fish remains have been found in the Harbour Island formation.
3. To distinguish the concealed marble and limestone in the Yuen Long area from the Lok Ma Chau Formation, the name Yuen Long formation is suggested for the former.
4. The Lok Ma Chau Formation in the northwestern New Territories is metamorphosed. The Tai O Formation at Tai O is not metamorphosed. Fossil plant remains have been found in the latter.
5. Brachiopods and ammonites have been collected from the Tolo Harbour Formation. Some stratigraphically useful index species have been identified. The Tolo Harbour Formation is marine.
6. Index fossil plant assemblages of the Gigantopteris group have been collected at Centre Island. They indicate that this formation belongs to a terrestrial facies and is therefore different from the Tolo Harbour Formation.
7. A plant, Clathropteris, has been found in beds under the Liassic Tolo Channel Formation. It suggests that the plant bearing beds may belong to the Rhaetic stage of the Upper Triassic.
8. Plants collected from the Repubse Bay Formation suggest that the formation may belong to the Upper Jurassic.
9. There are three kinds of red beds in Hong Kong. They may all be Cretaceous. The Pat Sin Ling formation contains tuffaceous conglomerate, sandstone and slate which are slightly metamorphosed; none are calcareous. The Port Island formation in the restricted sense of the term adopted here contains calcareous materials, it is not metamorphosed. Charophyte algae (genus Atopochara) have been found in beds of the Port Island formation and Kat O Formation.

**SOME RECENT PUBLICATIONS**

**REMOTE SENSING IN CIVIL ENGINEERING** Edited by T.J.M. Kennie and M.C. Matthews, 392 p.; 81 photographs, incl. 23 colour plates, Surrey University Press, £37.50.
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**MAN-INDUCED LAND SUBSIDENCE** Edited by T.L. Holzer. Review in Engineering Geology VI, 231 p. Geological Society of America (P.O. Box 9140, Boulder, Colo. 80301). US$28.
ISBN 0-8137-4106-8.

**A GEOLOGY FOR ENGINEERS** 7th Edition (extensively revised), 1984, by F.G.H. Blyth and M.H. de Freitas, 325 p. Edward Arnold and English Language Book Society.
ISBN 0-7131-2910-7.

**THE EAST ASIAN TERTIARY/QUATERNARY NEWSLETTER No. 2** (May, 1985) Edited by R.O. Whyte and C. Badgley, 78 p. Centre of Asian Studies, Hong Kong University. HK$50.

## PUBLICATIONS RECEIVED

The Society acknowledges with thanks receipt from the Geotechnical Control Office of separates of the following publications (see also Newsletter vol. 3 no. 3)

**Bryant, J.F.**, 1982. Engineering geological applications of aerial photograph interpretation in Hong Kong. Proceedings of the Fourth Congress of the International Association of Engineering Geology, New Delhi, vol. 1, pp. 155-166.

**Greenway, D.R., Anderson, M.G. & Brian-Boys, K.C.**, 1984. Influences of vegetation on slope stability in Hong Kong. Proceedings of the Fourth International Symposium on Landslides, Toronto, vol. 1, pp. 399-404.

**Phillipson, H.B. and Brand, E.W.**, 1985. Sampling and testing of residual soils in Hong Kong pp. 75-81 in Sampling and Testing of Residual Soils: A Review of International Practice, edited by E.W. Brand & H.B. Phillipson, in press. Scorpion Press, Hong Kong.

**Styles, K.A., Hansen, A., Dale, M.J. & Burnett, A.D.**, 1984. Terrain classification methods for development planning and geotechnical appraisal: a Hong Kong case. Proceedings of the Fourth International Symposium on Landslides, Toronto, vol. 2, pp. 561-568.

## MEMBERSHIP NEWS

The society welcomes the following new members who have joined since the issue of the last Newsletter: Alexander Au (s), Chau Wang, Cheng Ting Hing, Chow Chun Hung, Hui Yun Chung, Kwan Kam Chau, Leung Yee Chiu, Low Hon Wah, Ng Kwing Hon, Or Chun Chau, Pang Ching Yan, Pang Lai Hing (Miss), Tam Kwok Kwan, Ying Mei Shirley (Miss), Yuen Kai Sang.

## FUTURE INTERNATIONAL MEETINGS

*(See also Newsletter v.3, nos. 2 and 3)*
*Language English unless otherwise stated*

1985

16-20 September — Seminar workshop on geological influences on the environment; Manila. (Ms Veronica R. Villavicencio, Executive Director, NEPC, PHCA Bldg., East Avenue, Diliman, Quezon City PHILIPPINES, or Dr S.T. Malling, UNESCO JL Thamrin 14, Tromolpos 273/JKT, Jakarta, Indonesia).

15-20 September — International Symposium on Fundamentals of Rock Joints; Bjorkliden, Lapland, Sweden

Topics: Geology of Joints; statistics of rock joints; properties of rock joints including time dependent effects; hydraulics of joints; modelling of joints and jointed rock masses.

(The Secretary, Fundamentals of Rock Joints, Centek Conferences. S-951 87 Lulea, Sweden)

The above two meetings both in the very near future have only just come to our attention. We advertise the first because it is in the region and the second because the subject is one that will be of particular interest to many members. In each case, enquiries about attendance, contributions and availability of proceedings should be sent to the addresses given in brackets.

1986

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| 22-25 June | ASCE Conference: Use of In-Situ Tests in Geotechnical Engineering; Blacksburg Virginia, U.S.A.<br><br>(The Task Committee, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, U.S.A.) |
| 25-28 August | Large Rock Caverns; Helsinki, Finland<br><br>Topics: Case histories; finance, production, legal, environmental questions; technical and geological problems.<br><br>(Secretary General Dr Karl Saari, International Symposium on Large Rock Caverns, Technical Research Centre of Finland, Lehtisaarentie 2, SF-00340 Helsinki, Finland) |
| 24-26 September | VIII Danube European Conference on Soil Mechanics and Foundation Engineering; Nurenberg, Germany<br><br>Themes: 1. Deep Excavations (over 10 m depth) or high retaining walls; 2. Safety of high slopes.<br>Language: English and German<br><br>(Deutche Gesellschaft fur Erd-und Grundbau e.v., Kronprinzenstrasse 35a, D-4300 Essen 1, Fed. Rep. of Germany) |
| 20 October - 2 November | Symposium on Geology of Continental Margins; Nanjing<br><br>Languages: Chinese and English<br><br>(Prof. Shi Yangshen, Department of Geology, Nanjing University, Nanjing, China) |
| - November | International Symposium on Engineering in Complex Rock Formations; Beijing (sponsored by the International Society for Rock Mechanics).<br><br>(Secretariat of the ECRF SYMPOSIUM, Institute of Geophysics, Academia Sinica, P.O. Box 928, Beijing, China) |

**FORTHCOMING PROGRAMME**
**(See also Marine Studies Group)**

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|---|---|
| 28 September<br>Saturday<br>9 30 a.m. | Visit to the Geological Survey Section of the Geotechnical Control Office, 10th Floor, West Wing, Tsim Sha Tsui Centre, Tsim Sha Tsui East. Russell Arthurton, head of the section, will give a brief talk on the work of the section. There will also be exhibits showing the work in progress for the new geological map of Hong Kong, including drafts of the first map sheets now being prepared for publication.<br><br>If you plan to attend this meeting, please inform Mr K.W. Lai at the G.S.S./G.C.O. (Tel. K-663794) beforehand. |

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|---|---|
| 13 October<br>Sunday<br>9.30 a.m. | Field excursion to Cheung Pai Tau (Ledge Point) in Starling Inlet. Among the interesting geological features of this locality are "Kat O" conglomerates and, in the inter-tidal zones, old limestone diggings. We shall probably walk from So Lo Pun Pier (reference map: Countryside Series Sheet No. 5). There should be time, for those who wish to do so, to visit Lai Chi Wo as well. |
| Dep. Ma Liu Shui (Chinese U.) ferry pier at 9.30 a.m. | Cost: members $30, non-members $40. |
| Arrive back about 5.30 p.m. | Return reply slip in this issue, with payment, to P.S. Nau, Dept of Geography & Geology, University of Hong Kong. (Tel. H-8592832) |

**MARINE STUDIES GROUP**
**ONE-DAY SEMINAR**

**"MARINE GEOLOGY OF HONG KONG AND THE PEARL RIVER MOUTH"**

A one day seminar and discussion meeting on the above topic has been arranged by the Marine Studies Group to coincide with a visit to Hong Kong by senior members of the South China Sea Institute of Oceanology, Academia Sinica, Guangzhou.

DATE : Friday 20th September, 1985, 9 am-6 pm

VENUE : Hong Kong., Hui Oi Chau Science Building

Formal presentations on a wide range of important local marine geology topics will be given by Society and Institute members. Emphasis will also be placed on discussions, contributions and questions from participants who will have time to raise questions and hear current state of the art expert opinion on a wide range of topics including:-

STRUCTURAL GEOLOGY AND TECTONIC HISTORY

- Tectonic History, particularly Quaternary Tectonic History.
- Rift tectonics, especially the nature of the northern margin of the Pearl River Mouth Basin; control by Mesozoic or older basement fractures on rifting.

STRATIGRAPHY and SEDIMENTOLOGY of the DELTA

- Cainozoic history of the Pearl River Delta
- Deltaic sedimentation in relation to basin rift tectonics.
- Contemporary deltaic sedimentation.
- The effects of sea level change on the Pearl River Delta.

SUBMARINE PHYSIOGRAPHY and CHANNELS

- Tidal channels in the Pearl River Estuary and Hong Kong waters.
- Evidence for former river or tidal channels marking lower sea-level stands.
- Origin of channels on the continental slope.

Those wishing to register for this seminar are requested to complete the reply slip.

**VISIT TO GUILIN , GUANGXI PROVINCE, CHINA 1985**

| | | |
|---|---|---|
| Objective | : | An invitation has been received from the Guilin College of Geology and the Insitute of Karst Geology to visit some well-known caves. |
| Date of Visit | : | 18-23 October 1985. |
| Note : | 1. | Participants are limited to 10 persons in first come first service. Contact K.W. Lee 5-283048 Ext. 239. |
| | 2. | Estimated cost for the trip is about HK$1800 for Chinese Member and HK$2100 for Foreign Member. |

**REPLY SLIP**

Members interested are requested initially to make telephone contact with K.W. Lee (5-283048 Ext. 239) and then complete and return this reply slip.

NAME: ORGANISATION:

CONTACT TELEHONE:

NATIONALITY OF PASSPORT: PASSPORT NO:

Return slip to K.W. Lee c/o Charles Haswell & Partners, 13/F., Belgian House 77-79 Gloucester Road, Hong Kong

**REPLY SLIP** CHEUNG PAI TAU (LEDGE POINT) EXCURSION

I/we wish to attend the Cheung Pai Tau field meeting on October 13th.

NAME(S):

NAME(S) OF GUEST(S):

I/we enclose payment of $
(Cheque payable to Geological Society of Hong Kong)

**REPLY SLIP**

Send to:- Secretary, Geological Society of Hong Kong,
Geography and Geology Department, University of Hong Kong, Hong Kong

GSHK - Marine Studies Group - One Day Seminar on Marine Geology

I will be attending the Seminar

Name:

Address:

Organisation:

Tel. No.:

My particular interest is

I would like to make a contribution/raise questions on

## 註

1.本文曾在一九八四年十一月十三日至十八日於廣州市舉行的由廣東省地質學會地層古生物委員會主辦的〈廣東及其鄰區中新生界地層研討會〉上發表，今略作補充。

2.黃竹角咀組實際上可分出三個岩性組，建議命名爲鳳凰笏組，白沙頭洲組及船灣組。於白沙頭洲組內發現了泥盆紀盾皮魚類化石。

3.廣佈于元朗地區地表覆蓋層下爲衆多鑽孔資料所證實的大理岩及石灰岩層，可能相當于廣東省維憲階石磴子段灰岩，爲區別於落馬洲組受變質碎屑岩，建議命名爲元朗組。

4.落馬洲組於香港西北部及元朗地區，可與廣東省測水段煤系相當，亦可與深圳市測水段受變質碎屑岩可比。而大澳組則代表未變質的同時代層位，後者發現了植物化石碎片。

5.吐露港組爲一套海相碎屑岩，已發現衆多的腕足類、珊瑚、菊石、海百合、瓣鮑類及植物化石，其中腕足類部份標準化石可鑑定到屬種。結合其岩性，該組相當于廣東省二疊統上部孤峰組。

6.丫洲島出露煤系地層，岩性不同于吐露港組，並發現了大羽羊齒植物群化石，應相當於華南上二疊統樂平煤系及廣東二疊統下部煤系地層龍潭組，故建議命名爲丫洲組。

7.在里阿斯統吐露海峽組之下的層位中發現了格子蕨植物化石，爲華南上叠統瑞蒂克期常見植物化石，故建議該層命名爲深埇組，可與廣州地區小坪組相當。

8.在香港大嶼山石壁鳳凰頂、昂平及西貢嶂上地區，於淺水灣組火山岩系中的沉積岩夾層中採得大量能鑑定屬種的以松相類的柏型枝蘇鐵類的毛羽葉等爲主的植物化石群，與浙、閩及粵東海豐湯湖等地相當地層所產植物均可對比，其時代應屬晚侏羅世。

9.香港實際上存在三種不同類型的紅層，建議命名的八仙嶺組岩性爲具輕徵變質的凝灰質扁礫岩、礫岩、複礦砂岩及紫紅色板岩。赤洲島上的赤洲組爲絳紅色湖相含鈣質礫岩、砂岩、粉砂岩及泥岩等。而吉澳組則爲山麓相淡紅色含鈣質粗角礫岩、礫狀砂岩、砂岩等。赤洲組及吉澳組中均採得中晚白堊世常見的奇異輪藻屬化石。

## 桂林六日遊

**1985年10月18日—23日**

本會收到桂林冶金地質學院及岩溶研究所邀請，於今年十月組團到桂林進行爲期六天地質旅行：參觀當地著名溶洞、名勝，並安排乘船沿漓江至陽朔。全程均由邀請單位派專人講解。

交通：早上乘直通車至廣州，轉乘下午班機抵桂林，回程乘直航機返港。　乘

費用：由於國內機票收費標準有別，預計整個旅程(交通、食、宿)收費：持回鄉證會員收港幣1800元，外籍會員收2100港元。

詳情請電5-283048與李坤榮先生聯系，由於名額只有十位，按先到先得原則辦理。

## 節目預告

**九月廿八日**　星期六上午九時卅分

參觀土力工程處地質測量組。由該組主任 R. Arthurton 負責介紹。有興趣參加者請先以電話通知黎權偉先生(3-663794)。

**十月十三日**　星期日上午九時卅分

在中文大學碼頭集合往沙頭角海長排頭作地質考察。約於下午五時卅分回抵中文大學碼頭。

費用：會員　$30　　非會員　$40

請用本通訊內回條，連支票寄交香港大學地質系鈕栢燊先生收(5-8592832)

**九月二十日**　星期五

海洋研究組與南中國海海洋研究院合辦之整天的研討會。詳情請參閱本通訊之英文版。

# 香港地層系統及其與鄰區的對比(簡要)

香港理工學院土木與結構工程學系

李作明

近幾年來，香港在地層古生物方面的研究有了一定的進展。特別是以往被認爲中新生代地層中，已經發現古生代化石。如吐露港黃竹角咀組中發現了泥盆紀盾皮類魚化石，馬屎洲組內發現了早二疊世腕足類、珊瑚及菊石，丫洲發現了龍潭煤系植物化石，深涌發現了里阿斯化石群，大嶼山大澳組內發現了可能屬早石炭世植物化石，石壁及荔枝莊地區在淺水灣組中發現了晚侏羅世植物群，赤洲島及吉澳島等紅層中分析出一批輪藻。部份化石能鑑定到屬種，爲地層的詳細劃分提供重要依據。同時各地層間接觸關係的研究也有所加強。上述研究成果表明香港地層實有重新劃分的必要。

筆者根據古生物新資料，地層剖面測製結合前人資料以及與廣東省特別是與粵中和粵東地區對比，重新編製香港地層系統，拋磚引玉，希望引起大家興趣，加強研究，逐步改善。

| 系 | 統階 | 粵中及粵東地區 南頭(1979) | 香港 本文(11.1984) | 香港 J.D. Bennett (1984) | 香港 Allen & Stephens (1971) |
|---|---|---|---|---|---|
| 第四系 | 全新統 | 陸相堆積，濱海沉積 | 陸相堆積，濱海沉積 | X | 陸相堆積，濱海堆積 |
| | 更新統 | 陸相堆積，濱海沉積 | 陸相堆積，濱海沉積 | 吉澳組 | 吉澳組 |
| 第三系 | 上第三系 | 陸相堆積 | | | |
| | 漸新統 | 華涌組 | | | |
| | 始新統 | 西坳組 | | — | |
| | | 坳心組 | | | |
| | 古新統 | 大墜山組 | | — | |
| 白堊系 | 上統 | 丹霞群 | 吉澳組 9 | — | |
| | | 南雄群 | 赤洲組 9 | | |
| | 下統 | 官草湖群 | 八仙嶺組 9 | 赤洲組 | 赤洲組 |
| 侏羅系 | 上統 | 高基坪群 | 淺水灣組 8 | | |
| | 中統 | 百足山群-漳平群 | | 淺水灣組 | 淺水灣組 |
| | 下統 | 金雞組 | 吐露海峽組 | 大澳組<br>吐露海峽組 | 大澳組<br>黃竹角咀組 落馬洲組<br>吐露海峽組 |
| 三疊系 | 上統 | 小坪組 | 深涌組 7 | — | |
| | 中統 | 黃坌群 | | — | |
| | 下統 | 大冶群 | | — | |
| 二疊系 | 上統 | 大隆組 | | | |
| | | 龍潭組 | 丫洲組 6 | | 吐露港組 |
| | 下統 | 茅口組-孤峰組 | 吐露港組 5 | 吐露港組 | |
| | | 棲霞組 | 長排頭組 | | |
| 石炭系 | 上統 | 船山群 | | — | |
| | 中統 | 黃龍群 | | | |
| | 下統 大塘階 | 梓門橋段 | | — | |
| | | 測水段 | 落馬洲組，大澳組 4 | | |
| | | 石磴子段 | 元朗組 3 | 落馬洲組 | |
| | 岩關階 | 孟公坳組 | | | |
| 泥盆系 | 上統 | 帽子峰組 | | — | |
| | | 天子岭組 | | | |
| | 中統 | 老虎坳組 | 船灣組 2 | | |
| | | 桂頭組 | 白沙頭洲組 2 | 黃竹角咀組 | |
| | 下統 | | | | |
| 志留系 | 上統 | 岭下群 | | — | |
| | 中統 | 文頭山群 | | | |
| | 下統 | 連灘群 | | | |
| 奧陶系 | 上統 | 龍頭寨群 | | | |
| | 中統 | 長坑水組 | | — | |
| | 下統 | 下黃坑組 | | | |
| | | 新廠組 | | | |
| 寒武系 | | 八村群 | 鳳凰坳組 2 | — | |
| 震旦系 | | a, b, c, d 組 | | — | |

# 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。來稿以簡爲主。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爲限。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爲準。

**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：蒙Dr. D.R. Workman借出
香港大鵬灣平洲南岸之傾斜泥岩及粉砂岩

# 香港地質學會

## 通　訊

目錄

第三卷　第四號　一九八五年七月