geological society of hong kong

NEWSLETTER

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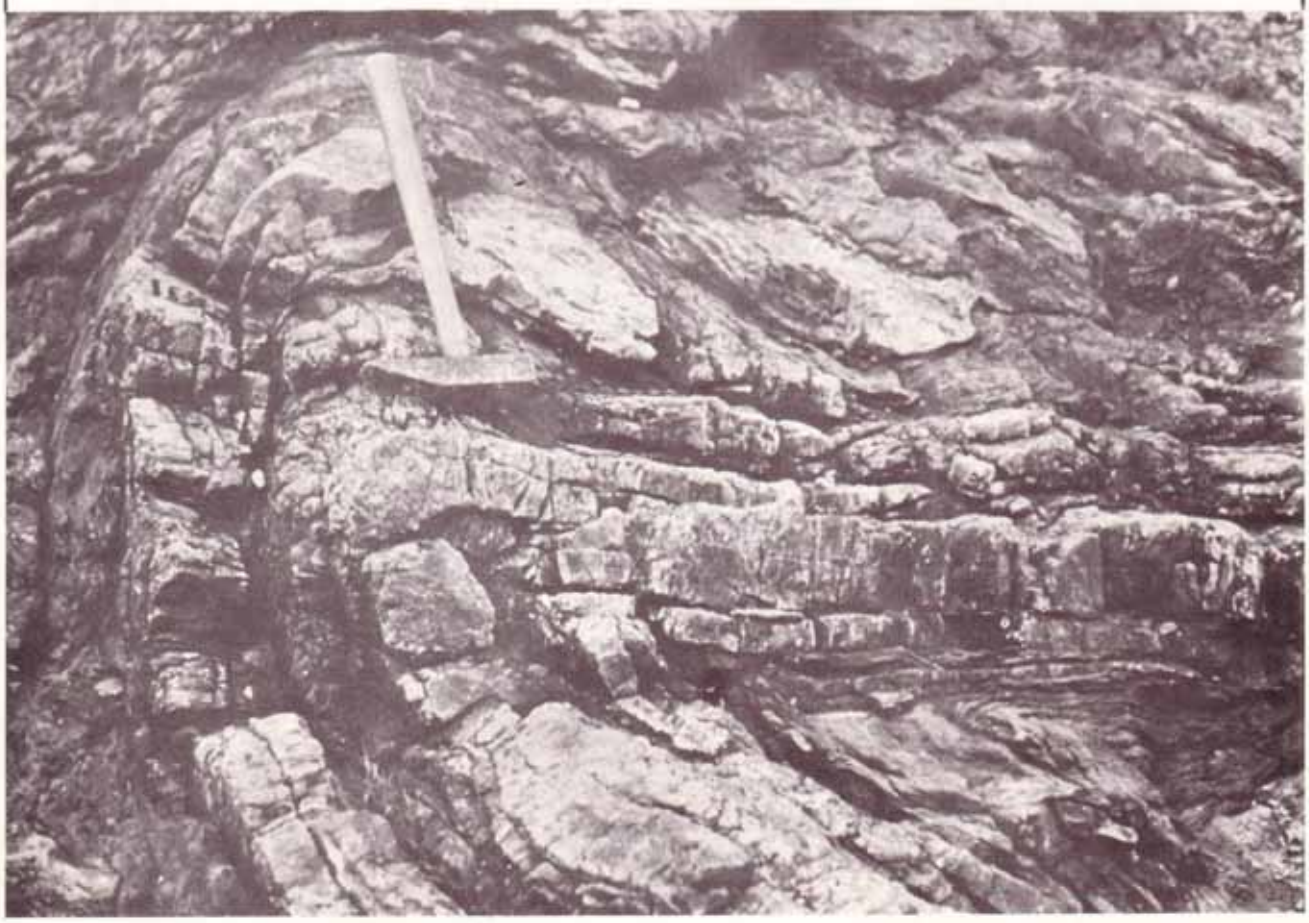

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NOTES FOR THE GUIDANCE OF CONTRIBUTORS TO THE NEWSLETTER

General : Typescripts, enquiries and all correspondence should be addressed to the Secretary, Geological Society of Hong Kong, c/o Dept. of Geography and Geology, University of Hong Kong. The Society does not assume copyright of material published in the Newsletter. Any other previous, current or expected future use of such material by the author must be stated at the time of submission.

Articles of a technical nature, as well as reports of interesting events, reviews and other topical items are welcome. Contributions must be short. 1,200 words is regarded as the normal acceptable length, although exceptions may be made at the discretion of the Society. Figures, tables and half-tone plates must be kept to a minimum and must all be on separate sheets.

Typescripts must be accurate and in their final form. Two complete copies should be sent to the Secretary. Typescripts should be double-spaced, including references, on one side of the paper only with a 2.5 cm margin on each side. A4 paper is preferred. All pages should bear the author's name and be numbered serially.

Send only photocopies of illustrations, retaining the originals until the Society asks for them. Originals should bear the author's name. Diagrams should be in black on tracing material or smooth white paper or board with a line weight and lettering suitable for reduction. A metric scale should be included, and north point (or where relevant, coordinates of latitude and longitude) on all maps.

References : The author is responsible for ensuring that the references are correct and that Journal abbreviations comply with those in the List of Serial Publications held in the Library of the Geological Society of London (Geological Society, 1978).

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

Cover Photograph : Courtesy - Dr. D.R. Workman
Refolded fold in Tolo Harbour Formation
Ma Shi Chau

ROTTEN RELICS RULE RESIDUAL REGOLITHS

Richard Harris
Harris & Sutherland (Far East)

INTRODUCTION

Relic joints can form significant planes of weakness within regoliths - the weathered mantle of residual soil that overlies bedrock in the Hong Kong environment. Relic joints are indeed 'rotten' because they upset the properties of an otherwise homogeneous earth material that can usually be subjected to standard testing techniques and designed using familiar engineering analysis.

The change in state from rock to soil during weathering is normally a destructive one, but relic joints are often preserved; owing their formation to the original geological discontinuities within the parent rock. They tend to pinch out or seal up in the latter stages of weathering and would therefore be expected to have most influence in the lower levels of the weathered mantle (photograph).

They are often preserved by their role as water passages in the original rock, whereby minerals leached during weathering are deposited along the walls of the joint. This process may both facilitate the preservation of the joint and the formation of a plane of weakness within the weathered soil mass.

Relic actually means 'survived from the past' and is not to be confused with the spelling 'relict', which means an old maid.

THE INTACT STRENGTH/JOINT STRENGTH BALANCE

The normal procedure for modelling the behaviour of a soil mass subjected to stress is to treat it as a homogeneous unit. The assumption therefore is that a soil slope is composed of an elastoplastic material that deforms in exactly the same manner regardless of the direction of the imposed forces. Testing of intact samples of soil, on the basis of this assumption, can give representative strength parameters that are used to design engineering structures in these massive materials.

Where breaks in the material space occur, a zone of weakness is formed. If the break is planar, such as that caused by a relic joint, the strength of the joint can be tested in plane strain, shear box tests. This strength is usually found to be lower than the intact material itself. Two strengths are therefore applicable to the design of the same soil; the upper bound, intact strength or the lower bound, conservative, joint strength. To use either strength alone would lead to either unsafe or excessively safe designs. Economic design of a jointed soil mass therefore requires a proper balance to be found between the strengths.

The balance may be illustrated by the Chinese weighting scale called a (ching). This device has a moving weight scale to balance a counterweight as in figure 1. If our counterweight represents the massive (or intact) strength, our moving weight can represent the influence that the joint (or mass) strength has on the shear strength of the soil. The movement of the horizontal bar can act as a pointer to determine the strength of the soil based on a particular mix of mass strength factors. This balance of massive and mass factors leads to the field strength of the soil known as the operational shear strength (McGown et.al. 1980).

Most soil designs ignore the fact that soil microstructure exists and are successful because the local weaknesses are relatively insignificant. However, recent failures in Hong Kong, on checked slopes, have almost exclusively been the result of local geological (mass) features which have contributed to instability. Thus the potential influence of relic joints must be considered in any investigation of soil behaviour.

INVESTIGATION OF RELIC JOINTS

The effect of relic features will vary with different parent lithologies and structures and, in many weathered soil cases, may be negligible. However, in the tuffaceous sediments of the Castle Peak foothills, the effects appeared to be serious enough to warrant a specific investigation.

The soil formed by weathering of the very hard, fine grained, parent rock was a red-brown, clayey silt. Testing of the intact strength of this material was carried out for the design of a large slope 30m high and 100m wide. Study of failures in temporary cuttings at the construction stage however led to the recognition that the soil was full of well formed, smooth, black-brown oxide coated joints that appeared to form the preferred surfaces for failure. Later testing showed these joints to have a strength only one third of the intact strength of the soil.

At this stage, trial pits were used to observe the soil fabric directly and to study the field behaviour of the soil. A representative sample of joints was measured in the field to give values of dip and dip direction to define each joint in three-dimensional space. Supplementary data was also collected on standard proforma (fig. 2), which detailed joint properties such as persistence, spacing, opening, infilling, roughness, water present and general remarks about individual joints.

ORIENTATION STUDY

The raw orientation data was plotted onto a stereographic projection on which the dip and dip direction of an individual joint can either be plotted as a great circle or a pole. The pole is especially useful because many joints can be plotted on a single stereoplot (fig. 3) and contoured with reference to their spatial density, to produce the grouping shown in fig. 4.

This grouping of the poles gives the joint regime of the soil and defines certain critical joints which may require further assessment in terms of joint persistence, frequency, spacing and infilling properties.

STABILITY STUDY

The orientations of the joints are important because of the angle at which the discontinuities will intersect the slope face. As more joints are incorporated into a shear surface by virture of their orientation, the more will the field strength be determined by the joint strength. Figure 5 illustrates both cases; the case where joint orientations are not important (above) and the case where joints are likely to be involved in failure (below). The two cases can result in widely differing safe slope angles.

The relationship of the joints to the slope may be defined by representing the slope itself as a plane superimposed onto the joint regime. A 'daylight zone' may be plotted which will envelope and identify all joint poles that will intersect the slope and could promote instability (fig. 6). These joints are known as 'daylighting' joints.

In the Tuen Mun case it was noted that, in soil, joints could influence stability even if they were of different orientations and discontinuous as in figure 5a. Thus, to consider a circular failure - which had already proved possible in the Tuen Mun soil, all joints dipping out of the slope at a 70^{o} angle or below and all joints dipping into the slope at 30^{o} or below were assumed to be liable to become involved in sliding the 'daylight' zones were therefore drawn at 70^{o} angles respectively to produce the envelopes illustrated in figure 6.

In fact, few of the important joint sets lie within the zones and even if the range of each joint set is considered, as defined by the 4% frequency contour, there is a restricted number of joints within the critical envelope. In this case, therefore, the joint strengths had only a limited influence on the operational shear strength of the soil, with reference to the particular orientation of the slope on site.

APPLICATION

Stereographic projections have been used in the general study of soil fabric for layered alluvial, fluvial, glacial or marine soils (McGown et al. 1980) or overconsolidated and fissured clays (Chandler 1971). The stereographic study of relic joints which form most of the discontinuities within in-situ weathered soils is particularly appropriate, in view of the success of this design technique in slopes cut in the original parent rock.

The joint regime, identified in the stereoplot (fig. 4), can be used to differentiate between different soil masses. This joint pattern is a reflection of the stress history of the soil mass and acts as a unique finger-print'; differentiating the genesis of one soil mass from another.

The identification of a soil mass may then form a further basis for data collection or analysis. The actual critical joints, identified from the stereoplot are subsequently assessed in terms of their persistence, roughness, infilling or spacing properties. The major joints may be adversely orientated in a particular slope. However, the fact that they are of limited persistence, widely spaced and infilled with (say) a sand, may mean that the joints are unlikely to influence the operational strength of the soil.

One feature that must also be included in any study of discontinuities is the identification of joints that do not fall into the 'representative' joint pattern. These are 'rogue' joints, or individual joints that do not belong to major joint set. They can be one-of-a-kind or they may be one of a dominant set of very widely spaced joints which may promote serious instability. Stereographic analysis can identify such features.

CONCLUSION

The balance between intact soil strength and joint strength can be assessed to determine a precise operational shear strength for the soil. It is a complex relationship that varies with the orientation of different slopes for a given soil. However, we must avoid the temptation of lower bound calculation using joint soil strengths. Soil mechanics has the sophistication to design for 'rotten relics' and we must maximise the opportunity to use these techniques and analyse these types of fissured soils more precisely.

REFERENCES

BELL F.G. (1977) — *'Foundation Engineering in Difficult Ground'. Butterworth, pp.598*

CHANDLER R.J. (1971) — *'A study of structural discontinuities in stiff clays using a polarising microscope' Proc. Symp. on Soil Structure, Gothenburg, p78 - 85.*

GEOLOGICAL SOCIETY (1970) — *'The logging of cores for engineering purposes' Eng. Gp. Working Party Report. Qtly. Jnl. Eng. Geol. 3 p1 - 24.*

GOLDER ASSOCIATES (1974) — *'Rock Slope Design Review' Report to Princ. Govt. Highways Eng. Hong Kong.*

HOEK E. and BRAY J.W. (1977) — *'Rock Slope Engineering', Revised Second Edition. Inst. Mining and Metallurgy, London.*

McGOWN A. MARSLAND A. RADWAN A.M. and GABR A.W.A. (1980) — *'Recording and interpreting soil macrofabric date' Geotechnique 30. no. 4 p.417-447.*

PHILLIPS F.C. (1971) — *'The use of Stereographic Projections in Structural Geology'. Third Edn. Edward Arnold, London.*

Photograph — Relic joints are most obvious in the lower soil mantle and pinch out or seal up in the latter stages of weathering.

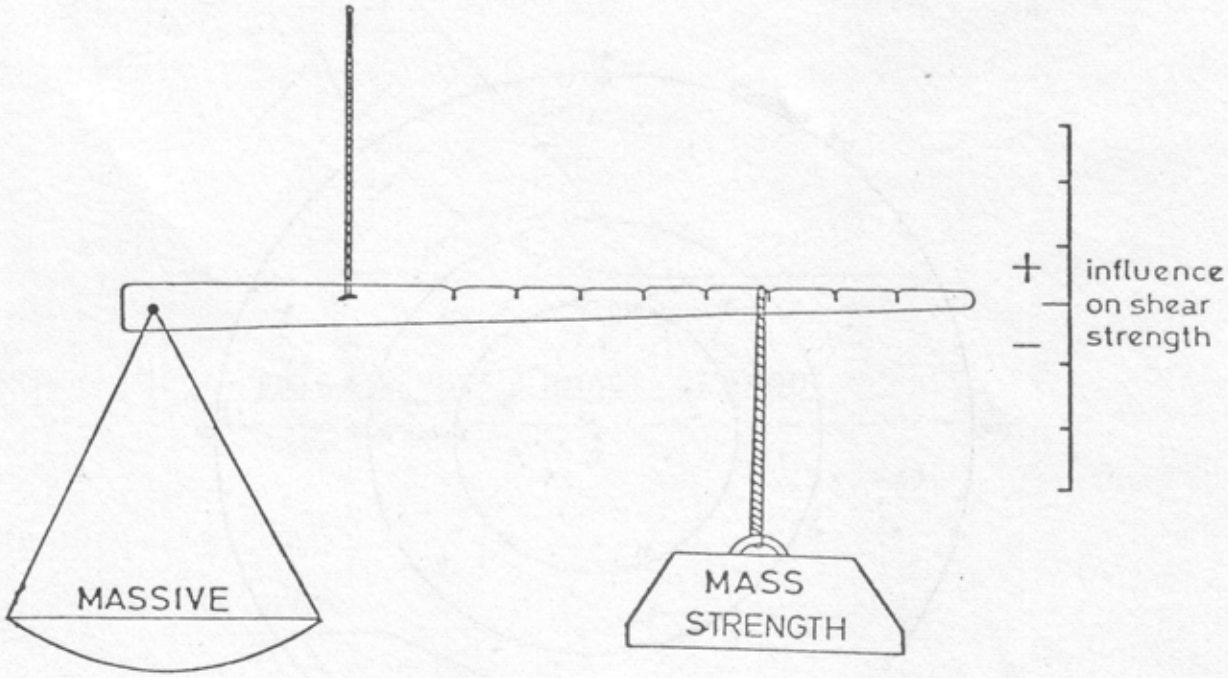

Fig. 1 Chinese weighing balance (effect of soil mass features on operational shear strength).

DISCONTINUITY SURVEY DATA SHEET

Consulting Engineers

GENERAL INFORMATION

Nr 1,0,0,6 Sr TMNT, A19 Date Day 19 Month 12 Year 78 Operator RH

Discontinuity data sheet No 0,1 of 0,8

NATURE AND ORIENTATION OF JOINTS

Change or No.	Type	Dip	Dip Direction	Persistence Strike	Persistence dip	Spacing	Opening	Continuity	Roughness	Wall strength	Wall alteration	Infilling	Water	Remarks
		84	184		4	4	6	7	4	3			1	heavy staining
		80	023		4	5	7	7	4	4			-	hard coating
Trial		80	331		5	4	6	1	-	4			"	
		21	210		4	6	6	7	4	4			-	
Pit		60	201		3	6	5	7	3	5			-	clean, but v. rough break
		24	325		4	4	7	1	-	4			"	
A		66	359		5	5	6	1	-	5			-	
		48	004		5	4	7	7	4	6			2	
		90	181		4	6	7	1	2	4			2	
		77	072		5	5	6	7	4	3			1	broken easily by hammer
		12	310		4	5	6	7	4	4			-	low persistence
		32	342		5	4	6	7	3	4			"	low persistence

Type: 0. Fault zone; 1. Fault; 2. Joint; 3. Cleavage; 4. Schistosity; 5. Shear; 6. Fissure; 7. Tension crack; 8. Foliation; 9. Bedding

Dip, Dip direction (Expressed in degrees)

Persistence (Expressed in metres) as:- 1. excellent (> 20m); 2. very good (10–20m); 3. good (5–10m); 4. fair (1–5m); 5. poor (< 1m)

Discontinuity Spacing: 1. Ext. wide (> 2m); 2. Very wide (600mm–2m); 3. Wide (200–600mm); 4. Mod. wide (60–200mm); 5. Mod. narrow (20–60mm); 6. Narrow (6–20mm); 7. Very narrow (< 6mm)

Opening: 1. Wide (> 200mm); 2. Mod. wide (60–200mm); 3. Mod. narrow (20–60mm); 4. Narrow (6–20mm); 5. Very narrow (2–6mm); 6. Ext. narrow (< 2mm); 7. Tight

Nature of infilling: 1. Clean; 2. Non-cohesive; 3. Cohesive; 4. Cemented; 5. Calcite; 6. Quartz; 7. Oxide (Fe, Mn); 8. Chlorite, talc; 9. Others, specify: Weathered tuffaceous sediments

Consistency of infilling: 1. Soft (< 150 kN/m²); 2. Firm (150–150 kN/m²); 3. Stiff (150–300 kN/m²); 4. Hard (300–1500 kN/m²); 5. Very hard (> 1500 kN/m²)

Roughness: 1. Polished; 2. Slickensided; 3. Smooth; 4. Mod. rough; 5. Rough; 6. Very rough; 7. Defined ridges

Wall strength: Express weathering & magnitude as points

Water: 1. Dry; 2. Seepage; 3. Slight flow; 4. Mod. flow; 5. High flow

Fig. 2 Typical form for discontinuity logging (after Geological Society of London, 1970).

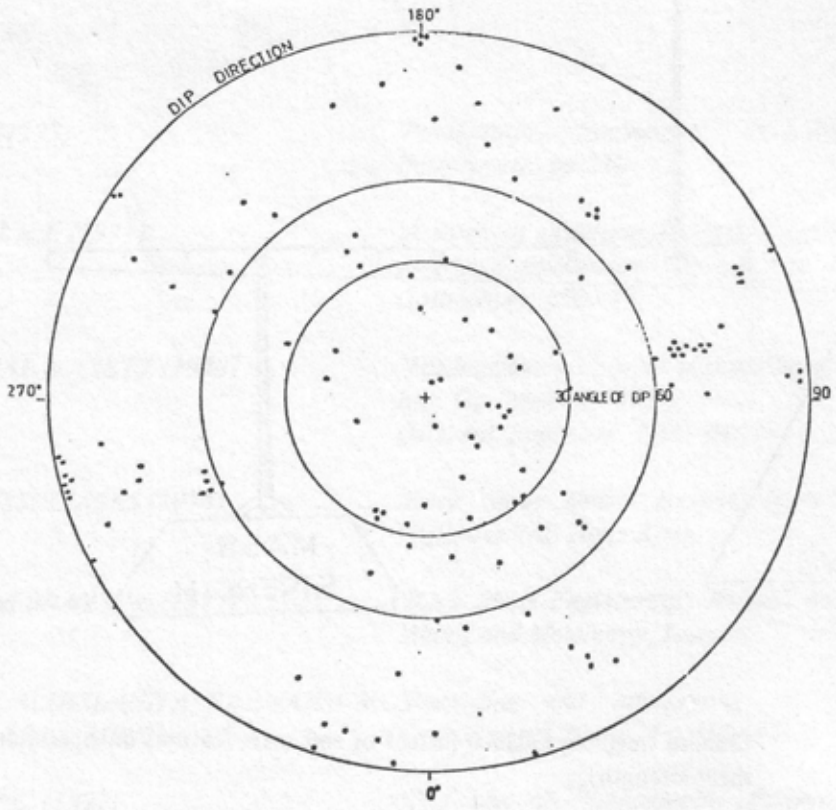

Fig. 3 Plot of Tuen Mun poles onto stereographic projection.

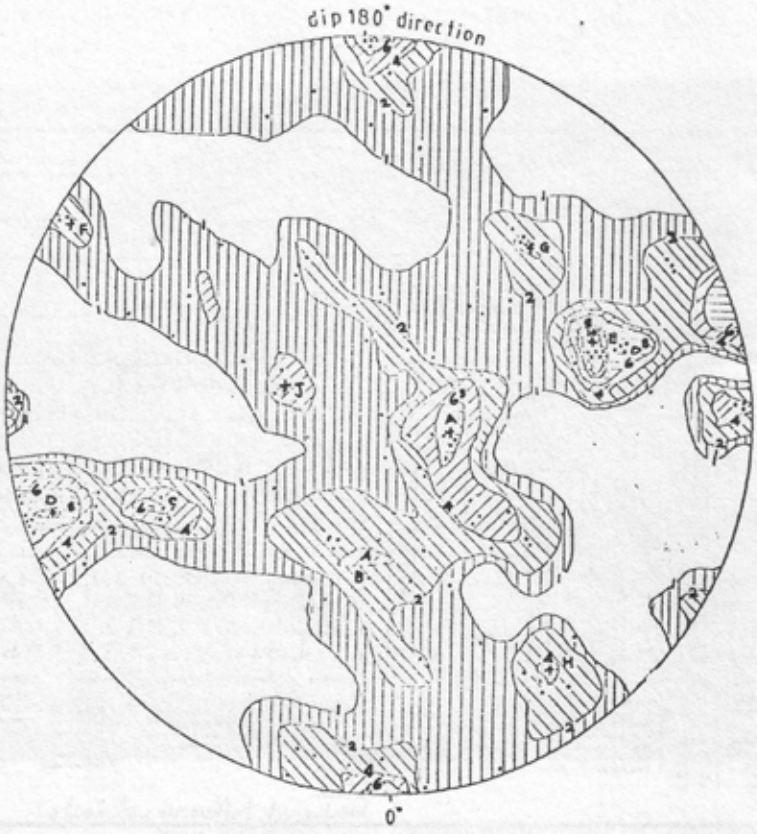

Fig. 4 Joint regime of weathered soil mass, Tuen Mun (figures give percentage pole concentrations).

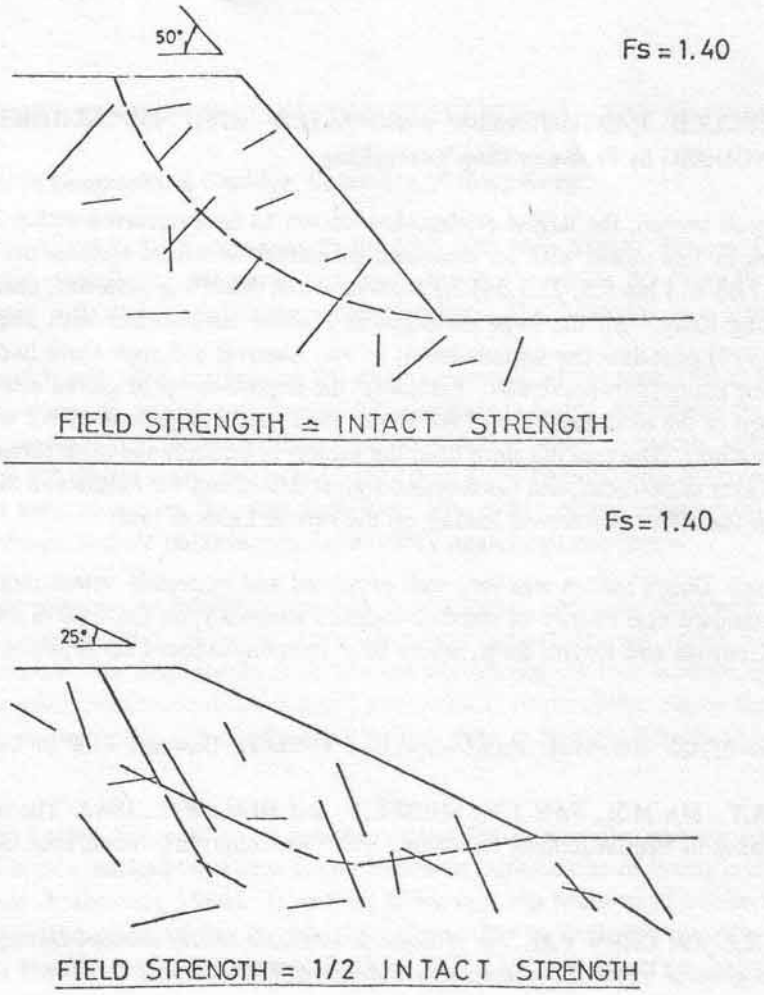

Fig. 5 Relationship of joint orientation to slope stability.

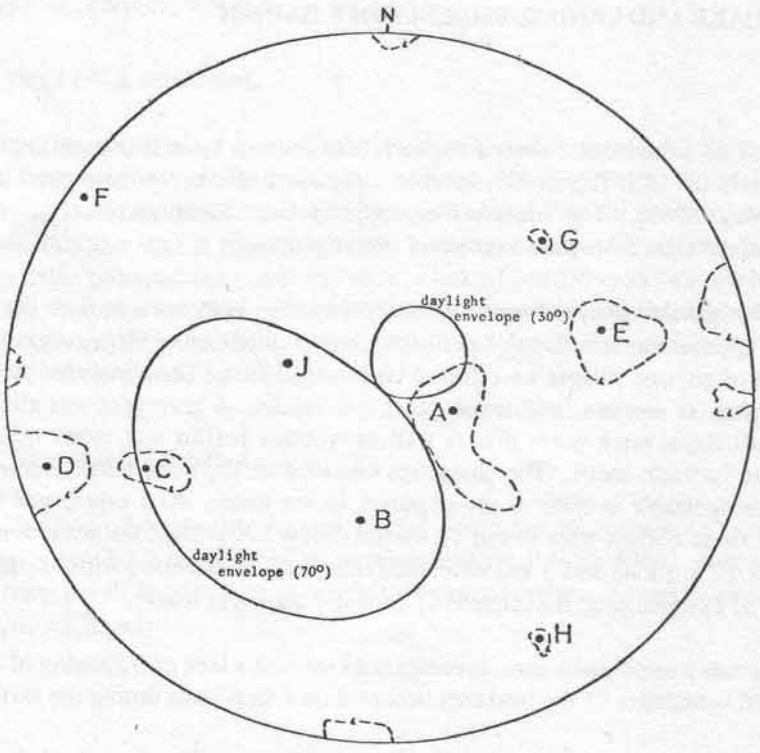

Fig. 6 Stability assessment of the jointed soil at Tuen Mun.

LECTURE ON INDUCED EARTHQUAKES ASSOCIATED WITH IMPOUNDMENT OF XIN FENG RESERVOIR, GUANGDONG by Professor Ding Yuangzhang

As is well known, the largest earthquakes known to have occurred within 250 km of Hong Kong, in fact the only ones in this radius with an estimated magnitude in excess of 5 on the Richter scale (Ms 6.1, 19.3.62; Ms 5.1, 29.7.62 and Ms 5.3, 23.9.64) are located at the Xin Feng reservoir, near the town of Heyuan, 160 km NNE of Hong Kong. All the large earthquakes (Twelve earthquakes with magnitude greater than 4 between 1961 and 1977) post-date the impoundment of the reservoir although there had been occasional small events in the area over many years previously. Evidently, the impoundment triggered increased activity on faults in the area. The largest of the earthquakes, on 19th March 1962, had a magnitude of 6.1 and damaged the dam (a concrete buttress structure). The area has since been the subject of possibly the most intensive study of reservoir-induced earthquakes ever undertaken, and has revealed a great deal about the nature and distribution of the faults in the area, and about the effect of reservoir loading on the various kinds of fault.

Professor Ding's lecture was very well presented and extremely interesting. Clearly, the Xinfeng project stands as a standard case history of reservoir-induced seismicity, on the scale of its more famous counterparts, the Kariba, Kremasta and Koyna dams, where large reservoir-induced earthquakes have been recorded in recent years.

Copies of the following recent papers of Professor Ding are now in the society's collection:-

DING Y.Z., XIAO A.Y., MA M.X., PAN J.X., SHEN L.Y. and MIAO W.C., 1982. The tectonic environment of the induced earthquakes in Hsinfengchiang Reservoir. Proc. IV Congr. Int. Assoc. Eng. Geol., New Delhi, v. VII, pp. 147-154.

DING Y.Z., ZHEN X.Z. and CHEN Y.M. The aftershock activities of the induced earthquake in Hsinfengchiang reservoir areas (paper given at a recent conference in Yugoslavia, bibliographic details not yet received).

Our thanks to Professor Ding for these, and for a very stimulating lecture.

THE 1605 EARTHQUAKE AND LAND SUBSIDENCE OFF HAINAN

Reported by W. Yim

An area of subsidence believed to have been caused by a strong earthquake which took place during the Ming dynasty on 13th July, 1605, has been identified off the northern coast of Hainan, South China (China Daily, 25th May, 1983). The site was discovered by Chen Enmin, a researcher at the Guangdong Provincial Earthquake Bureau after more than four years' investigation.

It is thought that the earthquake intensity may have been equal to 8 on the Richter scale, and that the epicentre was at Qiongzhou, now Qiongshan County, in the northeast of Hainan island. Near a bay southeast of Haikou city, ruins of ancient villages were found on the tidal flats. These included stone-slab well covers and other stone articles such as mortars, millstones, poles and blocks. A graveyard was also discovered containing coffins made of basalt slabs, brick grave pits as well as wooden coffins and stone tablets, all of which were covered by oyster and barnacle shells. The characters engraved on the stone tablets, including a date of the year A.D. 1604, remain recognizable in spite of the exposure to sea water. At a submerged village called Renchun, walls, millstones and stone coffins were found 10 metres below the present sea level. Furthermore, in a shallow water area more than 10 km long and 1 km wide, cultivated land criss-crossed with footpaths was found. At the submerged township of Dongnaigang, the remains of a theatre stage was found.

Unlike many earthquake sites, investigations showed a lack of fracturing of the land. As a result, it is believed that general subsidence of the land area occurred on a large scale during the earthquake.

I would like to thank Professor Y. Huang, Honorary Member, for bringing the matter to my attention.

OCCURRENCE OF AXINITE IN GRANITE PEGMATITE AT LEI YUE MUN BAY NEAR CHAI WAN

W.W.S. Yim, Department of Geography & Geology, University of Hong Kong

During the Society's field excursion to the Chai Wan Mass Transit Railway Depot in October, a brownish-coloured massive mineral was discovered in a pegmatite cavity within the Hong Kong Granite. Specimens of this mineral were collected for laboratory identification. The following is a report of the findings.

The mineral locality lies adjacent to the eastern entrance of the Mass Transit Railway tunnel near the Pak Sha Wan Station currently under construction. The pegmatite cavity, containing the brownish-coloured mineral is enclosed by medium-grained Hong Kong Granite which is white in colour and almost completely devoid of biotite. About 20 metres away, contacts of the Hong Kong Granite with the pyroclastic rocks of the Repulse Bay Formation are exposed on the same rock face. The cavity measures about 40 centimetres in diameter. Other minerals present include potassium feldspar, milky quartz and muscovite.

The brown mineral was initially suspected to be a garnet, andradite, in view of its colour, vitreous lustre, hardness of 7 and massive habit. However, a one-directional perfect cleavage, which is absent in all garnets could be seen. Furthermore, the determination of the specific gravity on two separate specimens using the Berman density balance gave measurements of 3.33(5) and 3.33(3) respectively. Since the specific gravity of andradite is about 3.86, the mineral is apparently not a garnet. It is, in fact, most likely to be axinite, a calcium borosilicate.

Axinite is known to occur in pegmatite cavities found near the contact zone of acid igneous intrusions. The mineral occurs particularly where the metasomatic introduction of boron into lime-rich rocks has taken place (Deer, Howie & Zussman 1966). It appears likely that the widespread occurrence of calcite veins associated with the pyroclastic rocks of the Repulse Bay Formation in Junk Bay may be traced to the same calcium source as for the axinite. As far as the writer is aware, this is the first report on the presence of axinite in Hong Kong.

Reference

W.A. Deer, R.A. Howie and J. Zussman (1966). An Introduction to the Rock-forming Minerals. Longman Group Ltd., London, 528 p.

PLANS FOR PUBLICATION OF A JOURNAL

It is the Society's intention to establish in due course a journal or bulletin containing original papers from any source. At present a few submissions which are too long for the newsletter are in hand, but more are needed. Up to now, formal review and decisions on acceptability for publication have been deferred pending a clear indication that the time is right to proceed in this direction. Clearly the lack of an established publication may tend to deter potential contributors, while a lack of contributions will prevent such publication becoming established. Members are therefore requested to keep our own society in mind when preparing papers for publication. Submissions should generally conform with the guidelines for contributions to the newsletter, except of course for length, which should be "within reason".

WANTED - COPIES OF NEWSLETTER NO. 4

As word about the Society gets around, we get occasional requests from overseas for sets of our newsletters. We still have a few back numbers of all issues except no. 4 (May 1983). It is perhaps unlikely that anyone who still has a copy wants to part with it, but if there are any unwanted copies about, please send them to the secretary (newsletter no. 4 only).

MEMBERSHIP

On 31st December 1983, membership stood at 294, an increase of 128 over the year. There were 5 Honorary Members (4 on 31.12.82), 277 Members (150) and 12 Student Members (9). Of the 277 Members, 15 were registered as non-resident.

A list of members, in which it is proposed to include academic qualifications, professional and scientific affiliations which are generally well known in Hong Kong, and addresses, will be drawn up and circulated soon. Please see the separate insertion in this newsletter.

We wish to thank the following members for their 1984 subscription and to remind other members that their 1984 subscription is now due.

Addison R.	Choot G.	Lee W.M.	Randall P.
Atherton M.J.	Fowler J.N.	Lo Y.H.	Shaw R.
Burnett A.D.	Gray I.	Lui K.H.	Shek K.F.
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Chau E.	Lai K. W.	Ng K.Y.	Wong C.K.
Cheung L.	Lau W.K.	Pickering G.M.	Wong K.M.
Chan K.K.	Lee J.	Price I.	Yim W.
Chiu C.K.	Lee K. W.	Pun K.S.	Yu S.

SERIES OF INTERNATIONAL MEETINGS ON GEOLOGY AND URBAN DEVELOPMENT IN S.E. ASIA (IUGS/AGID)

In March last year we published a letter to the Chairman, on the above subject, from the International Union of Geological Sciences (IUGS). This referred to a proposed Hong Kong Symposium in 1984, so members might like to know where things stand. In a nutshell, there will be no symposium in 1984.

As noted in the IUGS letter, the plan is to incorporate the Hong Kong meeting into a 5-year programme sponsored by IUGS and the Association of Geoscientists for International Development (AGID), with the latter working out the details of the programme. The programme so far consists mainly of two meetings, styled LANDPLAN I (Bangkok, April 1982) and LANDPLAN II (Kuala Lumpur, April 1984) - see elsewhere in this issue. The remainder of the programme, or at least the next stage, will be decided during LANDPLAN II. It would be premature to say anything more than that Hong Kong is a likely venue for a "LANDPLAN III" meeting in about 2 years' time, which will focus on the role of geology, and the particular geological problems faced, in Hong Kong.

1983 IN RETROSPECT

In 1983, the first full calendar year of its existence, the Society mounted a total of 19 meetings and events, as follows:-

Conference: GEOLOGY OF SURFICIAL DEPOSITS IN HONG KONG
(September 19-21)

Lectures (5): TAIWAN - TECTONICS & METALLOGENY -
Prof. G. Kullerud (January)

NEW GEOLOGICAL SURVEY OF HONG KONG -
Mrs. J.D. Bennett and R. Addison (February)

TECTONIC EVOLUTION OF THE SOUTH CHINA SEA -
Dr. D.R. Workman (June)

ENGINEERING PROPERTIES OF RELIC JOINTS -
Mr. R. Harris (November)

INDUCED EARTHQUAKES ASSOCIATED WITH IMPOUNDMENT OF XINFENG RESERVOIR, GUANGDONG - Prof. Ding Yuangzhang
(December)

Field trips to Guangdong (3) :	HENGGANG (SHENZHEN) - April
(in co-operation with the Geological Societies of Shenzhen and Shaoguan)	SHENZHEN, SHEKOU AND DAYA BAY (2-day) - November
	SHAOGUAN AND GUANGZHOU (5-day) - November
Field trips in Hong Kong (8) :	BRIDE'S POOL (January)
	TOLO CHANNEL (2) (March/April)
	TSING YI (May)
	PIONEER QUARRY (July)
	PORT ISLAND AND DOUBLE ISLAND (August)
	CHAIWAN MTR DEPOT (October)
	S.W. LANTAU (November)

Annual General Meeting (May)

Review meeting (December): THE YEAR IN RETROSPECT

PUBLICATIONS - REQUEST FOR COPIES OR REFERENCES

If you have had anything published on, or relevant to, the geology of Hong Kong or the South China region, in 1983, would you please send a copy (a separate or a photo copy) to the secretary. All such papers received will be acknowledged in the newsletter and will be added to the Society's collection of documents available to members on request.

The same applies to any unpublished or manuscript reports that members may like to make available.

The Society will also be glad to receive and disseminate, via the Newsletter, information about any articles relevant to its members' interests that may appear in publications which are not widely read in Hong Kong.

FORTHCOMING INTERNATIONAL MEETINGS (1984)

21-24 Feb.

FIFTH OFFSHORE SOUTHEAST ASIA CONFERENCE AND EXHIBITION (OSEA), Singapore. Information from Jean MacDonald, OSEA, 6-E Mt Sophia, SINGAPORE 0922.

27-31 March

TRAINING SEMINAR ON GEOLOGICAL/GEOTECHNICAL PROBLEMS OF URBAN CENTRES

2-5 April

WORKSHOP ON ROLE OF GEOLOGY IN PLANNING AND DEVELOPMENT OF URBAN CENTRES IN SOUTHEAST ASIA (LANDPLAN II)

Both the above meetings at University of Malaya, Kuala Lumpur. Seminar fee US$100. Workshop registration US$50. Some accommodation is available for both meetings at University hostels for c.US$7 per day. For registration forms and information, write to Dr. J.K. Raj, Department of Geology, University of Malaya, Kuala Lumpur 22-11.

9-13 April

FIFTH REGIONAL CONFERENCE ON GEOLOGY AND MINERAL RESOURCES OF S.E. ASIA (GEOSEA V)' Kuala Lumpur. See GSHK newsletter No. 4 (May 1983). Details from T.T. Khoo, Department of Geology, University of Malaya, Kuala Lumpur 22-11.

21-23 May

SYMPOSIUM ON AGGREGATES. Nice. Details from M. Primel Louis, 58 Boulevard Levebvre, 75732, Paris cedex 15, France.

25-27 June

SYMPOSIUM ON ROCK MECHANICS, Evanston, I11., U.S.A. Information: Charles H. Dowding Dept. of Civil Engineering, Northwestern University, Evanston, I11. 60201, U.S.A.

9-11 July

LECTURE SERIES: GEOTECHNICAL ENGINEERING PRACTICE in Cambridge, Mass., U.S.A. (Boston Soc. of Civ. Engineers). Contact Thomas K. Liu, Haley & Aldrich Inc., 238 Main St., Cambridge, Mass. 02142, U.S.A.

4-14 August

27TH INTERNATIONAL GEOLOGICAL CONGRESS, Moscow, Organizing Committee of the 27th IGC, Institute of the Lithosphere, 22 Staromonetniy, Moscow 109180, USSR.

GEOLOGICAL EXCURSION TO LANTAU (27th November 1983)

D.R. Workman and R.A. Addison

On 27th November, about 45 members and guests journeyed to a small un-named bay some 2 km SW of Shek Pik, Lantau (Grid Ref. 965595), to see exposures of the Repulse Bay formation and enjoy, while still able to do so, one of the few remaining unspoiled stretches of accessible coastline on the island.

The group first examined outcrops of flow-banded rheomorphic welded tuffs at the northern end of the bay. The main interest, however, lay in the sedimentary formation which forms the headland south of the beach (and crops out over large areas of the hillside to the west). These beds have the appearance of mixed epiclastic (partly volcanigenic) and pyroclastic-epiclastic deposits. Some of the sequence comprises well-bedded mudstones, in part seemingly more or less hornfelsed, or possibly hard (cherty) because of presence of fine volcanigenic silica. There are also fine to coarse greenish-grey and purple-tinted sandstones and pebbly sandstones, which are well-bedded and show current marks and fining-upward sequences, as well as poorly-bedded and poorly-sorted beds with fragments and lenticles of chert-like and other material. Some fossil wood was found in a mass of pebbly mudstone or paraconglomerate, including one well-preserved example of a branching twig.

Some of the deposits seem totally unsorted and possess complex relations with the other sediments which could not be properly worked out in the time available. Some may be ash flows or lahar paraconglomerates, other are injection breccias presumably associated with volcanic activity such as gas-streaming. Altogether, a rich harvest here for any keen sedimentologists.

FORTHCOMING PROGRAMME

Rockfall and its Control **Tuesday 21st February**
Joint meeting with the HKIE Geotechnical Group

The first annual joint meeting with the Geotechnical Group of the Hong Kong Institution of Engineers will be on the topic of falling rocks. The subject was chosen since it is an "engineering" problem that seems to be frequently left to geologists to solve. Falling rock is an interesting (and worrying) subject, whether it is natural falls due to erosion processes, unstable blocks falling from man-made cut slopes, or simply children pushing lumps over a cliff. Each is a real danger. The design of measures to control possible falls is a broad subject covering the prediction of falls and the trajectory of falling or rolling rock together with the choice of barrier or rock trap.

It is presently planned to have three main speakers covering the topics above followed by an opportunity for a few 5-minute contributions.

The lectures should be very interesting and you are all encouraged to come along. If you feel you can make a contribution and would like to be considered for a 5-minute slot please contact Peter Randall of Ove Arup and Partners on 5-283031.

The meeting will be held in the auditorium of the Duke of Windsor Building 1/F., 15 Hennessy Road, Hong Kong. 5.15 for 5.45 p.m.

Field Excursion to Ap Lei Chau
Housing Authority Site **Sunday 11th March**

Mr. K.W. Lai has kindly offered to show us around this large and very interesting site of a new housing estate. Features include new 70m high rockslopes which have needed various treatments, and large exposures of tuffs, lapilli tuffs and fault zones. It will also be possible to see the variety of foundations that have been constructed for the tower blocks.

We shall meet at 10.00 a.m. at the entrance to the site which can be found very close to the first bus stop over the Ap Lei Chau bridge. Suitable buses are 90M from Admiralty Station, 91 from Sai Ying Pun and 92 from Causeway Bay. A large notice board set up by Leighton the contractors helps to identify the site entrance. All visitors must bring their own safety helmet.

There is no slip to return for this visit, just come along.

Field Excursion to Crooked Island **Sunday 25th March**

The purpose of this trip is to see the very controversial Kat O Formation. Is the formation of Pleistocene age as suggested by Allen and Stephens or Palaeocene as suggested recently by Chinese geologists, and why does the material at Crooked Island have a calcareous content? Also what is the significance of the drowned volcanic caldera suggested by Hein just north of these exposures?

A junk will leave the Chinese University ferry pier at 9.00 a.m. for Crooked Island and Ap Chau. Both islands have exposures of the Kat O formation together with some interesting villages for those not totally dedicated to the geology.

If there is time the junk will visit the recently discovered unconformity near Lai Chi Wo and the thrust fault between the Port Island and Repulse Bay Volcanics formation at Double Haven.

There are piers at each of the proposed stops which should allow dignified disembarkation for even the least athletic members of the society.

Please complete the reply slip below and return it to Toni Pearson.

Future Provisional Dates for Meetings **Monday 16th April**
(Pencil them into your diary now)

Lecture by Professor Liu Zhaoshu of the South China Sea Institute of Oceanology

If Prof. Liu is not able to come it is proposed to hold a "study-in" at the Geology Laboratory HK University where we will have an opportunity to learn from the experts more about the University's magnificent collection of rock samples. Microscopes and rock thin-sections will be available for us all to use and (luckily) advice at hand to tell us what we are looking at. A marvellous chance to get a better understanding of Hong Kong rocks.

Annual General Meeting-Hong Kong Polytechnic **Tuesday 8th May**

節目預告（詳見英文版）

岩崩及塌石之預防措施	二月廿一日星期二
參觀房屋署之鴨脷洲工地	三月十一日星期日
考察吉澳洲	三月廿五日星期日
南中國海海洋研究院劉昭蜀教授演講	四月十六日星期一

（如劉教授行程有變時，是日節目則改爲在港大地質實驗室鑑辨岩石標本）

周年大會（在理工學院舉行）	五月八日星期二

REPLY SLIP (Field Excursion to Crooked Island) 25 MAR **Sunday 15th January 1984**

I wish to attend. Please find enclosed a cheque in the sum of $ for ( ) adults and ( ) children.

Name: Day time contact Tel. No.

Send this slip to Mrs. A. Pearson, C7 Hillgrove, 18 Cape Drive, Chung Hom Kok, Hong Kong. Make out crossed cheques to the Geological Society of Hong Kong.

Adults $35 per head, children $20 per head.

一九八四年將要舉行的國際性會議

二月二十一日至二十四日：第五屆東南亞近海會議及展覽，新加坡。

三月二十七日至三十一日：城市中心地質及土工學問題的訓練及研討會

四月二日至五日：東南亞城市中心規劃和發展中地質學任務實習班。
以上兩會議均在吉隆坡馬來亞大學舉行，研討會費用一百美元，實習班註冊費五十美元，膳宿於大學旅舘，每日七美元，有興趣者可向馬來亞大學地質系拉茲博士問詢。

五月二十一日至二十三日：集合體研討會，魯依士先生詳細介紹，法國巴黎。

六月二十五日至二十七日：岩石力學研討會，在美國易凡士頓西北大學土木工程系舉行，可向該系道丁先生問詢。

七月九日至十一日：美國麻省坎布里奇市土力工程實踐的演講組合。由波士頓土木工程師協會主辦，可向格、劉先生等問詢。

八月四日至十四日：第二十七屆國際地質大會。由第二十七屆國際地質學會理事會組織，在莫斯科舉行，可向蘇聯莫斯科岩石圈研究所問詢。

連年有關城市地質東南亞國際會議

去年三月我們曾經發表過國際地質科學公會（IUGS）致函籌委會主席倡議舉辦1984年香港會議的可能性。關於這方面的消息，簡單地說，1984年將不舉辦該會議。

在IUGS信中提議，香港會議將列入由IUGS和國際發展地學協會（AGID）共同發起的五年計劃程序內。並由AGID完成其程序細節。以目前所知，該計劃主要包括兩項會議，稱之爲"陸地會議I"（曼谷，1982年4月）和"陸地會議II"（吉隆坡，1984年4月）其餘細節，或下一個階段將在"陸地會議II"中討論決定。香港能否成爲兩年後的"陸地會議III"的會議地點，現在還是言之過早。"會議III"的中心將討論地質科學的任務特別是香港面對着的許多地質問題。

一九八三年回顧

香港地質學會正式成立後的第一個年度裡，安排了十九個會議、演講和野外活動等項目，計有：

會　　議：一、香港地表沉積地質研討會（九月十九日至二十一日）

演　　講：二、格·古勒路特：台灣構造和礦床成因（元月）
三、朋那特博士和阿狄遜博士：香港重測地質圖（二月）
四、沃克曼博士：南中國海的構造演化（六月）
五、哈利士先生：殘餘節理的工程特性（十一月）
六、丁原章教授：廣東省新豐江水庫庫水誘發地震（十二月）

地質旅行：七、深圳市及橫崗地區考察
八、與深圳市地質學會互訪項目：深圳市、蛇口及大亞灣（兩天）（十一月）
九、與韶關市地質學會互訪項目：韶關市及廣州市訪問（五天）（十一月）
十、新娘潭地質考察（元月）
十一、吐露港丫島及船灣水庫沿海地質（三月）
十二、荔枝莊南岸地質（四月）
十三、青衣島野外考察（五月）
十四、參觀派安石礦場（七月）
十五、赤洲島及灣洲島野外考察（八月）
十六、柴灣地下鐵車廠工地（九月）
十七、南大嶼山考察（十一月）

大　　會：週年大會（五月）
年結大會：一年的回顧（十二月）

籌劃出版專刊

本會擬在短期內出版一份專刊，刊載一些原創性的論文——來源不拘。目前我們收到一些因佔篇幅頗多而不便刊於通訊裏的稿件，但仍要湊合多些才能夠出版一份專刊。我們暫仍未有一個標準審核可刊出的文章；到有明確需要時，我們將會制訂一套方案去進行的。顯然地，設立專刊會鼓勵大家投稿；但同樣地，缺乏稿件也會令到這份專刊難產的。所以我們懇請會友們如有論文需要發表時，優先考慮來稿本會。稿件簡則大致和通訊的要求一般；字數當然「不拘」，但總以「適中」爲可。

呼籲——供給參考資料或文獻

會員們於1983年間如有已發表或未經發表的任何有關華南或香港地質之論文，冀能惠賜本會一份（影印本亦可）。請直接寄給本會秘書。本會將會在通訊裏向作者致謝，並將論文存入本會的資料庫裏以供會友們借閱參考。

會員們如在一些香港不大流行的刊物裏見到普羅會衆都會有興趣的文章時，請轉告本會秘書或編輯組仝人，以便我們可在通訊中向會友們提供資料。

尋——通訊第一卷第四號

當本會的成立日漸爲海外友會所知後，他們都來函要求我們寄一整套的通訊給他們。本會現仍存有少量各期的通訊來應付友會的要求，唯獨缺第一卷第四號（1983年5月）。如有會友現仍存有這期通訊而願意拿出來捐助本會者，請寄給本會秘書收。

會務消息

截至1983年12月31日止，會員人數是294，比去年同時多了128人。本會現有榮譽會員5人（1982年12月31日時有4人），277名會員（去年同時爲150人）及12名學生會員（去年同時爲9人）。277名會員中有15位是登記爲非本地會員的。

編纂會員錄的工作現正接近完成，並將會附同本通訊寄出給各會員。會員錄刊有會員們的學歷，專業或科技性的會員資格（以香港認可者爲限）及通訊地址。如會員們發覺他們的資料有遺誤時，請通知本會秘書。

在英文版內刊有截至1983年12月31日止已交1984年度會費的會員芳名。請其他會員儘早將1984年度會費寄交本會司庫 M. J. Atherton, C/O Dept. of Civil & Structal Engineering, Hong Kong Polytechnic, Kowloon.

海南島的1605年大地震及其陸沉

嚴維樞報告

在中國南方，海南島東北岸外，確定了一片陸地沉降區。相信是明朝1605年 7 月13日强烈地震造成的（ 中國日報：1983年 5 月25日 ）。 這個遺址是廣東省地震局的一名研究員——陳恩民先生，經過四年多的野外調查發現的。

該地震的震級可達黎氏表的7.75至 8 級，震中在瓊州即現瓊山縣（ 海南島東北部 ）。在海口市東南方的一個港灣地帶，古代村庄的廢址被發現在潮汐平台上。這些發現包括石板砌造的水井井台，其他石物有石臼（ 缽 ）、石磨、石柱、石塊等。也發現一座古墓，內有玄武岩石板砌作的棺材，磚砌的坟坑。它們以及木質棺材、石碑等，都被牡蠣殼和藤壺殼覆蓋着。退潮時，石碑上的刻文包括日期是公元1605年的字跡（ 明萬歷三十三年 ）均可清晰辨認。在一座沉陷了的古村庄——林村（ Reuchun ）中，牆、石磨和石棺等均發現於目前海面下十公尺處。更甚者，在一個淺水區，還發現了長十公里寬一公里並伴有小路的十字形耕地地帶。在東寨港的一個沉陷村庄中，甚至還發現了一座戲台。

雖然和許多地震震害區不同，這裡很少出現被撕裂地體。但大規模出現的陸地沉陷，相信仍然是一場大地震的結果。

謝謝榮譽會員黃玉崑教授提供的有關素材。

近柴灣鯉魚門灣處產於花崗偉晶岩中的斧石

香港大學　嚴維樞

在去年十月由地質學會舉辦的柴灣地下鐵路車場地質考察中，發現了一種產於香港花崗岩的偉晶空洞中的棕色塊狀礦物，並採集了些礦物樣品做爲實驗室鑑定，下面是報導此項發現。

發現礦物地點是位於鄰近地下鐵路通道東部入口處，靠近正在建造的白沙灣地鐵車站。含有這種棕色礦物的偉晶空洞是包含在淡色的、幾乎缺乏黑雲母的中粒香港花崗岩。在同一岩石截面上約二十米處爲香港花崗岩和淺水灣組火山碎屑岩的接觸帶。測得偉晶空洞直徑40公分。其他礦物包括鉀長石，乳白色石英和白雲母。

觀察其顏色，玻璃光澤，硬度爲七和塊狀習性，此棕色礦物，起初覺得爲石榴子石、鈣鐵榴石。但，由於僅有一面的完全解理，此即一塊石榴子石所不可能有的。另外，採用伯爾曼密度秤對兩個樣品分別進行比重測定，得出各自比重爲3.33(5)和3.33(7)。然而鈣鐵榴石的比重約爲3.86。凡此種種，認爲此礦物顯然不是石榴子石。事實上，它極可能爲一種鈣硼硅酸鹽斧石礦物。

斧石通常是產於靠近酸性侵入體接觸帶的偉晶空洞中。這礦物的產生特別是由於硼元素的參於與富含鈣質的岩石所發生的交代作用的結果。（ DEER NOWIE & ZUSSMAN 1966 ）斧石礦物中鈣元素可追跡到同個鈣質物質原源，即與廣泛分佈於將軍澳淺水灣組火山碎屑岩中的方解石細脉有關。據作者所知，這是香港第一次所報導的斧石礦物。

大嶼山地質考察（ 節譯 ）

1983年11月27日本會會員及會友一行45人到大嶼山石壁西南約 2 公里的一個未命名小灣作地質考察。

在該區內我們見到淺水灣組各類岩石的露頭。最爲吸引的是那些沉積岩層。我們還找到一些木化石。

那天對一般的熱愛沉積研究者來說是一個豐收日。

節理殘迹對殘積土的控制（提要）

Richard Harris
Harris & Sutherland (Far East)

香港的風化殘積層常覆蓋於基岩上，其殘存節理在表土中形成明顯之軟弱面。在標準的土壤試驗中殘存節理會改變均質土的性質。

岩石風化轉變爲土壤過程中，在母岩中形成的節理常能殘存下來，在風化後期這些節理趨於變薄或被充填，因而影响到風化蓋層下部的性質。

岩石節理由於作爲地下水通道的作用而保留在原岩中，淋溶礦物在風化過程中沿着節理而沉積。這種作用也促使風化土體中節理的保留和軟弱面的形成。

原文介紹研探方法並列舉屯門實例。作者强調在土力穩固度分析時應顧及節理殘迹的影響力。

廣東省新豐江水庫蓄水誘發地震的演講

丁原章教授

衆所週知，距香港二百五十公里爲半徑的範圍內，震級超過黎氏表五級的唯一最大地震（註1），是發生在新豐江水庫。它位於香港北北東方向的一百六十公里處，靠近河源縣。雖然該區歷史上發生過一些小震動，但所有較大的地震均發生在水庫截流蓄水之後（註2）。顯然地，蓄水激發起該區斷裂活動性的增强。1962年3月19日發生了最大的一次地震，强度達6.1級，並損傷了堤壩——鋼筋混凝土結構。從此，水庫的誘發地震研究便深入地在該區展開。記錄到的大量資料，使斷裂構造的性質和分佈特徵得到充分研究。各類型斷裂構造對水庫荷載之不同效應也得以辨認。

丁教授的講演十分精彩和引起極大的興趣。明顯地，新豐江研究項目在水庫誘發地震性研究的標準個例中，其大小雖然接近於其他的更加出名之相似水庫，如卡里巴（KARIBA）、克里馬斯達（KREMASTA）和該那（KOYNA）諸水庫，但它特殊的地方是具有更長期的地震記錄史。

本地質學會收集到下列有關丁教授的一些近作：

（1）新豐江水庫誘發地震的構造條件　丁原章　肖安予　馬漢雄　潘建雄　沈立英　謬維成
第四屆國際工程地質大會論文集　1982　新德里　第七卷　第147—154頁

（2）新豐江水庫區誘發地震的餘震活動性　丁原章　沈××　陳恩民
（最近在南斯拉夫的地震討論會上發表，原文未收到）

我們再次謝謝丁教授的激勵性演講。

香港大學D. R. Workman錄

（註1）　Ms　6.1　19-3-62
Ms　5.1　29-7-62
Ms　5.3　23-9-64
Ms　4.7　12-5-77

（註2）　1961年至1977年間，超過四級地震的有十二次。

香港地質學會

常務委員會

投稿本會通訊簡則

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通　訊

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