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The Society has a membership of about 600 earth scientists interested in Malaysia and other Southeast Asian regions. The membership is worldwide in distribution.

**The occurrence of the oolitic limestone facies in the
Semantan Formation**
(Penemuan fasies batu kapur oolit dalam Formasi Semantan)

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Abstract: A new outcrop of limestone facies is exposed at 'Mentakab Industrial Park', near Mentakab-Temerloh by-pass. Here, the limestone is in the form of lenses interbedded with shale and tuffaceous sandstone sequence of the Semantan Formation. At least two limestone microfacies are recognised: oosparite limestone and micritic limestone. In the micritic limestone, gastropod and crinoid stems are found. The occurrence of the oolitic limestone in the Semantan Formation has not been reported before. Since the oosparite limestone is usually interpreted to be deposited in shallow marine environment, this new finding further indicate that not all rocks of the Semantan Formation was deposited in the deep sea environment.

Abstrak: Satu singkapan baru yang mendedahkan fasies batu kapur Formasi Semantan terdapat di kawasan perindustrian Mentakab, di tepi jalan pintas Mentakab-Temerloh. Di sini, batu kapur tersingkap sebagai beberapa kekanta yang berselang lapis dengan syal dan juga batuan tuf Formasi Semantan. Jurus fasies batu kapur ini sama atau selaras dengan kedudukan batuan syal yang terdapat di bawah dan atasnya.

Sekurang-kurangnya dua jenis mikrofases batu kapur ditemui. Fases pertama ialah batu kapur oosparit dan fasies kedua ialah batu kapur mikrit yang mempunyai fosil gastropod dan juga krinoid. Kewujudan batu kapur oosparit yang belum pernah dilaporkan terdapat dalam Formasi Semantan dijelaskan di sini. Oleh kerana batu kapur oosparit ini mencadangkan sekitaran laut cetek, pertemuan ini lagi menunjukkan tidak semua batuan Formasi Semantan terendap di sekitaran laut dalam.

INTRODUCTION

The Semantan Formation is widely distributed along the Central Belt of Peninsular Malaysia (Kamal Roslan, 1989). This formation is comprised of a rapidly alternating sequence of carbonaceous shale, siltstone and tuffaceous sandstone, with a few lenses of conglomerate and limestone. The shale and tuffaceous sandstone make up the bulk of the sequences. The formation is Middle to Late Triassic in age, based on palaeontological evidence (Jaafar Ahmad, 1976, 1980; Kobayashi, 1963; Kummel, 1960; Savage, 1950; Metcalfe *et al.*, 1982).

Earlier reports of limestone facies in the Semantan Formation are as small limestone lenses in the shale-tuffaceous sandstone sequences, e.g. Hindu Temple (near Mentakab), along Sungai Chengal and Sungai Mentuang, Karak-Mancis area, and Jengka area.

However, the limestones from these localities were recrystallised and are composed of fine to medium-grained anhedral calcite of mosaic texture. Their internal structure are either not clear or damaged due to recrystallization and other diagenetic processes. Gastropods and crinoid stems were also reported

in this limestone facies. Because of the very poor exposure the relationship between limestone and other facies of the Semantan Formation was not clearly demonstrated.

OOLITIC LIMESTONE

A new outcrop of limestone facies is found at 'Mentakab Industrial Park', near Mentakab-Temerloh by-pass (Fig. 1). The limestone facies is found as lenses within a sequence of alternating shale-tuffaceous sandstone of the Semantan Formation (Fig. 2). The limestone, which is 2 cm to 15 cm thick and pale grey in

colour, alternates with thin to very thin shale and appears as stylolite due to diagenesis (Fig. 3). The total thickness of the limestone facies is estimated to be approximately 5 metres thick.

At least two limestone microfacies which are interbedded each other are recognised: oosparite limestone and micritic limestone. Micritic limestone comprised of very fine calcite crystals. Perfect-shaped, well-preserved fossils of gastropods of up to 1 cm in size are found in the micritic limestone (Fig. 4). This facies appears to be the common limestone facies of the Semantan Formation.

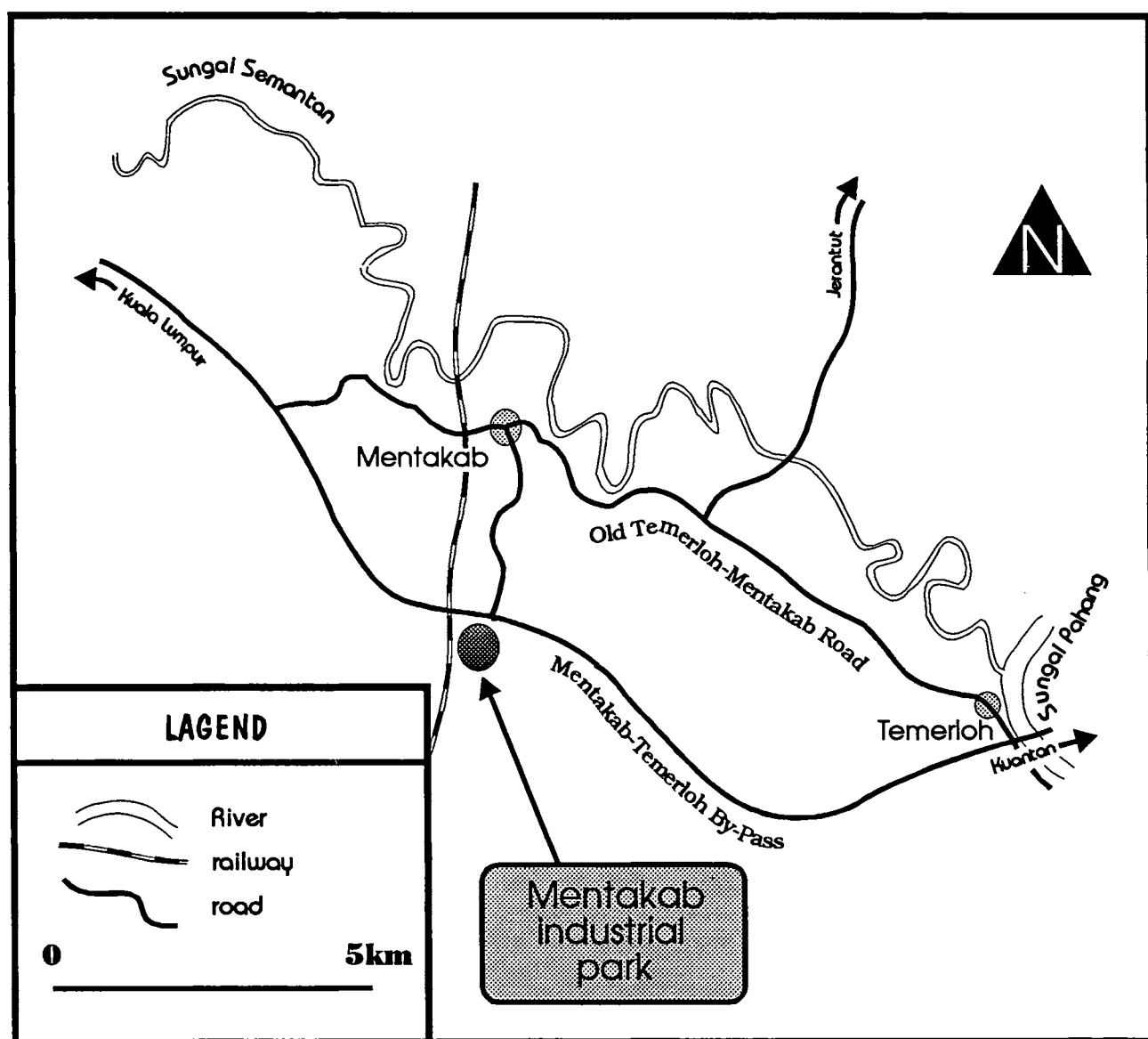


Figure 1. A location of the new outcrop of limestone facies of the Semantan Formation at 'Mentakab Industrial Park', near Mentakab-Temerloh by-pass.

Oolitic limestone is found in the lenses of the uppermost sequence. In previous reports, there were no mention about the occurrences of the oolitic limestone in the Semantan Formation. This limestone facies comprised ooids as allochems cemented by sparry calcite (Fig. 5). The ooids are 0.5 mm in size, rounded and are in perfect form, displaying one or several regular lamellae. The nuclei of some of the ooids are made up of angular quartz grains (single crystal and polycrystal) and are coated by very thin lamellae of calcite (Fig. 6). Other components of the oolitic limestone are angular quartz grains smaller than the size of the ooids.

INTERPRETATION

Marine ooids originate in high-energy shallow-water environments, influenced by wave action or tidal currents. Ooids typically form in agitated waters where they are frequently moved as sand waves, dunes and ripples by tidal and storm currents, and wave action (Tucker, 1981). The majority of ooids originate at depths down to 2 m (Flügel, 1982), although they could probably form at greater depths of up to 10 to 15 metres (Milliman, 1981). Most of the present-day site of active ooids formation are concentrated near the tropics between 25°N and 25°S, where the salinity of the ocean water is at its maximum, and the annual rainfall precipitation rates are less than the evaporation rate (Sellwood, 1986).

Since marine ooids have to formed originally in the shallow marine environment, the ooids could have been transported into deep sea environment if the interpretation that the Semantan Formation sediments were wholly deep-sea sediments were true. However, from the association of oolitic limestone and gastropod-containing micritic limestone, and the absence of evidence for turbidity current deposition of the limestone, we believe that the oolitic limestone was deposited in shallow marine together with the micritic limestone.

This is the first real evidence found to suggest that part of the rocks of the Semantan Formation were deposited in shallow water. Other facies in the Semantan Formation are turbidite sequences indicating deep sea environment. Therefore the occurrence of the

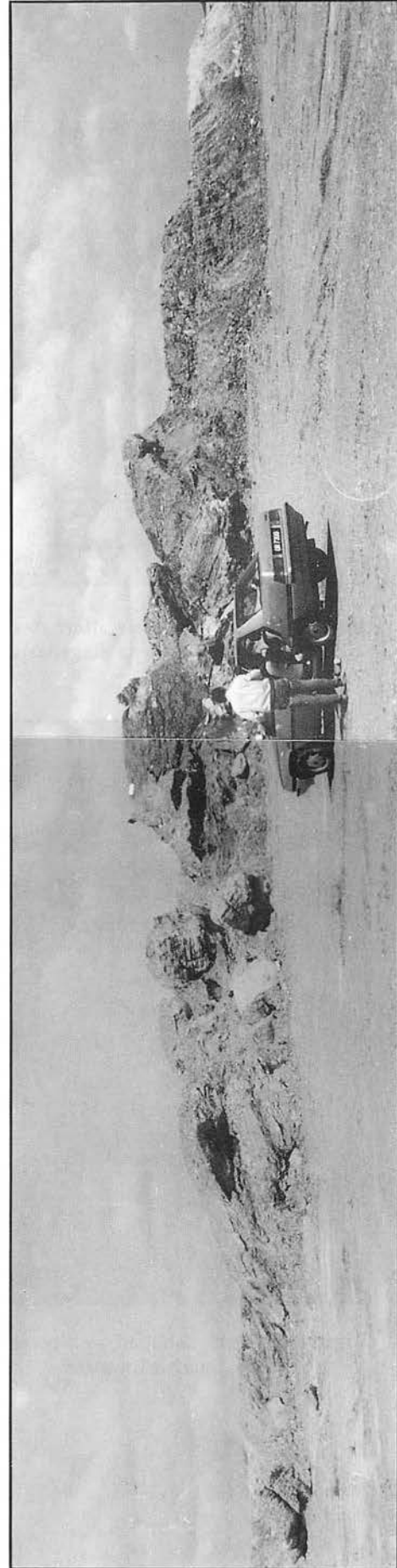


Figure 2. Lenses of the limestone facies within a sequence of alternating shale-tuffaceous sandstone of the Semantan Formation.



Figure 3. The limestone alternates with thin to very thin shale that appears as stylolite due to diagenesis.



Figure 4. Perfect-shaped, well-preserved fossils of gastropods of up to 1 cm in size in the micritic limestone.

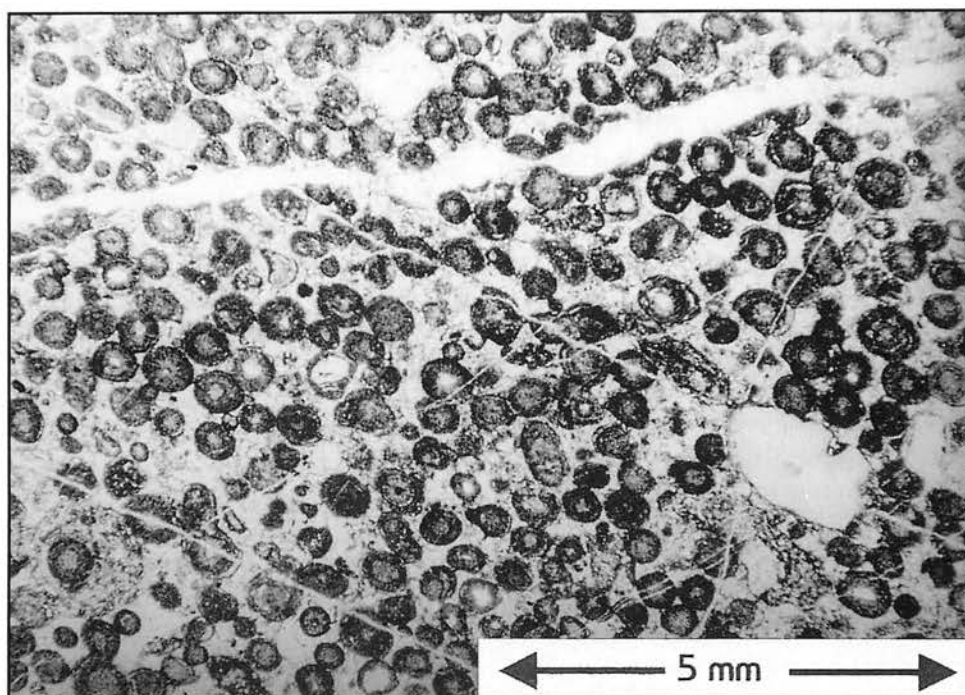


Figure 5. Oolitic limestone facies comprised of round and perfect form ooids as allochems cemented by sparry calcite.

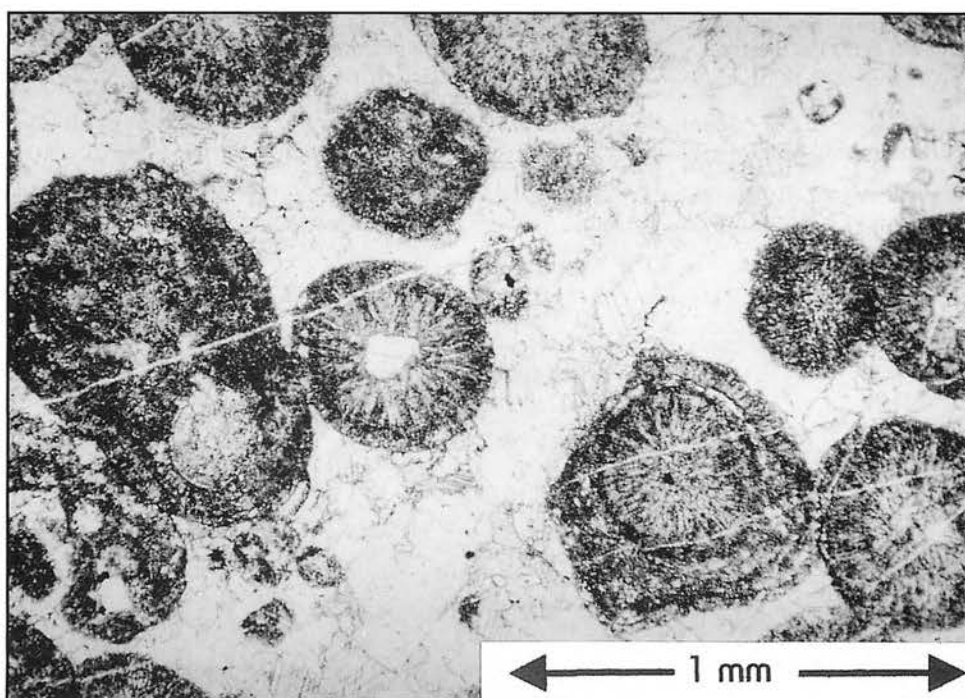


Figure 6. The nuclei of some of the ooids are made up of angular quartz grains and are coated by very thin lamellae of calcite. Ooids are cemented by sparry calcite.

oolitic limestone in Semantan Formation further indicate that not all of the Semantan Formation was deposited in the deep sea environment (Azhar Hussin, 1992; Jaafar Ahmad, 1976; Kobayashi *et al.*, 1963; Kobayashi & Tamura, 1984; Tamura *et al.*, 1975).

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REFERENCES

- AZHAR HJ. HUSSIN, 1992. Sedimentary facies of the Semantan Formation and their implication. Geol. Soc. Malaysia Ann. Geol. Conf. 1992, Kuantan, Pahang.
- JAAFAR AHMAD, 1976. The geology and mineral resources of the Karak and Temerloh area, Pahang. *Geological Survey of Malaysia Memoir*, 15: 127p.
- JAAFAR AHMAD, 1980. The geology and mineral resources of the Sungai Teris, Pahang. *Geological Survey of Malaysia Memoir*, 18: 141p.
- FLUGEL, E., 1982. *Microfacies of limestone*. Springer-Verlag, Berlin Heidelberg New York: 633p.
- KAMAL ROSLAN MOHAMED, 1989. *Stratigraphy and sedimentology of the Triassic rocks of Peninsular Malaysia*. PhD thesis, University of London: 293p.
- KOBAYASHI, T., 1963. On the Triassic Daonella beds in central Pahang, Malaya. *Japan Journal Geology and Geography*, 34: nos. 2-4.
- KOBAYASHI, T., BURTON, C.K., TOKUYANE, A. AND YIN, E.H., 1963. The Daonella and Halobia Facies of Thai-Malaya Peninsula compared with those of Japan. GPSEA Vol. 3, p. 98-122.
- KOBAYASHI, T. AND TAMURA, M., 1984. The Triassic Bivalvia of Malaysia, Thailand and adjacent areas. GPSEA vol. 25, p. 201-228.
- KUMMEL, B., 1960. Anisian ammonoids from Malaya. *Breviora Museum of Comparative Zoology*, 124: p. 1-8.
- METCALFE, I., SIVAM, S.P. AND STAUFFER, P.H., 1982. Stratigraphy and sedimentology of Middle Triassic rocks exposed near Lancang, Pahang, Peninsular Malaysia. *Geological Society of Malaysia Bullrtin*, 15: p. 19-30.
- MILLIMAN, J.D., 1981. *Marine carbonates*. Springer-Verlag, Berlin Heidelberg New York: 375p.
- SAVAGE, H.E.F., 1950. Triassic fossils from Kuala Lipis, Pahang. *Colonial Geology and mineral resources*, 1: p. 76-77.
- SELLWOOD, B.W., 1986. Shallow-marine carbonate environment. In: H.G. Reading (ed.). *Sedimentary environments and facies*, (second edition). Blackwell Scientific Publications: p. 283-342.
- TAMURA, M., *ET AL.*, 1975. System of Malaysia, Thailand and some adjacent areas GPSEA vol. 15, p. 103-149.
- TUCKER, M.E., 1981. *Sedimentary Petrology*, an introduction. 252 pp. John Wiley & Sons.

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Point load strength of a porphyritic hypersthene microdiorite from the Tawau area, Sabah, East Malaysia

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Abstract: Point load tests on air and oven dried, as well as water saturated, samples of a porphyritic hypersthene microdiorite all yield similar strength indices [$I_{s(50)}$] of 13.6 MPa. These indices were calculated from the log-log plots of the loads at failure (P) versus the squares of the equivalent core diameters (De^2) of several, tetrahedral blocks of different sizes that were tested. The absence of a difference in the point load strength indices of the saturated and dry samples is attributed to the low effective porosity (mean value of 0.95 %) of the microdiorite which limits absorption of water. The point load strength index of 13.6 MPa is related to the uniaxial compressive strength by a multiplication factor of 18.

INTRODUCTION

The Point Load Strength, as described by Broch and Franklin (1972), has gained widespread acceptance as an index test for the strength classification of rock material and as a means for estimating other strength parameters as the uniaxial compressive strength (ISRM, 1985; Brook, 1985). Little or no specimen preparation is needed for this test which involves the splitting of rock specimens by application of a concentrated load through a pair of spherically truncated, conical platens; the specimens being in the form of cores (the diametral and axial tests), cut blocks (the block test), or irregular lumps (the irregular lump test). The most widely known version of the test involves the diametral splitting of rock cores and determination of the point load strength index which is related to a reference core diameter of 50 mm. Where cores with other diameters are tested, a size correction factor needs to be introduced (ISRM, 1985).

Where specimens with shapes other than cores are tested, both shape and size correction factors need to be introduced. The shape correction factor is based on the minimum cross-sectional area of the tested specimen and involves

calculation of an "equivalent core diameter" (Brook, 1985). The size correction factor, however, is best determined from the log-log plots of the loads at failure (P) versus the squares of the equivalent core diameters (De^2) of a range of specimen sizes as this allows interpolation (or extrapolation) of the load corresponding to an equivalent core diameter of 50 mm (ISRM, 1985).

In this paper are presented the results of point load tests that have been carried out on air and oven dried, as well as water saturated, blocks of a porphyritic hypersthene microdiorite from the Tawau area. Correlation of the point load strength index [$I_{s(50)}$] with the uniaxial compressive strength is also discussed.

SAMPLING SITE — GEOLOGICAL SETTING

In the Semporna Peninsula, post-orogenic volcanism during the Pliocene and Quaternary was accompanied by the injection of a varied assemblage of intrusive igneous rocks into older, folded formations and volcanic rocks. Most of these intrusions form small steep-sided stocks and thick dykes; sills and other concordant intrusions being rare, probably owing to the

relative ease of injection of magma along the innumerable faults in the severely disturbed formations. The intrusions are of an intermediate to acidic composition and predominantly consist of diorite, andesite, dacite and granite (Kirk, 1962; 1968).

In the Tawau area, hypersthene diorite forms the bedrock of a line of prominent steep conical hills, Mount Gemok, Middle Hill and Kukusan Hill; these hills rising abruptly above the surrounding, flat to undulating, low-lying Quaternary deposits. A number of quarries are found at these hills for the bedrock serves as an important source of aggregates in Sabah.

METHOD OF STUDY

In connection with a study on the geotechnical properties of the diorite bedrock, point load tests were carried out as these tests offer a simple and rapid means of obtaining a strength classification. A large, fresh diorite block of some 0.1 m³ was collected at a quarry at Kukusan Hill and then sawn into smaller tetrahedral shaped blocks of various sizes. Some of these blocks were oven dried at 105°C for 12 hours, whilst others were air dried for a week, before being tested with an ELE Point Load Test Apparatus. In order to investigate the influence of moisture content on the point load strength index [$I_s(50)$], some of the blocks were saturated by complete immersion in distilled water under a vacuum for 2 hours before being tested.

Thin-sections were also prepared from the large block in order to classify the rock material, whilst density, unit weights and porosities of selected samples were determined according to the suggested method of ISRM (1979) using saturation and buoyancy techniques.

PETROGRAPHY OF INVESTIGATED ROCK MATERIAL

In hand specimens, the rock material shows an indistinct porphyritic texture with several small, light to dark grey and black phenocrysts set in a light grey, fine grained matrix. The phenocrysts, of square to rectangular shapes, are mostly between 1 x 2 mm² and 2 x 3 mm² in size, whilst the matrix comprises grains of less than 1 mm in size. A few, dark grey,

oblate xenoliths of some 2 cm diameter are also sometimes seen in the rock material.

In thin sections, the rock material shows a hypidiomorphic-granular texture with phenocrysts of plagioclase, hornblende, hypersthene and augite set in a fine grained matrix of mainly plagioclase with some hornblende and pyroxene as well as abundant iron oxide grains and minor, accessory orthoclase and quartz. The phenocrysts are mostly 0.5 x 0.5 mm² to 1.5 x 2.5 mm² in size, though a few are up to 2 x 3 mm in size, whilst the fine grained matrix is less than 0.15 mm in size.

Plagioclase phenocrysts are the predominant phenocrysts and together with the matrix plagioclases constitute some 77.2% of the rock material. They are mainly of an oligoclase composition and commonly show concentric zoning as well as polysynthetic twinning.

Hornblende constitutes some 9.9 % of the rock material and occurs both in the matrix and as phenocrysts, though it is invariably altered to mainly iron oxides and chlorite. Hypersthene constitutes some 2.9% of the rock material and occurs both in the matrix and as phenocrysts, while augite constitutes some 1.7% and mainly occurs as phenocrysts. Iron oxide grains (opaques) constitute some 3.2% of the rock material and are mainly magnetite with cubic shapes. Quartz and orthoclase are only found as interstitial grains and constitute some 2.5%, and 2.6%, of the rock material respectively.

On the basis of the textural features and mineralogical composition (as determined from the point counting of 1,000 points in each of 2 thin-sections), the rock material is best classified as a Porphyritic Hypersthene Microdiorite (after Hatch, Wells & Wells, 1972), as has also been classified by Liaw (1979). It is to be noted that Kirk (1962, 1968) classified the rock material as a hypersthene diorite, though he pointed out that it was medium to fine grained and not markedly porphyritic.

RESULTS AND DISCUSSION

Results of the point load tests on oven, and air, dried samples are shown in Table 1, whilst results of the tests on saturated samples are shown in Table 2. Calculated values of the

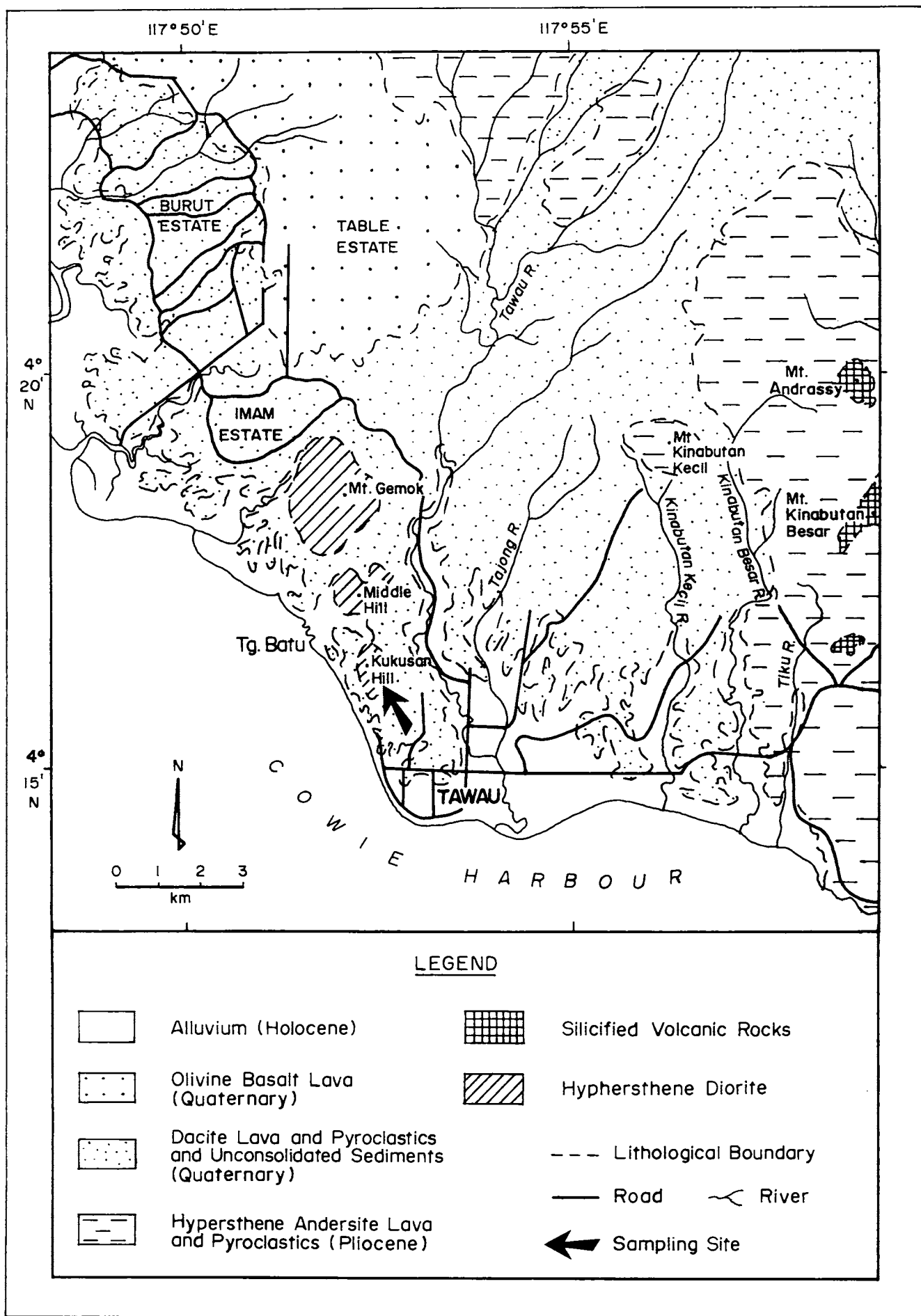


Figure 1. Geological sketch map of the Tawau area, Sabah (after Kirk, 1962).

uncorrected point load strengths in both Tables appear to be rather variable, though when the loads at failure (P) are plotted in a log-log graph versus the squares of their equivalent core diameters (De^2), a distinct linear relationship is seen (Fig. 2). The best-fit line (drawn visually) through the points for both the dried, and saturated, blocks yields a gradient of 0.933 (i.e. $\tan 43^\circ$) (Fig. 2).

From the log-log plots (Fig. 2), the load at failure corresponding to an equivalent core diameter of 50 mm is 34 kN, and the point load strength index [$Is_{(50)}$] of both the dried, and saturated, samples of the porphyritic hypersthene microdiorite is therefore 13.6 MPa. In terms of a point load strength classification, as suggested by Brook (1975; 1985), the rock material would be classified as being of very high strength.

It is to be noted that the determined strength index [$Is_{(50)}$] of 13.6 MPa is comparable with published data, as Broch (1974) who quotes a point load strength of some 11.7 MPa for tests on dried core samples (of 35 mm diameter)

of a quartz diorite. Broch (1974) has also shown that the point load strength of this quartz diorite decreases with increasing moisture content and reaches a value of some 9 MPa on full saturation. In the case of the investigated rock material, however, there is no difference in the point load strength indices [$Is_{(50)}$] of both the dried and saturated samples. The most likely explanation for this anomaly is perhaps the low effective porosity (mean value of 0.9 %; Raj, in prep.) of the porphyritic microdiorite which would inhibit the absorption of water.

Compression tests carried out on block samples of the porphyritic microdiorite furthermore, yield a mean uniaxial compressive strength of 244.92 MPa (Raj, in prep.). The point load strength index [$Is_{(50)}$] would thus need to be multiplied by a factor of 18.0 to be equivalent to the uniaxial compressive strength. This multiplication factor is similar to multiplication factors reported by other workers as Broch and Franklin (1972), and Brook (1975; 1985) who quote multiplication factors of between 18 and 24 for a wide variety of rock materials.

Table 3: Results of point load tests on air, and oven, dried samples — porphyritic hypersthene microdiorite

Sample Number	Equivalent Core Diameter mm ²	Load at Failure lbf	Load at Failure kN	Uncorrected Point Load Strength MPa
1 a	841	2,650	11.70	13.91
1 b	731	2,700	12.00	16.42
1 c	892	2,800	12.50	14.01
1 d	1,295	3,600	16.00	12.36
1 e	1,107	3,550	16.00	14.45
1 g	1,185	3,000	13.50	11.39
1 h	736	1,970	8.70	11.82
1 j	626	2,000	9.00	14.38
3b	1,484	5,000	22.00	14.82
2 a	840	2,500	11.00	13.10
2 b	776	2,600	11.50	14.82
2 c	1,066	3,600	16.00	15.01
2 d	1,072	3,800	17.00	15.86
2 e	950	3,100	14.00	14.74
2 f	1,574	4,600	20.50	13.02
3 a	1,483	4,700	21.00	14.16
3 e	1,314	4,700	21.00	15.98

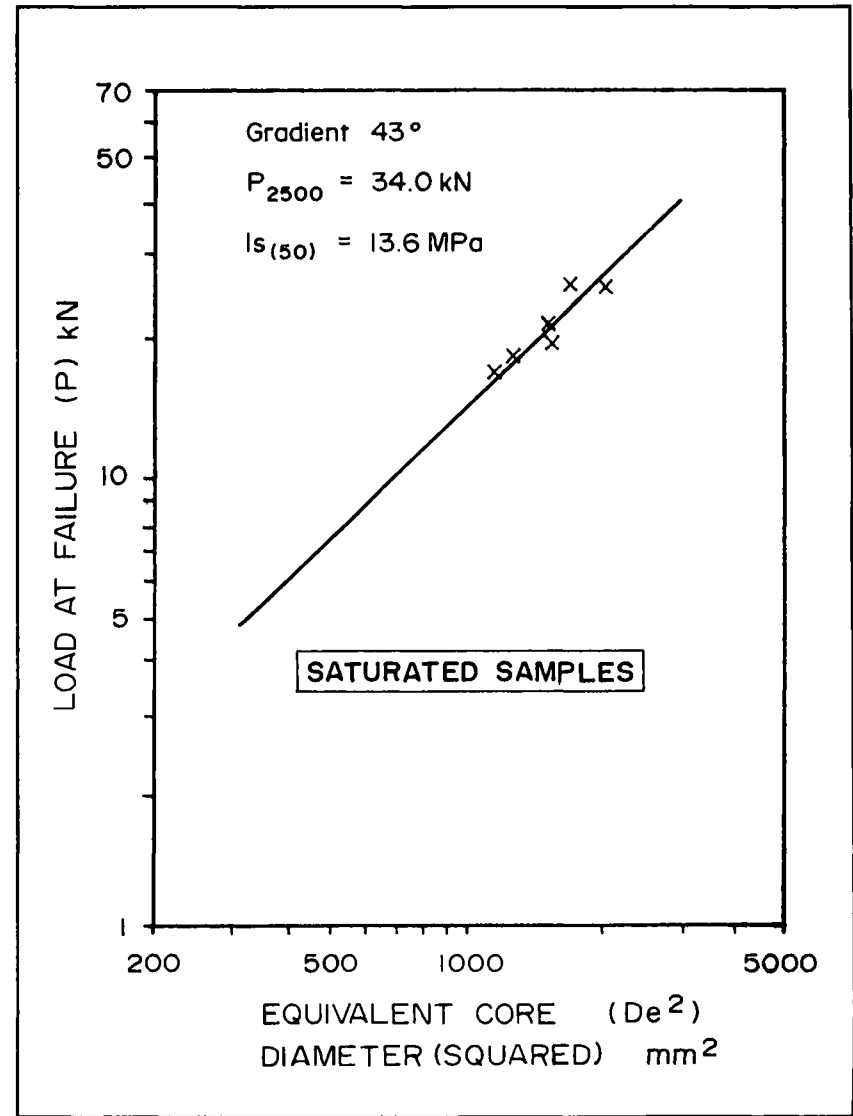
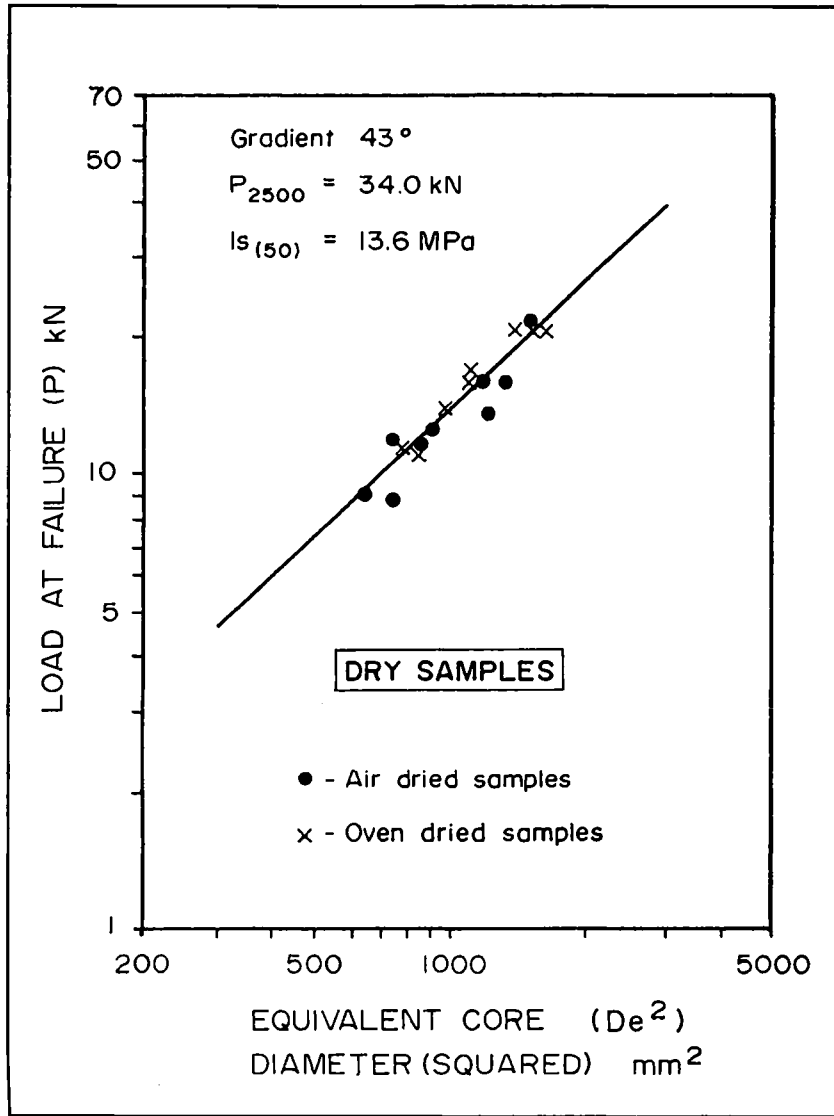


Figure 2. Log-log plots of load at failure (P) in kN versus squares of equivalent core diameters (D_e^2) in mm^2 — Tawau diorite samples.

Table 4: Results of point load tests on saturated samples — porphyritic hypersthene microdiorite

Sample Number	Equivalent Core Diameter mm ²	Load at Failure lbf	Load at Failure kN	Uncorrected Point Load Strength MPa
SD 1a	1,535	4,400	19.50	12.70
SD 2c	795	4,100	18.00	22.64
SD 2d	827	4,100	18.40	22.25
SD 3a	622	3,000	13.00	20.90
SD 3c	602	3,400	15.00	24.92
SD 3d	545	3,000	13.40	24.59
SD 6a	1,277	4,200	18.50	14.49
SD 6c	1,129	3,950	17.50	15.50
SD 7a	1,493	5,000	22.00	14.74
SD 7b	1,686	5,950	26.50	15.72
SD 10c	1,983	5,950	26.50	13.36

CONCLUSION

Arising from the above discussion it is concluded that the porphyritic hypersthene microdiorite shows a point load strength index [IS₍₅₀₎] of 13.6 MPa for both dried and saturated samples. This value of the point load strength index is related to the uniaxial compressive strength by a multiplication factor of 18.

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REFERENCES

- BROCH, E. AND FRANKLIN, J.A., 1972. The point load strength test. *Int. J. Rock Mech. Min. Sci. & Geomech. Abstr.*, V. 6, p. 669-697.
- BROCH, E., 1974. The influence of water on some rock properties. *Advances In Rock Mechanics, Reports Of Current Research*, V. II-A, Denver, 1974. p. 33-38.
- BROOK, N., 1975. The point-load test in geotechnical practice. *Engng. Geol.*, No. 9, p. 1-11.
- BROOK, N., 1985. The equivalent core diameter method of size and shape correction in point load testing. *Int. J. Rock Mech. Min. Sci. & Geomech. Abstr.*, V. 22, p. 61-70.
- HATCH, F.H., WELLS, A.K. AND WELLS, M.K., 1972. *Petrology Of The Igneous Rocks*. Thomas Murby & Co., London. 511 p.
- ISRM (INT. SOC. ROCK MECHANICS), 1979. Suggested methods for determining water content, porosity, density, absorption and related properties and swelling and slake-durability index properties. *Int. J. Rock Mech. Min. Sci. & Geomech. Abstr.*, V. 16, p. 141-156.
- ISRM (INT. SOC. ROCK MECHANICS), 1985. Suggested method for determining point load strength. *Int. J. Rock Mech. Min. Sci. & Geomech. Abstr.*, V. 22, p. 51-60.
- KIRK, H.J.C., 1962. *The Geology And Mineral Resources Of The Semporna Peninsula, North Borneo*. Mem. 14, Geol. Survey Dept., Brit. Territories In Borneo, Govt. Printing Office, Kuching. 178 p.
- KIRK, H.J.C., 1968. *The Igneous Rocks Of Sarawak And Sabah*. Bull. 5, Geol. Survey, Borneo Reg., Malaysia. Govt. Printing Office, Kuching. 210 p.
- LIAW K. K., 1979. *Petrology and geochemistry of the volcanic suite of north Tawau area, Semporna Peninsula, Eastern Sabah, Malaysia*. (Unpubl) B.Sc. (Hons) Thesis, Univ. Malaya. 80 p.
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PERTEMUAN PERSATUAN **Meetings of the Society**

Forum on Urban Geology and Geotechnical Engineering in Construction

1-2 July, 1993, Petaling Jaya – Report

I) Forum, 1st July, 1993

The Forum on "Urban Geology and Geotechnical Engineering in Construction" was held on 1st July, 1993, at the IEM Building, Petaling Jaya. This is the first forum jointly organised by the Institution of Engineers Malaysia (IEM) and the Geological Society of Malaysia (GSM).

Eight lectures were delivered at the Forum, four by engineers and another four by geologists. The programme for the Forum is as shown, and copies of the proceedings of the Forum are available for reference at the IEM and GSM libraries. **Limited copies of the proceedings are available for sale at the IEM Secretariat.**

The first four lectures dealt with topics related to limestone and ex-mining ground, and include: geologic settings and engineering geologic problems in the Ipoh and Kuala Lumpur areas (both dominated by karst geology); treatment of cavities in limestone for piled foundations using bored pile socket through cavity and underpinning by minipile; detection of cavities in limestone by the Pole-Dipole resistivity technique; and geotechnical works in the development of an ex-mining land located in limestone terrain. All four lectures were amply illustrated by case studies, with many colour slides thrown in during the presentations.

The 5th and 6th lectures dealt with peat, i.e. the geology and characteristics of peat deposits, and construction problems in peat. The Sibuluan case study also illustrates how geologic information in the form of various thematic maps can help in urban land-use planning and construction. Some methods of construction in peat successfully adopted include: surface soil reinforcement, displacement, replacement and pile supported embankment. Appropriately, case studies were presented from Sarawak and Johor where peat deposits are of wide occurrence. Interestingly enough, both speakers are from Sarawak and they have had much personal experiences with peat, having grown up, lived and worked in Sarawak for many years.

The final two papers dealt with quality site investigations and test data in granite mainly, incorporating more engineering-geologic input, with examples from the North-South Expressway; and non-destructive tests for checking the integrity of pile foundations. Once again, ample case studies based on the authors' personal experiences were provided.

The response to the Forum was overwhelming, with about 120 participants registered, far exceeding the original target of 80 maximum intended. The IEM lecture hall was filled to maximum capacity throughout the day of the Forum, and many lively discussions and comments followed each presentation.

As expressed by Dr. Ooi T.A. (Organising Chairman) and Dr. Chan S.F. (Chairman, Geotechnical Engineering Division, IEM) in their opening and closing remarks, such a forum is of mutual benefit to members of both organisations, and hence, similar forums on topics of mutual interest will be organised in the future. For members of IEM and GSM who have missed the boat this time for one reason or another (such as too busy chasing jobs or chasing payments?), I hope you will be able to join us in similar joint forums in the future, to help further promote healthy interactions between members of the two professional bodies.

II) Site Visits, 2nd July, 1993

Two site visits were conducted on 2nd July, 1993, namely to the Kuala Lumpur City Centre (KLCC) project site in the morning, and the Bandar Sunway area in the afternoon. The number of participants for the site visits was restricted to about 50, and hence, unfortunately, many interested members had to be turned away.

The KLCC personnel and consultants provided briefings on the project, including project description and planning, site investigations and geotechnical design aspects, as well as treatment of cavities in the limestone bedrock and the slumped zone. The proposed Petronas Twin Towers will be 87-storey high and will be among the top 2 or 3 tallest buildings in the world! The ground conditions comprise alluvium, Kenny Hill formation, and limestone bedrock (typical K.L. subsurface geology), with the bedrock exhibiting a subterranean cliff-like feature at the Twin Towers location (The limestone bedrock drops from about 90 m depth to 180 m depth). It is interesting to note that the original positions of the Twin Towers (as determined earlier by architects/planners) have been shifted slightly at the outset due to ground conditions/geology. Some details of the design and selection of the foundations were provided, culminating in the adoption of long barrette piles founded entirely within the Kenny Hill formation (S.P.T > 50) and terminating some distance above the limestone bedrock and the slumped zone, i.e. utilising skin friction only. Interesting accounts were also given on the grouting of cavities in the limestone bedrock, compaction grouting of the slumped zone (as opposed to jet grouting), and skin grouting of the barrette piles. Incidentally, the slumped zone here occurs just above the limestone bedrock and has S.P.T. values of < 15.

The visit to Bandar Sunway in the afternoon was led by Mr. Yeow T.S. of Bandar Sunway Sdn. Bhd. An account was given on the past, present and future development of Bandar Sunway – from tin mining to limestone quarry to property development. A guided tour of the Bandar Sunway area, the quarry pit and the Sunway Lagoon was conducted personally by Mr. Yeow and his colleague, Mr. Leong. The Bandar Sunway area is underlain by the Kuala Lumpur limestone with its many associated karstic features, many of which are exposed in the quarry pit as well as preserved at the Sunway Lagoon site. In fact, the limestone pinnacles, arch, etc. enhance the aesthetics of the Sunway Lagoon area. In developing the Bandar Sunway project, various soil and rock stabilization techniques have been adopted, such as rock anchors and guniting for rock slopes; preloading, vertical drains, dynamic compaction, etc. for the mine tailings (see paper by Yeow *et al.* presented in the Forum).

Acknowledgments

The organisers record their thanks to all parties that have contributed to the success of the Forum:

- all authors for writing and presenting their papers,
- KLCC and their consultants for the site visit and briefings, not forgetting the sumptuous lunch and hospitality provided,
- Bandar Sunway Sdn. Bhd. for the site visit and briefings, plus drinks, snacks and tour of the Lagoon area,
- Miss Ooi and her colleagues at the IEM Secretariat for the supporting functions (proceedings, secretarial, audio-visual, etc.)

Tan Boon Kong,
Chairman, Working Group on
Engineering Geology & Hydrogeology
(3rd July, 1993)

Footnote: *This Report is submitted to both the IEM Bulletin and the GSM Newsletter*

Forum Urban Geology & Geotechnical Engineering



Site Visit



Forum on Urban Geology and Geotechnical Engineering in Construction, 1-2 July, 1993, Petaling Jaya

Photographs — Proceedings at Forum and Site Visits (on a lighter note)

- | No. | Caption |
|-----|--|
| 1. | Master of Ceremony, Mr. James Wong, getting the show started. Time to wake up, James! |
| 2. | En. Aminudin receiving a token of appreciation from the Organising Chairman. |
| 3. | A question being posed by a lady engineer to geologist En. Aminudin. The speaker's reply: "That's a very tough question to reply to ..." |
| 4. | From the Organising Chairman (Dr. Ooi T.A.) to the Co-chairman (Mr. Tan B.K.), or is it the other way around? |
| 5. | Mr. Wong B.C. clarifying some points on possible renovations in the Bandar Sunway Project. "When I quote them the Board of Engineers rates, they all run away! ..." |
| 6. | Lunch at Sri Melaka, with all the "General"'s men, and woman. |
| 7. | Mr. Lam S.K. responding to James's query: "You are using the wrong auger! We have a special auger for peat ..." |
| 8. | Mr. Tan Y.K. on the construction problems in peat: "When a machinery gets bogged down in soft clay, at least you can still see it. When one sinks into peat, you don't even see it anymore – the machinery has become a 'reinforcement' for the soil!" |
| 9. | Mr. Muhinder Singh: "Look, guys, we are talking about quality site investigations here!" And, in the background, echoed James Wong: "Yeah, at quality prices!" |
| 10. | Mr. Mun K.P. on non-destructive testing of piles: "You got to be kidding. Our tests detect the cracks, not cause the cracks!" |
| 11. | Dr. Chan S.F. formally closing the Forum: "When we do site investigations using boreholes, we are investigating only 1%, 2% or at most 3% of the ground. The other 97% of the ground is where we need the geology/geologist." |
| 12. | The capacity crowd, still very serious and attentive at the end of the day. |
| 13. | Briefing and model of the KLCC project at the site office. |
| 14. | Site visit at KLCC. Tour group leaders can be identified by their hard-hats worn the other way around. |
| 15. | Mr. Yeow T.S. receiving a token of thanks from the organising chairman. |
| 16. | The Bandar Sunway project also includes a mobile Karaoke lounge (just kidding!). |
| 17. | Mr. Leong at the Sunway quarry pit: "See the sinkhole over there?" |
| 18. | Time to get out of this "pit" before they fire the next blast. |
| 19. | Dr. Ooi T.A. obviously enjoying himself and perhaps thinking: "I must bring my kids here more often". |
| 20. | All good things must come to an end, and what better way than to end at the beautiful Sunway Lagoon. |

Ceramah Teknik (Technical Talk)

The use of microwave remote sensing in geology

BAS KOOPMANS

Abstrak (Abstract)

During the late 1960s and the first half of the 1970s, large parts of the world were covered by airborne side-looking radar surveys. Most of these surveys were carried out over Third World countries where the complete lack of any type of map severely hampered development progress. The "Radar" project in Brazil is the best known example and the largest in areal extent (4.5 million km²). The survey was later expanded to cover the entire Brazilian territory of 8.5 million km². With other radar surveys over the Colombian, Ecuadorian, Peruvian and Bolivian Amazon areas, the largest cartographic blank in the world (the South American Amazon area) was coloured in thanks to the fast method of data acquisition (independent of weather conditions) and the synoptic view provided by radar mosaics, which permit relatively rapid reconnaissance surveying.

With the launch of Seasat in 1978, spaceborne imaging radar for earth observation "came into its own".

The nineties is the decennium of satellite radar surveying. With the launch of the ERS-1 of the European Space Agency (ESA), in July of 1991, the remote sensing community in Europe is gearing up to full use of side looking radar data for earth observation.

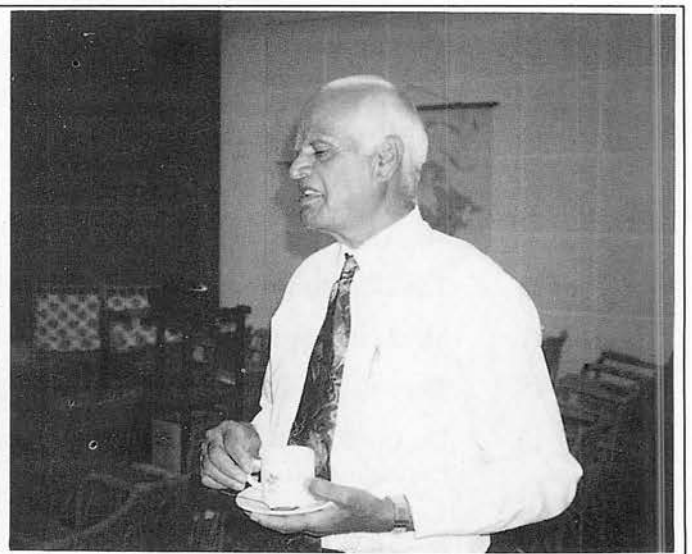
Even before the ERS-1 there was the launch of the Soviet LAMAZ radar satellite in March of 1991.

The Japanese ERS-1 was launched on 11 February 1992. The deployment of JERS-1 by the National Space Development Agency of Japan (NASDA) was not without some difficulty. The deployment of the SAR antenna was delayed, and the check-out schedule of the payload was revised. Everything eventually functioned perfectly.

The geological community has always been a prime user of remote sensing data for application surveys. Oil and mining companies have shown a great interest in the use of airborne radar data for their exploration programs and large areas have been contractually flown with radar for them, particularly in the humid tropical belt. The availability of satellite radar data in future and the possibility of digital combining these microwave data with satellite data obtained in the visible and near infrared part of the spectrum will form an attractive option for exploration surveys.



BAS KOOPMANS



M.Z. FASHORI

Exploration strategy based on a proven sedimentological model for the glauconitic sandstone (Lower Cretaceous) of Southern Alberta

M.Z. FASHORI

Abstrak (Abstract)

A comprehensive sedimentological study of the glauconitic sandstone (Mannville Group) of Southern Alberta has shed light on the reservoir complexities and sandbody geometry of this important hydrocarbon-producing formation. The study includes most of the glauconitic pools from Countess to Rockford, which occur within a pronounced southeast-northwest trending paleovalley, incised into regional Ostracod beds.

Both high permeability glauconitic and younger, low permeability Upper Mannville channels followed the same valley. Where directly overlain by an Upper Mannville channel, the glauconitic was usually truncated or completely removed by erosion. This resulted in isolated pods of glauconitic sandstone, which form ideal stratigraphic traps.

Sedimentological and petrographic analysis of glauconitic and Upper Mannville sandstones has shown that they can be differentiated on the basis of texture, sedimentary structures, and mineral composition.

With the use of 3-D seismic, glauconitic sandstones and cross cutting Upper Mannville channels can be accurately mapped. Seismic surveys should be confined to the width of the paleovalley that can be identified on well logs by the absence of region ostracod beds. The integrated approach of using a sound sedimentological model coupled with 3-D seismic has led to a highly successful drilling program throughout the study area since 1989.

Marine carbonate sequences from foreland areas

STEVEN L. DOROBK

Abstrak (Abstract)

Thick wedges of siliciclastic sediment that characterize the proximal parts of foreland basins are typically used to decipher the tectonic evolution of these basins. Marine carbonate strata, however, are more common in many foreland basins than is generally expected and may provide a better record of relative sea level change than siliciclastic strata. In terms of their paleogeographic setting, carbonate facies may develop in the proximal foredeep on a variety of topographic highs, in the distal foreland area far from terrigenous influx, or across the entire foreland basin during tectonically quiescent stages of basin development. Thus, deformation patterns and differential subsidence across foreland areas dramatically affect carbonate platform morphology, facies patterns, and stratigraphic development.

Synorogenic foreland carbonate platforms typically have ramp profiles that mimic the flexural profile produced by tectonic loading. During active convergence and cratonward migration of an orogenic wedge, the flexural profile also migrates cratonward and synorogenic carbonate platforms typically onlap/backstep cratonward. The cratonward limit of onlap/backstepping is controlled largely by the rigidity of the foreland plate and eustatic sea level fluctuations during convergence. Basinward parts of some foreland carbonate platforms may be drowned (*sensu stricto*) during active convergence, especially if the underlying lithosphere has low rigidity, if the orogenic wedge advances rapidly, or if an eustatic sea level rise occurs at the same time as migration of the flexural profile. True flexural drowning might occur most often when thermally immature lithosphere is loaded by an orogenic wedge.

In some foreland areas, complex patterns of synorogenic differential subsidence affect carbonate deposition hundreds of kilometers cratonward of the proximal foredeep. These patterns of differential subsidence reflect the response of preexisting basement structures across the foreland to tectonic loading along the plate margin and are not easily explained by

simple flexural models. Quantitative subsidence analyses from these foreland areas suggest that differential subsidence in the distal foreland is temporally related to tectonic loading along the continental margin, but cratonward limits of the differential subsidence are beyond reasonable limits of flexurally produced subsidence. In addition, patterns of differential subsidence in the distal foreland do not have "normal" flexural wavelengths, amplitudes, or orientations with respect to the orogenic wedge and alternative tectonic models are necessary to explain the differential subsidence.

During periods of relative tectonic quiescence, when the foreland basin is near isostatic equilibrium, carbonate units may prograde concentrically from all sides of the basin. Tectonic subsidence may be essentially non-existent and accommodation is generated by sediment loading and eustatic sea level rise. Over time, the basin depocenter typically shifts cratonward, away from remnants of the former orogenic wedge. Cratonward migration of the depocenter probably reflects isostatic rebound of the former orogenic wedge as it is eroded. Sequence geometries and stacking patterns probably are controlled largely by eustatic fluctuations. Large lateral shifts in facies tracts occur because of the low depositional gradients and very low subsidence rates across the foreland. Platform profiles have very low dips and progradation rates of shoal water facies are high. Lowstand facies may have not been deposited because all available accommodation is filled with highstand carbonates that rapidly prograde or aggrade across the entire basin.

In contrast, some postorogenic foreland carbonate platforms may develop on high relief, fault-bounded uplifts that formed during previous stages of active convergence along the plate margin. If vertical displacement along the boundary faults of these uplifts is great enough, synorogenic siliciclastic sediments cannot completely fill adjacent depocenters. During subsequent postorogenic stages of basin evolution, these foreland uplifts act as pedestals for carbonate platform development. In addition, the boundary faults of the foreland uplifts may be reactivated long after active convergence and may localize later platform margins.

Fieldtrip to Cameron Highlands – Pos Blau

23–25 July 1993

Structural Geology & Tectonic Working Group

The Society's Tectonic & Structural Working Group successfully organized a 3-day fieldtrip to Cameron Highlands-Pos Blau from 23rd to 25th July 1993. The trip, led by Dr. H.D. Tjia and Mustaffa Kamal Shuib was to study and examine the structures and lithologies along the Bentong suture zone exposed along a new dirt track linking Cameron Highlands to Gua Musang.

At about 5.00 pm 23rd July a convey of three 4WDs reached Pos Brook Rest House. The rest house, managed by JHEOA, although basic, equipped with 4 rooms, a kitchen and a toilet, managed to accommodate all 15 participants comfortably. On the evening immediately after setting down, some of the participants, led by Dr. Ahmad Tajuddin were kept busy preparing meals for the group while some of us walked to the nearest outcrop 0.5 km away to examine an "igneous injection complex". By 8.00 pm dinner was served – compliments to the chefs!!

The 2nd day was devoted to seeing the geology along the dirt track. Dr. H.D. Tjia joined the group at Air Panas Sg. Bor. Although time was limited, the participants were able to examine, study and discuss the structural styles, and lithologies that characterized the Bentong suture along the dirt track.

On the way back to Kuala Lumpur on the 3rd day, a brief stop at the vegetable market near Brinchang was very much welcomed by the participants.

The working group would like to thank the Society for the support and En. Ahmad Nawi of JHEOA for accommodation and preparing food during our stay at Pos Brook.

Mustaffa Kamal Shuib

Jul–Aug 1993

Fieldtrip to Jenderak and Kenyir

13–15 August 1993

**Jointly organised by Economic Geology & Stratigraphy/Sedimentology
Working Groups**

After an early start on the morning of 13th August 1993 and a 2½-hour journey from K.L. in a 4WD and van, the 14 participants arrived at Kuala Krau to meet up with Michael Lau of Setia Barite Mine Sdn. Bhd. A further ½-hour journey was needed to reach the current mining area of Setia Barite Mine at Jenderak. The stratiform NW-SE trending bedded barite was overlain by carbonaceous mudstone and sandstone and underlain by andesite and tuff, all dipping about 50°E. The barite deposit has been offset by at least 3 prominent faults.

After spending about 2 hours at the mine, the participants were then treated to lunch at Kuala Krau by Setia Barite Mine Sdn. Bhd.

Next it was a long, long drive to Tasik Kenyir. After picking up the prepared dinner at Kuala Berang, the 2 vehicles arrived at Tasik Kenyir around 7 pm. The boat was there but not the boatman! As darkness set in, delicate discussions and negotiations were made and finally at 9 pm another boatman agreed to take us to our destination – Mahathir Island.

Dinner of chicken curry was served on the boat. The 3-hour boatripe in total darkness was quite an experience as the drowned branches and trunks of trees were sometimes only just 10 feet away from the boat! However the boatman was able to navigate us safely to our destination. Arriving around midnight, everyone looked for his or her corner on the floating platform off Mahathir Island and not too long afterwards the snoring competition got on its way.

When it was light the next morning, when the surroundings were revealed, it showed how precise the boatman had been in his navigation in total darkness. Mahathir Island turned out to be a small island with a staircase leading all the way up to a spectacular bungalow at its summit.

Southerly, the workings on the northern slopes of the former Tengku Paduka Mine could be seen in the morning, misty light in the adjacent island. A short ½-hour boatripe took us to the Natplex Barite Mine, however, the climb up the steep slope to the present mine workings really sapped everyone's energy. The bedded barite occur in slate. Stratigraphically lower are the metachert while overlying the slate are mudstone and sandstone.

Fieldtrip leader, Dr. E.B. Yeap, showed the varieties of barite present including nodular barite. Some fishing enthusiasts, were taken by boat to try their luck at some fishing grounds, however, the fish were not hungry yet that morning.

Lunch was at the 'floating restaurant' of Natplex Mining Sdn. Bhd. After lunch the boat headed for the limestone outcrops of Bukit Biwah and Bukit Taat, the Stratigraphy/Sedimentology part of the trip.

The boat was able to get close to some of the precipitous outcrops, rising up vertically from the lake however, those further away had to be reached by swimming of course! That wet part was ably led by Stratigraphy/Sedimentology Fieldtrip Leader, Dr. Azhar. The boat was able to drop anchor at a section of Bukit Taat and, all present had a field day collecting white, grey or black limestone abundant with fossils of algae, foraminifera and corals.

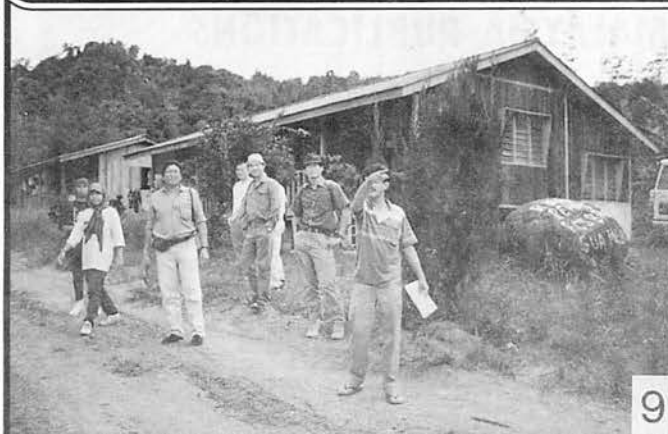
It was another night at the platform off Mahathir's Island. The participants spent the evening swimming, fishing or gazing at the spectacular sunset while Chief Cook, Dr. Ahmad, was busy cooking dinner. Next morning it was all the way back by boat and then the vehicles. Being the durian season, it was obvious there was a durian feast at one of the roadside stalls. For those who have not seen Kenyir Dam, there was a round trip there before heading full steam or rather trottle back to Kuala Lumpur!

G.H. Teh

Fieldtrip to Cameron Highlands - Pos Blau



Fieldtrip to Cameron Highlands - Pos Blau



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GEOLOGICAL SOCIETY OF MALAYSIA PUBLICATIONS

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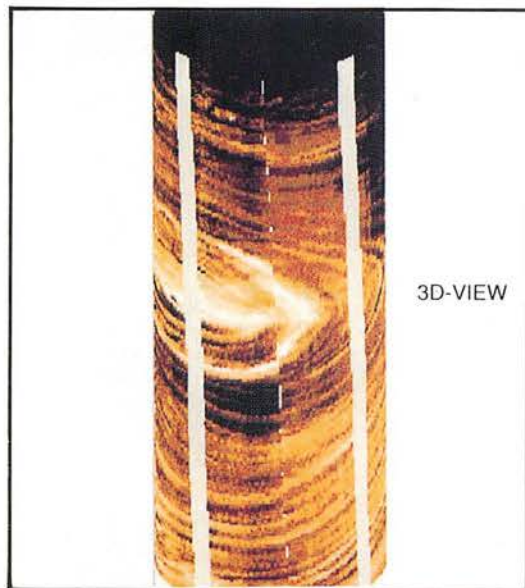
Fullbore Micro Imager*

Formation imaging using microelectrical arrays has benefited the oil industry since its introduction in the mid-80s. The FMI*, Fullbore Formation MicroImager tool, is the latest-generation electrical imaging device. It belongs to the family of imaging services provided by the MAXIS 500* system with its digital telemetry capability.

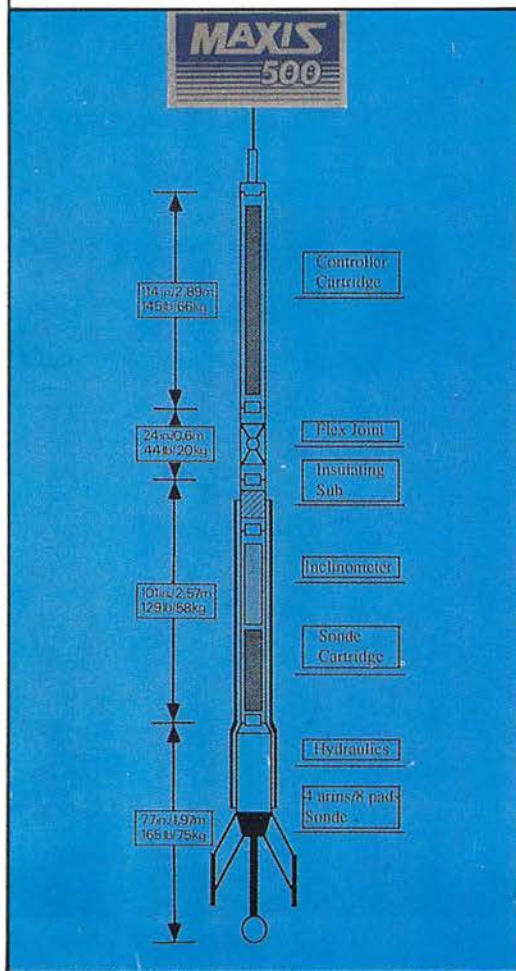
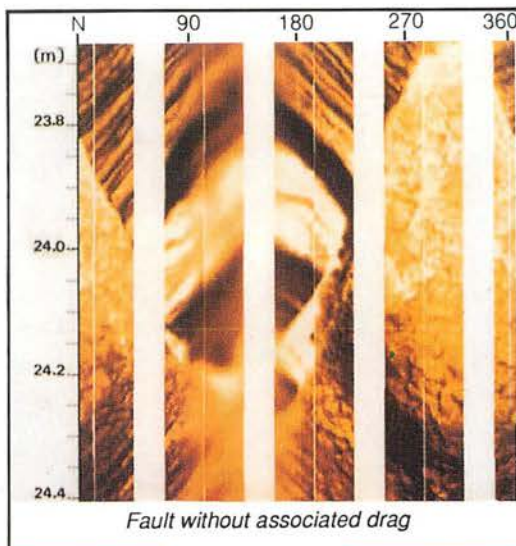
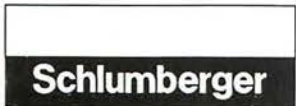
The FMI log, in conductive muds, provides electrical images almost insensitive to borehole conditions and offers quantitative information, in particular for analysis of fractures.

The FMI tool combines high-resolution measurements with almost fullbore coverage in standard diameter boreholes, thus assuring that virtually no features are missed along the borehole wall. Fully processed images and dip data are provided in real time on the MAXIS 500 imaging system.

The tool's multiple logging modes allow wellsite customization of results to satisfy client needs without compromising efficiency.



"Bullseye" structure



Fieldtrip to Jenderak and Kenyir



Fieldtrip to Jenderak and Kenyir



Fieldtrip to Jenderak and Kenyir



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Fieldtrip to Cameron Highlands – Pos Blau

No.	Caption	No.	Caption
1.	A group photo at the Hot Spring near Sg. Bor.	10.	Participants welcoming fieldtrip leader, H.D. Tjia.
2.	Stopping at the outcrop of huge sandstone blocks in olistostrome.	11.	Lunchtime.
3.	It is tough getting a sample of the sandstone olistolith.	12.	Discussions after lunch.
4.	An eager search for plant fossils.	13.	H.D. Tjia indicating on the map the location of the serpentinite lens.
5.	Discussions on the complexly folded outcrop near Sg. Cenderoh.	14.	Participants studying the serpentinite outcrop.
6.	Help yourself to dinner.	15.	H.D. Tjia showing the schistosed serpentinite lens.
7.	Time for breakfast.	16.	Shopping for fresh fruits and vegetables at Brincang (on the way back).
8.	A group photo outside Post Brooks Rest House.		
9.	Mustaffa indicating the first outcrop is only 500 m from the Rest House.		

Fieldtrip to Jenderak and Kenyir

No.	Caption	No.	Caption
1.	Breakfast at a stall after the tunnel at Genting.	13.	Participants studying the structure of the country rock.
2.	Michael Lau briefing the participants on the Setia Barite Mine of Jenderak.	14.	Fieldtrip leader, E.B. Yeap showing the barite mineralization at Natplex Barite Mine.
3.	Participants taking a look at the barite mineralization.	15.	Lunch on the floating restaurant.
4.	Michael Lau elaborating on the rock types in the mine.	16.	The fishermen are back with their catch.
5.	Down to the deepest portion of the mine.	17.	Sampling the limestone outcrop at Bukit Biwah from the boat.
6.	A closer look at the barite vein at the southern part of the pit.	18.	The more enthusiastic participants wade out to study the outcrops.
7.	Lunch at Kuala Krau hosted by Setia Barite Sdn. Bhd.	19.	Fieldtrip leader Azhar Hj. Hussin with samples from the more distant outcrops.
8.	Waiting in the dark at Kenyir Jetty for the boatmen.	20.	The boat docking at Bukit Taat.
9.	All systems go on the substitute boat.	21.	"Do you see that? It's full of fossils!"
10.	Dinner at 9.30 pm on the moving boat.	22.	Dinner at Mahathir Island.
11.	Rise and shine, the morning is fine.	23.	Tired and sad to be on the way back.
12.	A helping hand from boat to shore.	24.	A group photo back at Kenyir Jetty.
		25.	A durian feast on the way back.

**Check Presentation to Geological Society of Malaysia
Donation of RM20,000.00 — for participation in
international convention
28 July 1993**

**Speech by Mr. Fateh Chand, President
Geological Society of Malaysia**

Pengerusi Majlis, Encik Zain Yusof and Dr. Roger Birch of Shell Malaysia,
Ladies and Gentlemen,

Next year, as you all are well aware, the Geological Society of Malaysia is cohosting with the American Association of Petroleum Geologists an International Convention to be held in August 1994 in Kuala Lumpur. This is a very important event for the geologists particularly those involved in the petroleum industry. The Society is represented by Dr. Khalid Ngah of PRSS, formerly PRI, who is the general chairman of the organising committee. Some 1,500 participants are expected from all over the world although the bulk of them will be from U.S.A.

To assist local geologists and young geoscientists to participate in this convention the Shell Companies of Malaysia are donating RM20,000.00. On behalf of the Society I like to thank Shell Malaysia for their understanding and kind gesture. I also wish to add that Shell has been a strong supporter of the Geological Society of Malaysia in the past. They have been regularly contributing towards the successful hosting of the Society's annual petroleum geology seminars. We hope this understanding and cooperation will continue in the years to come.

I also wish to take this opportunity to inform you all that Petronas has also made a commitment by agreeing to host a dinner and sponsor a cultural show during the International Convention.

Once again I wish to thank Shell Malaysia for this donation.

SHELL Check Presentation



No.

Caption

1. GSM President, Fateh Chand, thanking SHELL for the contribution.
2. En. Zain Yusuf, SHELL Director of Corporate Affairs, with his speech.
3. The check presentation.
- 4 & 5. The audience at the presentation.

**Speech by Encik Zain Yusuf,
Executive Director, Director of Corporate Affairs,
Shell Companies in Malaysia**

Mr. Chairman, Saudara Pengerusi Majlis Dr. Ahmad Tajuddin;
Mr. Fateh Chand, President of the Geological Society of Malaysia
and also Deputy Director General of Geological Survey Department;
Dr. Khalid Ngah, Deputy Director Upstream, Petronas Research & Scientific Services Sdn. Bhd.;
Members of the Geological Society Council;
Members of the press;
Ladies and gentlemen.

I am highly honoured to be given this opportunity to say a few words at this gathering of distinguished academicians and guests. Your objectives and activities will no doubt play a key contributing role in achieving a major target of Vision 2020, which is "the establishment of a Society that is not only a consumer of technology but also a contributor to the scientific and technological civilisation of the future."

The Geological Society of Malaysia facilitates the exchange of scientific and technical information on a subject fundamental to our business – exploration for and production of petroleum. For all these reasons, we are naturally happy to be associated with the Society.

Over the years since the 70s, the exploration strike rate has made some good progress. This improved situation is due to better information about subsurface structures obtained through advances in many areas of geochemistry, geophysics and petrophysics coupled with enormous increase in computing power. New reserves of hydrocarbons located in geologically complex areas are found and economically exploited thanks to technological breakthroughs, such as 3D Seismic, in oil exploration and production. This rapid advancement in technology combined with professional research have enabled us in Malaysia to economically produce such reserves with attention to the surrounding environment.

Shell companies in Malaysia look forward to playing a role in facilitation the exchange of information on the latest developments in the exploration and development of hydrocarbon resources through seminars and publications. In this respect, we look forward to next year's grand event – The American Association of Petroleum Geologists International Conference and Exhibition to be held in Kuala Lumpur. Certainly, the geological fraternity in general and the oil business in particular are going to benefit from the conference and exhibition.

On behalf of Shell Companies in Malaysia, I would like to congratulate the Society for successfully bringing the conference to Malaysia. We are honoured to be able to play a part in sponsoring Malaysian participants to the conference and I take this opportunity to wish the conference every success. Thank you.

BERITA-BERITA PERSATUAN News of the Society

KEAHLIAN (Membership)

The following applications for membership were approved:

Full Members

1. Mohd. Zain Hj Yusuf
185, Jalan Laksamana, Taman Dawani,
81400 Senai, Johor
2. Ahmad Hj Abas
Lot 2117, Jln Lutong-Kuala Baram, 98100
Lutong, Sarawak
3. Preamakanthan A/L Kanapathy
409, Block F, Lily Apartments, Taman
Mayang Jaya, SS26/10, 47301 Petaling
Jaya, Selangor
4. Umar Hamzah
13617, Taman Sri Antan, Kajang, Selangor

Student Members

1. Lee Choon Lian
Jabatan Geologi, Universiti Malaya, 59100
Kuala Lumpur
2. Mohamad Tarmizi Mohamad Zulkifley
Jabatan Geologi, Universiti Malaya, 59100
Kuala Lumpur
3. Nor Zaini Karim
Jabatan Geologi, Universiti Malaya, 59100
Kuala Lumpur

—♦—♦—♦—♦—♦—♦—

PERTAMBAHAN BAHARU PERPUSTAKAAN (New Library Additions)

The Society has received the following publications:

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. AGID News, No. 72/73, 1993 2. Forum on Urban Geology and Geotechnical Engineering in Construction, 1 July 1993, Petaling Jaya 3. Commonwealth Science Council Newsletter, March-April, 1993 4. Annales Academiæ Scientiarum Fennicæ, Series A, No. 157, 1993 5. AAPG Explorer, June, July 1993 6. Bibliography, Geological Bulletin of Turkey, 1947-1990, Vol. 1-33, 1992 7. International Ankara Marble Symposium 192: abstract, November 18-20, 1992 | <ol style="list-style-type: none"> 8. Abstracts of the Geological Congress of Turkey, 1992 & 1993 9. Bulletin of the Central Geological Survey, No. 8, 1992 10. Manilla-Narrobri, 1:250,000: Metallogenic map SH/56-9, SH/55-12 11. Chronique de la Recherche Minière, No. 510, 1993 12. Bulletin Centres Research, Explor-Prod. Elf Aquitaine Vol. 17, no. 1, 1993 13. IMM Bulletin No. 1012, 1993 14. Statistics of Mining Industry, 1991 15. AAPG Bull, Vol 77/6, 1993 |
|---|---|

16. *Journal of Geosciences*, Osaka City University, Vol. 36, 1993
17. *Memoirs of the Faculty of Science*, Ehime University, Vol. 1, 1992
18. *The University of Kansas, Palaeontological Contributions*, No. 3, 1993
19. *US Geological Survey Yearbook Fiscal Year 1992*
20. *Bulletin of the Geological Survey of Japan*, Vol. 44, Nos. 1-4, 1993
21. *Geological Bulletin of Turkey*, Vol. 34, No. 2, 1991 & Vol. 35, Nos. 1&2, 1992
22. *Natural History Research*, Vol. 2, No. 2, 1993
23. *Journal of the Natural History Museum & Institute, Chiba*, Vol. 2, No. 2, 1993
24. *Bulletin of the American Museum of Natural History*, No. 215, 1993
25. *Oklahoma Geology Notes*, Vol. 53, Nos 1-3, 1993
26. *Oklahoma Geology Survey Bulletin* 145, 1992
27. *Seatrad Bulletin*, Vol. XIV, No 1, 1993
28. *US Geological Survey Bulletin*, 1992:1966, 2041, 1787-EE, 1787-CC, 1839-K, 2032-A, 1683-D, 1787-FF, 2012, 1787-GG, 1787-BB, 1968
29. *US Geological Survey Bulletin*, 1993:2035, 1808-O, 1917-L, 2019, 1842-D
30. *USGS Prof. Paper 1992: 1408-F (Text & Plates), 1551-F, 798-D, 1416-C, 1407-C, 1506-D, 1404-G (Text & Plates, 1523*
31. *USGS Circular*, 1992: 1092
32. *Memoires pour servir a l'Explication des Cartes Geologiques et Minières de la Belgique*, Nos. 34 & 35, 1993



BERITA-BERITA LAIN

Other News

Computer plotting programmes for orientation data

The personal computer programme "QUICKPLOT: A MICROCOMPUTER-BASED PROGRAM FOR PROCESSING OF ORIENTATION DATA by D.A. Everdingen, J.A.M. Van Gool & R.L.M. Vissers" is described in *Computers & Geosciences*, Vol. 18, No. 2/3, pp 183-287, 1992. The authors state: "Many computer programs have been produced to plot and analyze orientation data in the earth sciences. Generally, such programs have been written to satisfy specific needs and most require specialized input data format and limitations have been put on the style or quality of the output. Quickplot was written as a general-purpose, menu-driven program which combines the capabilities of a number of previously published programs. The capabilities of the program include reading data in several formats; plotting, contouring, and rotating the data; combining data files and plotting stereographic projections and modified Flinn and triangular fabric diagrams. In addition, several statistical tests may be performed, including Eigen analysis, Fisher test of significance and a uniformity test". QuickPlot was written by J. van Gool and D. van Everdingen at the Memorial University of Newfoundland (January-August 1990). The program evolved from FABRIC, a program written by R. Vissers at the University of Utrecht in the Netherlands.

The included files are:

- QUICKPLOT.EXE – self-extracting archive which contains:
- QP.EXE – the QuickPlot program
- QPU.EXE – Utilities program for use in running QP in batch mode

- QP.ICO – MS-Windows icon for QP
- QPU.ICO – MS-Windows icon for QPU
- QP.TXT – manual for QuickPlot
- SAMPLE.DAT – sample data file (dip-Azimuth Dip format, two columns)
- ROSE.EXE – a rose diagram plotting program

The following brief explanation is abstracted from the QP.TXT file which contains the Quickplot Manual, Version 1.0 and has full details of procedure with additional comments in [brackets] by the present author.

"QuickPlot is a program for plotting directional data. It accepts data in various formats and plots, contours or rotates the data on a lower hemisphere equal area projection. The plot may be saved to a file for later printing through a program like Lotus (R) PGRAPH (part of the Lotus 1-2-3 software package) or one may make a screen dump to the printer. Plots saved to a file can be edited using either Lotus (R) Freelance or any other graphics program that can import .PIC files. This is a graphics program and thus requires a graphics card to be present. The program will run off a floppy diskette [rather slow] or a hard drive [much quicker], on an IBM PC, PC-XT, PC-AT or 100% compatibles. It should be noted here that while the program displays the graphics only if a graphics card is present, it will produce Lotus (R) PGRAPH compatible files without the graphics card present, but ONLY in batch mode. This program should run on all IBM PC/XT/AT's and 100% compatibles equipped with 640KB memory and a graphics card (graphics cards supported include Hercules, CGA, EGA, VGA).

A Math Coprocessor is not required (but a coprocessor) will significantly speed up those parts of the program that require many calculations, especially the contouring.

The program is compiled with MicroSoft (R) QuickBASIC (v 4.5) and as such requires that the program MSHERC.COM be run before running this program with a Hercules graphics card (this is supplied with the QuickBASIC software). MSHERC.COM is licensed by the MicroSoft Corporation.

DATA FILE FORMAT

The data are to be entered with two numbers to each line of the file. These two numbers may be in one of three formats: Dip-Azimuth and Dip or Dip and Dip-Azimuth or Strike and Dip (following the right hand rule, that is the dip direction always lies to the right of the strike .e.g. 120 34 indicates the plane dips 34 degrees toward 120 degrees (south of east); and may NOT contain characters such as N, S, E, W). Comments or blank lines may be included anywhere in the file as long as they contain NO numbers.

In the interactive mode the program starts with the main menu at the top of the screen. Eight choices are open to you:

1. Input data – load a datafile from disk into the program.
2. Plot data – plot the data using various symbols on the stereo net. (Up to 12 different symbols can be chosen on the same plot. The diameter of the screen plot is fixed.)
3. Contouring – contour the data on the net using traditional or weighted counting methods on a Kalsbeek type counting net. (Various contour patterns are available. Manual or automatic contour intervals may be set)
4. Rotate data – rotate the data on the net about a specified axis.
5. Stats – perform an eigen analysis on the data or apply a Fisher test for dispersion on the sphere or compute a PI girdle to the data set or draw a modified Flinn diagram.

6. Options – set the system defaults for plotting and set the current data directory.
7. DOS – this allows you to access DOS from the program, to perform other tasks before returning to the program.
8. Exit – exits the program back to the operating system (DOS).

All these choices are accessed by either moving the cursor box with the cursor keys and pressing <ENTER> or by pressing the first letter of the menu option. Help on any of these options can be obtained by positioning the cursor box over the item and pressing the F1 key. This help is only available at the main menu and only if the file QP.HLP is present in the same directory or on the same disk as the QuickPlot program.

The rose diagram plotting program (RQSE.EXE) was included at the request of several QuickPlot users. It can plot various rose diagrams to PIC files or by screen dump to an Epson printer. The input data file format is flexible and allows multiple column data files to be read, one of which contains the orientation data (see the help in the program for more details. Disclaimer: this program may be not bugfree, therefore the user assumes all risks for its use.)

The programmes are recommended to all students and professional geologists who need to plot orientation data quickly and accurately with the added bonus of being able to contour precisely the plots in seconds rather than hours. The computer programmes described here are inexpensive as, being in the public domain, are distributed freely; the detailed Quikplot programme listing written in Microsoft QuickBASIC totals 100 pages but the compiled programme, help file, manual and sample data set may be obtained from the authors at Memorial University of Newfoundland and further queries may be addressed to:

Robert B. Tate
 Department of Geology
 University of Malaya
 59100 Kuala Lumpur
 Malaysia

Geology in Europe and Beyond II

Models for Mineral Deposits in Sedimentary Basins

13 and 14 April 1994

BGS Minerals Industry Forum II

15 April 1994

British Geological Survey, Keyworth,
Nottingham, United Kingdom

BGS Short Courses

12 April 1994

Multidataset analysis methods for mineral exploration and deposit modelling

Industrial mineral deposit evaluation
Environmental geochemistry and mine development: monitoring and remediation

International Project Liaison Meetings

12-14 April 1994

The 1994 international conference is the successor to that held at the Kingsley Dunham Centre of the British Geological Survey in April, 1992. Organized by the institution of Mining and Metallurgy, the meeting will be hosted by the British Geological Survey and is associated with the International Union of Geological Sciences (IUGS)/UNESCO Deposit Modelling Program. The conference will further develop the themes addressed at the first meeting, which were focused on the hypothesis that spatial associations of ore deposits are to some extent dictated by the inhomogeneous distribution of elements in the earth's crust. Where ore-forming elements are of low natural abundance (<10 ppm), evaluation of crustal reservoirs related to areas of potential enhanced mineralization will require assessment of the variation in background levels. The conference aims to develop this theme further, though not exclusively, in the broad context of mineral deposits in sedimentary basins, which increasingly require the integration and evaluation of a complex range of concepts and technologies, some of which also relate to exploration models for

oil, gas and coal. This will be exemplified in a special symposium led by a multidisciplinary team concerned with basin evolution models.

Five themes have been identified with examples of topics for consideration:

Theme 1: Ore deposits associated with sedimentary basins, including the sources of metals and fluids, the role of basinal brines and hydrocarbons in metallogenesis and ancient placer deposits

Theme 2: Terranes – comparative metallogeny of the Precambrian, Caledonides, Hercynides and Alpides

Theme 3: Magmatic ore deposits, especially those of mafic-ultramafic association and including genesis of diamonds

Theme 4: Hydrothermal ore deposits associated with volcanics/high-level plutonic rocks and their tectonic controls, including mineralization at mid-oceanic ridges

Theme 5: Strategic mineral inventories

Priority will be given to abstracts related to one of the above topics, but other topics will be considered. Abstracts (300 words) should be submitted by 30 September, 1993. Full papers are required from authors for oral and poster presentations and should be submitted no later than 13 April. Abstracts will be published in *Minerals Industry International* and issued to all registrants. Full papers will be submitted for consideration in the Institution's *Transactions*, subject to normal refereeing procedures. Rapid publication of accepted papers is planned.

Excursions

Visits to areas of metallogenic and exploration interest will be arranged before and/or after the Conference and Forum in line with interest indicated on the Reply Form.

Tour 1: Lake District

Tour 2: Wales

Tour 3: Grampian Highlands

Tour 4: Cheshire Basin

Tour 5: Cornwall

Short Courses

Short courses on "Multidataset analysis methods for mineral exploration and deposit modelling", "Industrial mineral deposit evaluation" and "Environmental geochemistry and mine development: monitoring and remediation" are planned, for Tuesday 12 April. They will be organized by P.M. Green, G.P. Riddler and T.M. Williams at the British Geological Survey, Keyworth. If you wish to attend any of these courses, please indicate on the reply form.

Please reply to P.R. Simpson at BGS Keyworth, Nottingham, United Kingdom with proposed details of your meeting.

Tel: +44 602 363532

Fax: +44 602 363200

BGS Minerals Industry Forum

Chairman: P.J. Cook, Director BGS

Convener: J.A. Plant, Assistant Director,

Minerals and Geochemical Surveys Division, BGS

Coordinators: G.P. Riddler, Group Manager, Mineral, BGS

P.R. Simpson, D.E. Highley and E. Bishop

Panelists will include leaders in various fields within the minerals industry and a representative from the Department of Trade and Industry.

The strategic importance of mineral supply to the UK national economy will be addressed and case histories of metalliferous and industrial mineral exploration and evaluation by the private sector in collaboration with the BGS will be presented; tours of laboratories and other BGS facilities at the Kingsley Dunham Centre will be arranged; space will be provided for exhibitors offering services to the minerals industry. A panel discussion will be held before an invited minerals industry audience to deal, in particular with, regulatory and planning issues.

International Project Liaison Meetings

An open session will be held of the International Union of Geological Sciences/ UNESCO Deposit Modeling Program (DMP). Other international programmes with links to ore deposit modeling are also invited to the Kingsley Dunham Centre, 12-14 April.

WATERLOO '94
Geological Association of Canada
Mineralogical Association of Canada

GAC-MAC Joint Annual Meeting - 16 to 18 May 1994

**REGISTRATION AND
 ACCOMMODATION**

Technical activities will be held on the campus of the University of Waterloo. Lodging and meals will also be available on campus, as well as in nearby hotels and restaurants. Registration forms will accompany the first circular in Fall 1993.

**FIRST CIRCULAR AND CALL
 FOR ABSTRACTS**

The first circular will be sent to GAC and MAC members in September 1993. It will include registration and abstract forms. *The deadline for receipt of abstracts will be 1 December 1993.*

SECOND CIRCULAR

The second (and final) circular will be distributed in February 1994. It will contain reservation forms for on-campus accommodation and the complete technical program. Attendees will receive a copy of the abstract volume upon arrival at the meeting. Copies will be mailed to non-attending GAC and MAC members who have paid the requisite fee with their annual membership.

EXHIBITS

Display space will be available for companies, universities and other organizations. The deadline for requests from exhibitors is 1 February 1994.

SOCIAL EVENTS

Various social events are planned for attendees and their guests, including a welcoming reception, country pub tour, wine-tasting, and tours of local museums.

SYMPOSIA

The Petrology, Mineralogy, and Geochemistry of Alkaline Rocks (Co-ordinators: R.H. Mitchell, N. Eby; MAC). A one- or two-day symposium on the petrology, mineralogy and geochemistry of peralkaline granites, nepheline syenites, carbonatites, kimberlites, lamproites and lamprophyres.

Isotopes in Environmental Geochemistry (Co-ordinators: R.J. Drimmie, S.K. Frappe, L.D. Cecil, R.H. McNutt). This symposium will provide a forum for discussion of new isotopic methods and applications in hydrology, ecology and other aspects of environmental geochemistry.

SPECIAL SESSIONS

The Tectonic Settings of Archean Greenstone Belts (G. Stott, H. Helmstaedt; Precambrian Division GAC)

Terranes, Domains, and Tectonic Assemblages within the Grenville Province: Definitions, Relationships, Models (R.M. Easton, A. Davidson)

Fluid Flow and Ore Deposits (S. Losh; Mineral Deposits Division GAC)

Meteorites and Impacts (S.A. Kissin, J.C. Rucklidge)

The Ocean Drilling Program: Recent Results (I.L. Gibson, M. Salisbury, J. Franklin, L. Mayer, K. Moran)

The Continental Drilling Program: Recent Results (J. Hall, W. Brisbin)

Spectroscopic Applications to Mineralogy (G. Henderson, MAC)

Clays in Industrial Settings (J. Warren)

Sequence Stratigraphy and Biostratigraphy (M. Melchin, D. Long; Paleontology Division GAC)

Techniques for Reconstructing Quaternary Paleoclimates (T.W.D. Edwards, A.V. Morgan; CANQUA)

Applied Structural Geology (W. Schwerdtner, Structural Geology and Tectonics Division GAC)

Stresses in Canada – Geology and Engineering (J. Adams, S. Bell, N. Yassir)

Geology of Urban Centres (P.F. Karrow, O.L. White)

Global Environmental Problems and Solutions: The Canadian Experience (J.B. Percival, D.E. Buckley; Environmental Earth Sciences Division GAC)

Applications of Groundwater Modelling to Groundwater Contamination Problems (E. Sudicky)

Subsurface Contamination in the Energy Resources Industry: Novel Approaches to Remediation (J. Barker)

Earth Sciences Teaching and the Computer (I.L. Gibson)

Hamilton Harbour Remediation: The Role of Environmental Geology (N. Rukavina, J. Coakley; Environmental Earth Sciences Division GAC)

SHORT COURSES

The Environmental Geochemistry of Sulphide Mine Tailings

(Co-ordinators: D.W. Blowes, J.L. Jambor; Participants: W.D. Robertson, E.O. Frind, J. Molson, R.V. Nicholson, C.N. Alpers, D.K. Nordstrom, A. Smith, J.A. Cherry; MAC). The topics covered in this two-day course include: the mineralogy of mine tailings; the physical hydrology and modelling of mine tailings; sulphide oxidation mechanisms – oxygen transport controls, bacterially mediated oxidation; secondary minerals and the limitations on dissolved metal concentrations;

acid neutralization mechanisms; the geochemistry of cyanide in inactive mine tailings.

Alteration and Alteration Processes Associated with Ore-forming

Systems (Co-ordinator: D. Lentz; Participants: G. Anderson, D.M. Burt, I. Hutcheon, E. Froese, N. Susak, A.E. Williams-Jones, C. Leitch, C. Stanley, W.E. Seyfried Jr., W.D. Goodfellow, M. Reed, G. Brimhall, D. Kontak, T. Kwak, T. Barrett, W. MacLean, R. Kerrich, J. Thompson; Mineral Deposits Division GAC). This two-day course includes: high-temperature alteration equilibria; applications of phase equilibria; hydrothermal exchange equilibria; clay mineralogy; oxidation-reduction-sulphidation equilibria; alteration processes and ore deposition; dynamic aspects of mass transfer; application of distribution coefficients and assessment of mineral equilibria; mass balance constraints; Pearce diagrams in analysis of rock alteration; alteration in specific mineralizing environments.

FIELD TRIPS

The Waterloo '94 Field Trip Committee has put together a variety of excursions that capitalize on the superb Precambrian, Paleozoic, Quaternary, Environmental, and Engineering geology that are mostly within a day's drive of Waterloo. Also planned are several "exotic" excursions, including an environmental trip to Germany (under the auspices of UFZ-Leipzig), an examination of the Paleozoic strata of Anticosti Island, and a visit to the Coldwell Alkaline Complex, near Marathon, Ontario. Many of the field trips will complement Symposia and Special Sessions on groundwater and environmental geochemistry, petrology of alkaline rocks, Grenville Province geology, sequence stratigraphy and biostratigraphy, tectonics, and urban geology. Also included is a mineral-collecting excursion to Michigan, a core workshop on pinnacle reef reservoirs in southwestern Ontario, and an introduction to the geology, scenery and wines of the Niagara area.

International Conference on Geoscience in Urban Development (LANDPLAN IV), 11-15 August, 1993, Beijing – Report

The LANDPLAN IV Conference was held in Beijing from the 11th-15th August 1993. It was organised by The Chinese Academy of Sciences, the Economic and Social Commission for Asia and the Pacific, the Ministry of Geology and Mineral Resources of the People's Republic of China, and the National Natural Science Foundation of China, with support from AGID, IAEG and INQUA.

The LANDPLAN IV Conference followed previous similar conferences held in Bangkok (1982), Kuala Lumpur (1984) and Hongkong (1986). For some reason, there appears to be a much longer time lapse before LANDPLAN IV was held in Beijing (1993).

As has always been the main theme or thrust of the LANDPLAN IV series of conferences, LANDPLAN IV again focused on urbanization, and the role of geology in urban development (Urban Geology). A wide spectrum of topics were covered in the Conference, and they include the following:

- i) Instability of large cities (megacities): earthquake, volcanic eruption, landslides and debris flow, subsidence, ground cracking and collapse, water environment problems,
- ii) Problems in reconstruction of megacities: underground space, water supply system, transportation and construction of other infrastructures,
- iii) Engineering geological and geo-environmental investigation for urban planning and construction: mapping, testing and monitoring techniques, evaluation system, microzonation,
- iv) Pollution and hazardous waste disposal in megacities: soil and water pollution, waste disposal, recreation and residence area planning,
- v) Landuse planning in urbanization: the promotion of thematic, user-oriented maps and geodata, tailor-made for the use of planner/decision maker and the establishment of frameworks for regular communication between the geoscience and planning communities.

Some 130 abstracts of papers were contained in the "Abstract Volume" handed out during registration. Unfortunately, the proceedings volume of the Conference containing the full papers were not ready then, so many details of the papers/presentations were not available for reference and discussions. Other than that, the 5-day Conference went on very well, with many lively discussions and comments. Presentations were made on case studies of cities from all over the world, such as: Beijing, Shanghai, Nanjing, Perth, Dhaka, Bandung, Singapore, Norwich, Aachen, Toronto, Lagos, etc., with each city having its own unique set of problems dictated by local geology. One of the highlights of the presentations was by a lady engineer/planner on the city planning of Beijing – its past, present and future development, incorporating not only geology and engineering, but also historical or archeological considerations in view of the rich orient history of Beijing.

A 1-day excursion to the various touristic and historic sites in and around Beijing, including the Great Wall of China, was well participated (see photos).

Tan Boon Kong

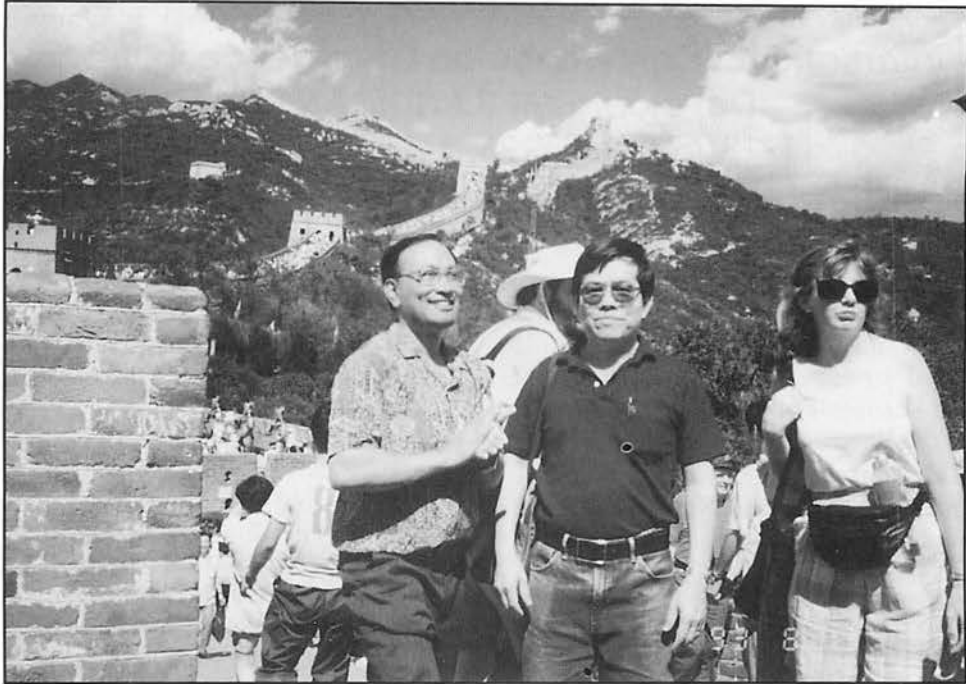


Photo 1. Participants at the one and only Great Wall of China (6,000 km long traversing very hilly and rugged terrain).



Photo 2. It's "Yum-Seng" time at the Conference banquet. Among the favourite dishes for the night, what else, authentic "Peking Duck"!

KALENDAR (CALENDAR)

1993

→→→ October 1993←←←

October 4-9

BASIN INVERSION (International Conference), Oxford, UK. (James G. Buchanan, British Gas Exploration and Production Limited, 100 Thames Valley Park Drive, Reading, Berkshire RG6 IPT, UK. Phone: 0734-353222; telefax: 0734-353484; telex: 846231)

October 10-15

INTERNATIONAL ASSOCIATION FOR MATHEMATICAL GEOLOGY (Silver Anniversary Meeting), Prague, Czechoslovakia. (John C. Davis, Kansas Geological Survey, University of Kansas, Lawrence, KS 66047, USA. Phone: (913) 864-3955; telefax: (913) 864-5317; E-mail: john_davis.moore_@msmail.kgs.ukans.edu. Europe, Africa, and Asia: Jan Harff, Institute for Baltic Sea Research, Seestr. 15, 0-2530 Warnemuende, Germany. Phone: 49 381 58 261; telefax: 49 381 58.336; E-mail: harff@geologie.io-warnemuende.dbp.de)

October 11-24

INTERGEMS '93 (2nd International Symposium on Precious and Decorative Stones), Prague, Czechoslovakia. Sponsored by Czech and Slovak Geological Services and Museums. (Secretariat INTERGEMS, Malostranske nam. 19, CS-11821 Praha 1, Czechoslovakia. Phone: 535 357; telefax: 533 564)

October 17-20

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (International Meeting), The Hague, The Netherlands. (AAPG, Box 979, Tulsa, OK 74101, USA. Phone: (918) 584-2555; telefax: (918) 584-0469)

October 18-23

NEW DEVELOPMENTS IN GEOTHERMAL MEASUREMENTS IN BOREHOLES (Meeting), Klein Koris, Germany. (Prof. E. Hurtig, GFZ Potsdam, Telegrafenberg A45, 0-1561 Potsdam, Germany. Phone: 49 331 310 347; telefax: 49 331 310 610; E-mail: gth@gfz-postsdam.dbp.de)

October 25-28

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Boston, Massachusetts, USA. (Vanessa George, GSA, P.O. Box 9140, Boulder, CO 80301, USA. Phone: (303) 447-2020)

October 27-28

PALYNOLOGY, CLIMATE AND SEQUENCE STRATIGRAPHY OF THE PLIOCENE, mtg., Baton Rouge, La., by the American Association of Stratigraphic Palynologists. (John Wrenn, Amoco Production Co., Box 3092, Houston, 77253. Phone: 713/556-2297. Fax: 713/584-7468). Deadline for abstracts: Aug. 31.

→→→ November 1993←←←

November 5-21

CIRCUM-PACIFIC AND CIRCUM-ATLANTIC TERRANE, Int'l mtg., Guanajuato, Mexico. (David G. Howell, USGS, MS 902, 345 Middlefield Road, Menlo Park, Calif. 94025. Fax: 415354-3224)

November 15-30

INTERNATIONAL GEOLOGICAL CORRELATION PROGRAMME, mtg., Santiago, Chile. (M. Vergara, Universidad de Chile, Departamento de Geologia y Geofisica, Casilla 13518-Correo 21, Santiago, Chile. Fax: 56-2-6963050)

November 15-30

LOW TEMPERATURE METAMORPHISM: PROCESSES, PRODUCTS AND ECONOMIC SIGNIFICANCE (IGCP Project 294 Thematic Meeting), Santiago, Chile. (Professor M. Vergara, Universidad de Chile, Departamento de geologia y Geofisica, Casilla 13518-Correo 21 Santiago, Chile. Telefax: 56 2-6963050)

1994**Jan 27-28**

DYNAMIC GEOTECHNICAL TESTING, symposium, Reno, Nev. (Dorothy Savini, American Society for Testing and Materials, 1916 Race St., Philadelphia, 19103-1187. Phone: 215/299-5413)

June 5-11

GEOCHRONOLOGY, COSMOCHRONOLOGY AND ISOTOPE GEOLOGY (ICOG-8), mtg., Berkeley, Calif. (Garniss H. Curtis, Institute of Human Origins-Geochronology Center, 2453 Ridge Road, Berkeley, 94709. Phone: 415/845-4003. Fax: 415/845-9453)

June 6-10

EUROPEAN ASSOCIATION OF EXPLORATION GEOPHYSICISTS (56th Annual Meeting and Exhibition), Austria Center, Vienna, Austria. (Evert Van der Gaag, Business Manager, European Association of Exploration Geophysicists, Utrechtseweg 62, NL-3704 HE Zeist, the Netherlands. Phone: (03404) 56997; telefax (03404) 62640; telex:33480)

June 12-15

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS, ann. mtg., Denver. (AAPG, Box 979, Tulsa, Okla. 74101. Phone: 918/584-2555. Fax: 918/584-0469)

July 1-5

HYDROMETALLURGY, int'l mtg., Cambridge, England, by Society of Chemical Industry and Institution of Mining and Metallurgy. (SCI, 14/15 Belgrave Square, London, England SW1X8PS. Phone: 071 235 3681. Fax: 017 823 1698) [December '92]

Aug 21-24

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS. Int'l. mtg., Kuala Lumpur, Malaysia. (AAPG Box 979, Tulsa, Okla. 74101. Phone: 918/584-2555. Fax: 918/584-0469)

1995**Mar 5-8**

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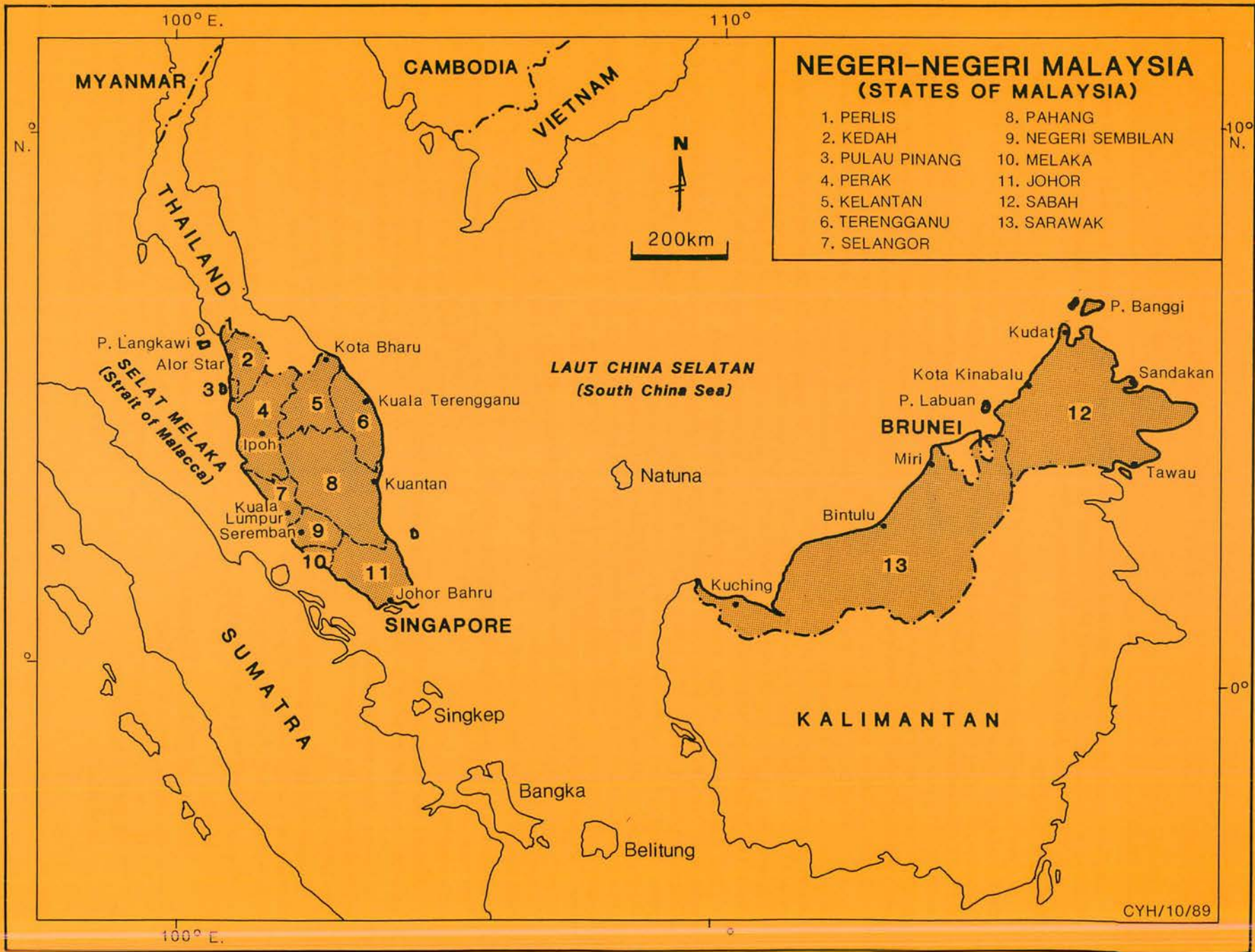
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