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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.

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CATATAN GEOLOGI

Geological Notes

Bukit Berapit fault zone

ZAITON HARUN

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Abstrak: Di tepi lebuh raya Ipoh-Changkat Jering grid 289133 dan 295143, tersingkap jalur granit tersesar di dalam jasad granit profil megahablur. Jalur sesar ini dicirikan oleh milonit dan breksia sesar. Milonit mengandungi kekanta-kekanta asimetri, berjurus hampir timur-barat dan sesar berjurus serupa memotong milonit tersebut sehingga menerbitkan pola jalinan.

Porfiroklas kuarza dan feldspar yang bertindak sebagai butiran yang tahan terhadap canggaan mempamerkan beberapa kriteria yang boleh digunakan untuk menentukan hala pergerakan sesar. Ciri-ciri mikrostruktur yang terpamer itu sesuai ditafsirkan sebagai hasilan metamorfisme fasies syis hijau.

Abstract: A fault zone in megacrystic porphyritic granite has been exposed at Ipoh-Changkat Jering highway grid 289133 and 295143. The faults are characterised by mylonites and fault breccias. The mylonites consist of asymmetric lenses which strike almost east-west and fault planes of the same attitude cut the mylonites in anastomosing manner.

Being resistant to deformation, quartz and feldspar porphyroclasts exhibit several criteria which can be used to determine the sense of shearing movements. Microstructural features exhibited are interpreted as resulting from greenschist facies metamorphism.

INTRODUCTION

Outcrops of sheared granite have been exposed at localities 1 and 2 (Fig. 2) Kuala Kangsar-Changkat Jering highway and at a new road cut which is part of an old road of Kuala Kangsar-Changkat Jering. The outcrops constitute the northern spurs of Bukit Berapit. They consist of moderately indurated megacrystic porphyritic biotite granite and sheared granite. The sheared granite is greenish light grey in colour and is a mylonite. The mylonite foliations strike almost east-west and fault planes of the same attitude cut the mylonite in anastomosing manner (Fig. 1).

The granite is part of the Bintang Range granite (Bignell and Snelling, 1977). Yap (1970, 1971) reported that cataclasite to mylonite, flasered to sheared granite represent brecciation

in granite of the Kuala Kangsar-Taiping area. Zaiton Harun (1992) observed several lineaments which strike NNW-SSE and E-W occur adjacent to, and cut the exposure (Fig. 2).

The purpose of this short note is to describe briefly several small scale structures and microstructural features which were used to determine the sense of movement along the faults, and to determine metamorphic facies resulting from faulting.

SMALL-SCALE STRUCTURES

Several small-scale structures were observed in both mylonite and granite. The sense of movement along faults in granite is often hard to determine. Structures such as pinnate fractures and fault displacements were

used in this case. Pinnate fractures are commonly observed along one edge of the lateral fault wall. The pinnate fractures occur as a row of fine, closely-spaced fine, short fractures with spacings of 2-3 cm which sometimes reach 1-2 cm. The fractures cut the edge of the fault with an acute angle, commonly between 11° to 30° . According to Hancock and Barka (1987) the angle between fractures and fault may reach 45° . A row of the pinnate fractures is only a few cm in length (Fig. 3 and Fig. 4).

A row of left stepping vertical *en echelon* quartz tension gashes strikes WNW. Pinnate fractures or horse tail structure developed along one of the tension gashes. These structures are interpreted as the result of right lateral movement (Fig. 4).

An example of the combination of pinnate fractures along the margin of slip plane and fault displacement criteria are used to determine the sense of movement. A WNW-ESE striking quartz vein was displaced right laterally by a N-S striking fault. The movement is also supported by the occurrence of pinnate fractures which strike north (Fig. 3).

MICROSTRUCTURAL FEATURES

Mylonites of Bukit Berapit fault zone contain asymmetric and symmetric lenses of

feldspar and quartz porphyroclasts. Several microstructural features observed in thin sections are compatible with the criteria described by Simpson and Schmid (1983), Passchier and Simpson (1986) and Ramsay and Huber (1987). These criteria are very useful in determining the sense of movements in shear zones. Only certain features will be highlighted here.

Displaced broken quartz and feldspar porphyroclasts in a ductile matrix are commonly observed in the thin sections of Bukit Berapit mylonites. A slight rotation produced openings within the quartz grains which are later infilled with recrystallized quartz and mica. The sense of displacement along the microfractures is opposite to the overall sense of shear in the rock. In this example the overall sense of shear is sinistral (Fig. 5).

Elongated quartz grain or subgrain shapes in quartz ribbon are oblique to the general foliation (Fig. 6). In a shearing environment the flattening plane of these new grains are approximately perpendicular to the maximum compression direction (Schmid *et al.*, 1981, Simpson and Schmid, 1983, Ramsay and Huber, 1987).

Observation of C- and S-surfaces in the thin sections are compatible to the description



Figure 1. Fault planes cut the Bukit Berapit mylonite in anastomosing manner.

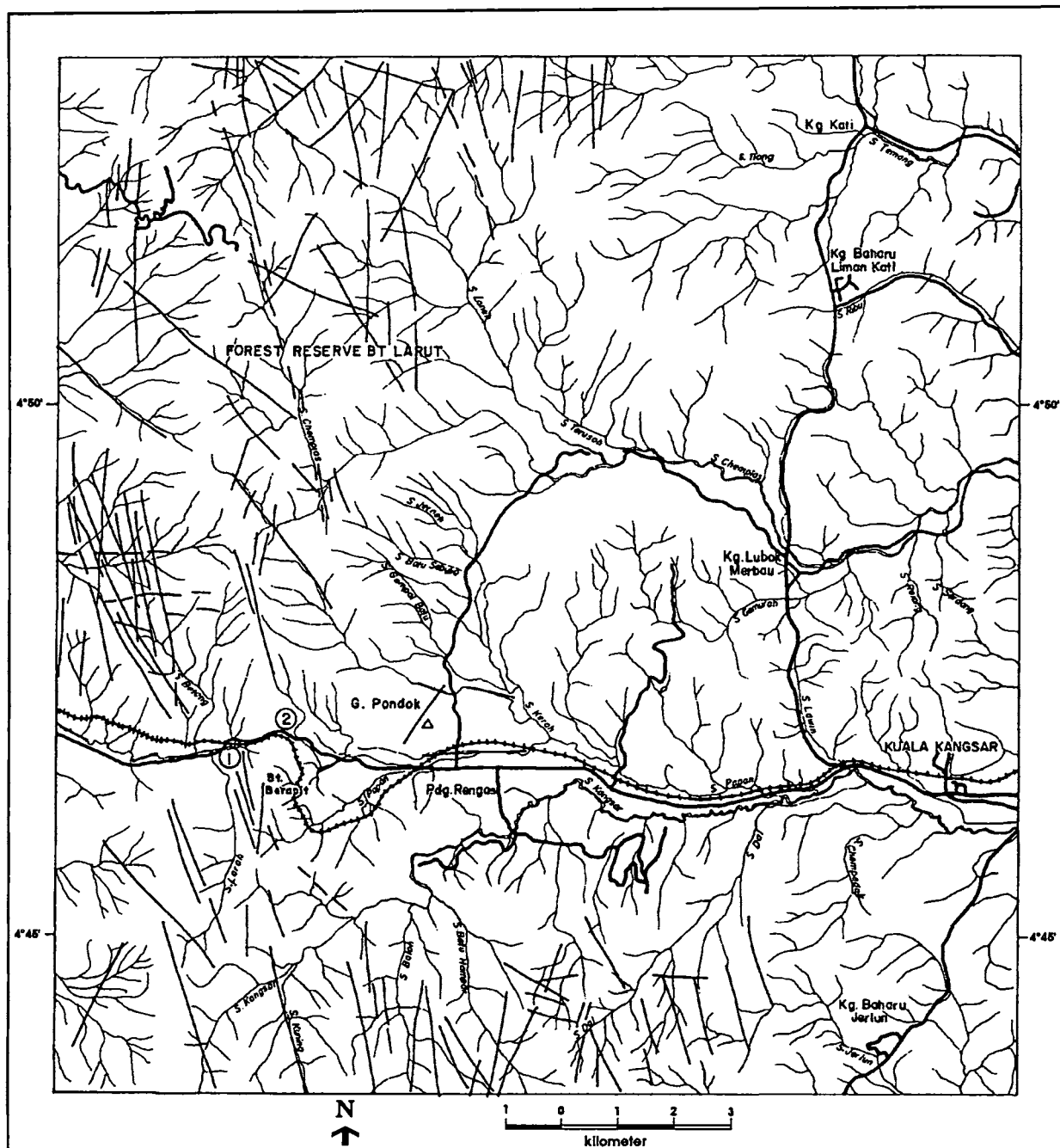


Figure 2. Lineaments of Bukit Berapit area. Location: (1) Bukit Berapit 289133 (2) Bukit Berapit 295143. The map is part of the map of Kuala Kangsar, Sheet 41.

given by Berthe *et al.* (1979) and Simpson and Schmid (1983). Aggregates of quartz ribbon and feldspar represent the S-surfaces whereas C-surfaces are represented by thin layers of recrystallised polymineralic aggregates with a reduced grain size. These S-surfaces are deflected into the C-surfaces, defining the sense of shear as dextral (Fig. 7).

METAMORPHIC FACIES

Granitic mylonites of Bukit Berapit show brittle-ductile microstructural assemblage of deformed quartz and feldspar. Considerable recovery is indicated by polygonal, elongated, recrystallized quartz grains within and at the margins of quartz ribbon. Some feldspar grains have undergone grain size reduction by microcracking and microfaulting (Fig. 7), whereas others show low temperature plasticity in the formation of simple open kink bands (Fig. 8) and recrystallization along microcracks. Influence of water in the metamorphism is probably indicated by considerable replacement of biotite by chlorite.

Mylonites formed under green schist conditions exhibit a reduction in grain size from that of the original rock (Tullis *et al.*, 1982) but often contain residual feldspar porphyroclasts (Simpson, 1985) and in this case contain both residual quartz and feldspar porphyroclasts. Bukit Berapit mylonites contain compatible microstructural features of green schist facies metamorphism as described by Simpson (1985).

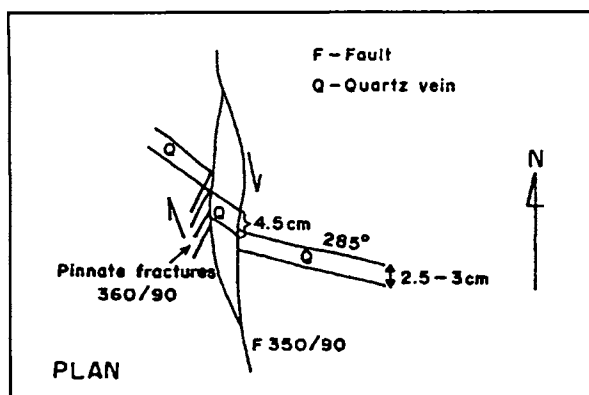


Figure 3. Quartz vein displaced right laterally along fault of 350/90.

CONCLUSIONS

Several structural features of sheared granite and mylonites from the Bukit Berapit fault zone are highlighted. Pinnate fractures, tension gashes and fault displacement are exhibited as typical.

Displaced broken quartz and feldspar grains, the angular relationship between C- and S-surfaces, the angular relationship between elongate quartz grains or subgrain shapes and the foliation are among the microstructural features used in determining the sense of movement within the fault zone.

Kinked and fractured feldspars, ductile deformation of quartz with minor to considerable recovery characterize the mylonites of Bukit Berapit formed under the greenschist facies conditions.

ACKNOWLEDGEMENTS

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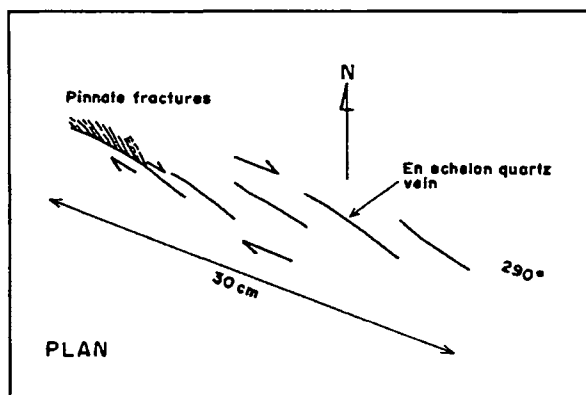


Figure 4. *En echelon* quartz veins and pinnate fractures indicate right lateral movement.

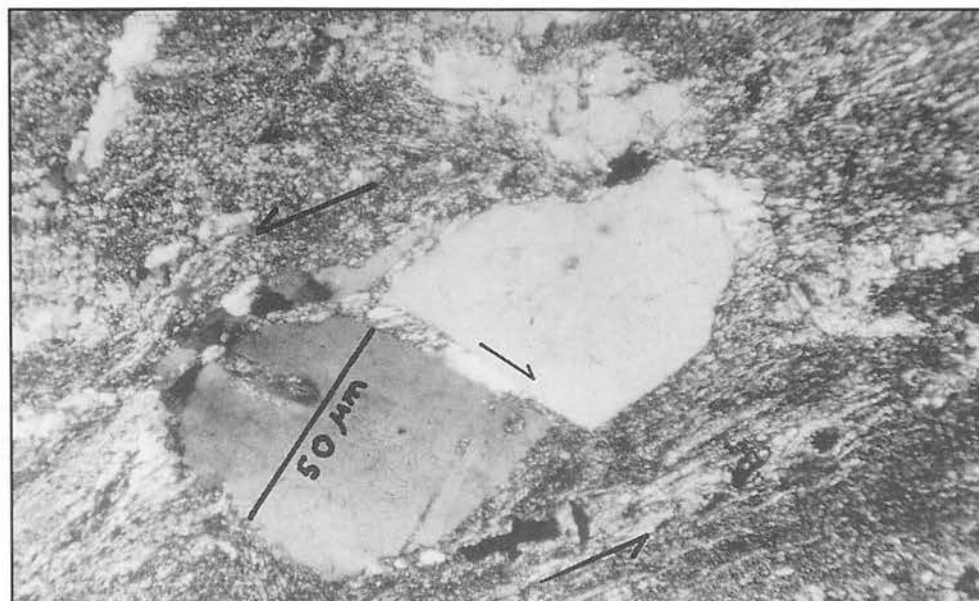


Figure 5. Photomicrograph of displaced broken quartz in mylonite.

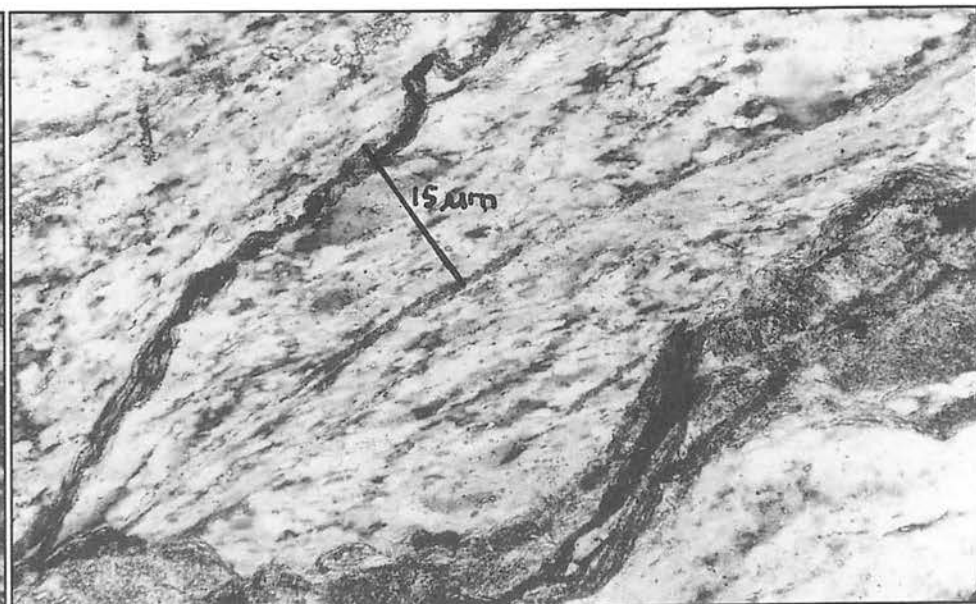


Figure 6. Thin section showing elongated subgrains in quartz ribbon.

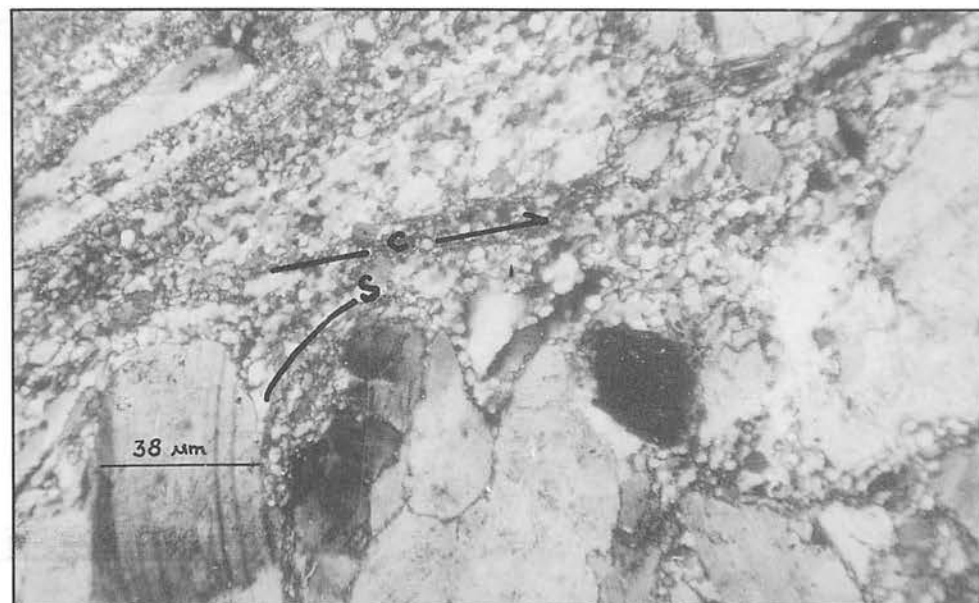


Figure 7. Thin section showing deflected S-surfaces into C-surfaces.

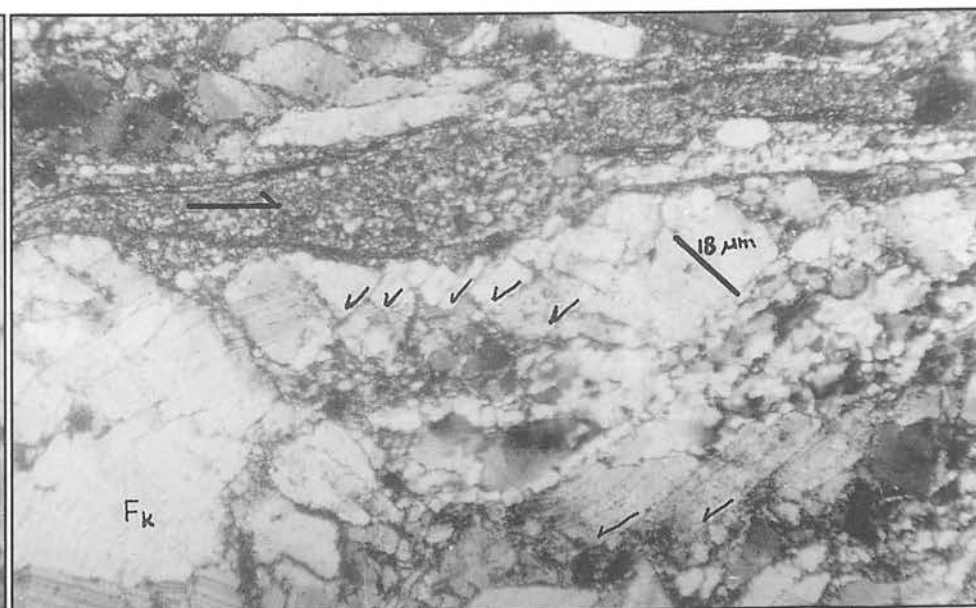


Figure 8. Thin section of kinked feldspar (Fk) and displaced broken feldspar which is illustrated with the analogy to a sheared stack of cards.

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Middle Triassic radiolaria from the Semanggol Formation, northwest Peninsular Malaysia

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Abstract: Thirteen species of radiolaria were retrieved from several outcrops in the north and south Kedah areas. The radiolarian assemblage is composed of *Pseudostylosphaera coccostyla*, *Pseudostylosphaera compacta*, *Pseudostylosphaera magnispinosa*, *Pseudostylosphaera japonica*, *Parasepsagon variabilis*, *Parasepsagon cf. asymmetricus*, *Eptigium manfredi*, *Hozmadia rotunda*, *Acanthosphaera awaensis*, *Triassocampe deweveri*, *Triassocampe* sp., *Yeharaia japonica* and *Cryptostephanidium* sp. This assemblage indicates that the age of the chert unit ranges from Anisian to Ladinian, Middle Triassic. No Permian radiolaria were recovered from the present material.

INTRODUCTION

The Semanggol Formation was originally proposed by Alexander (1959) for the Triassic rocks exposed at the Gunung (Putus) Semanggol in north Perak. Burton (1970) and Courtier (1974) have extended the formation to north and south Kedah. More detailed studies have been carried out by Universiti Kebangsaan Malaysia group (Abdul Rahim Samsudin *et al.*, 1991) and the Geological Survey Malaysia (Burton, 1988; Teoh, 1992). Burton (1973) subdivided the formation into three informal members, which were later called units by Teoh (1992). They are the chert unit, the rhythmite unit and the conglomerate unit.

The rhythmite unit is the most fossiliferous unit. Triassic bivalves were discovered by Kobayashi (1964) and, Burton (1970; 1988). Tamura *et al.* (1975) reported some Anisian *Paraceratites* sp. and Ladinian *Paratrachyceras* sp. and *Arpadites* sp. from the Pokok Sena area.

Radiolarian chert of the Semanggol Formation has been studied by Sashida *et al.* (1992), Sashida *et al.* (1993a), and Metcalfe and Azhar Haji Hussin (1994). They have reported the occurrence of the Permian radiolaria in the chert unit of the Semanggol Formation. Recently, more samples of radiolarian chert were collected from the Semanggol Formation in the north and south Kedah. Most of the samples yielded poorly preserved radiolaria. Some well preserved Middle Triassic radiolaria were retrieved from several chert samples collected from the outcrops in the vicinity of Pokok Sena, and Merbau Pulas areas (Fig. 1).

GEOLOGICAL SETTING

The Semanggol Formation is located in the north Perak, south and north Kedah areas, in the northwest of Peninsular Malaysia. It can be divided into three units based on lithologic association (Teoh, 1992). The oldest unit, the chert unit is composed of thinly bedded chert interbeds with siliceous mudstone layers. The

chert unit forms low undulating ridges. The chert unit is overlain by the rhythmite unit. The rhythmite unit consists of turbiditic sandstone interbeds with mudstone. These sequences were deposited by many episodes of weak turbidity currents. The conglomerate unit consists of very thick conglomerate interbeds with sandstone and mudstone. This unit was deposited in the deep sea fan (Ahmad Jantan *et al.*, 1989). The Semanggol rocks are gently

folded by the post-Triassic tectonic episode.

MATERIAL AND METHOD

More than sixty samples of radiolarian chert were collected from several localities in north and south Kedah. The samples were crushed and treated with 10 percent solution hydrofluoric acid for 24 hours. The samples were washed through 32 micron sieve. The

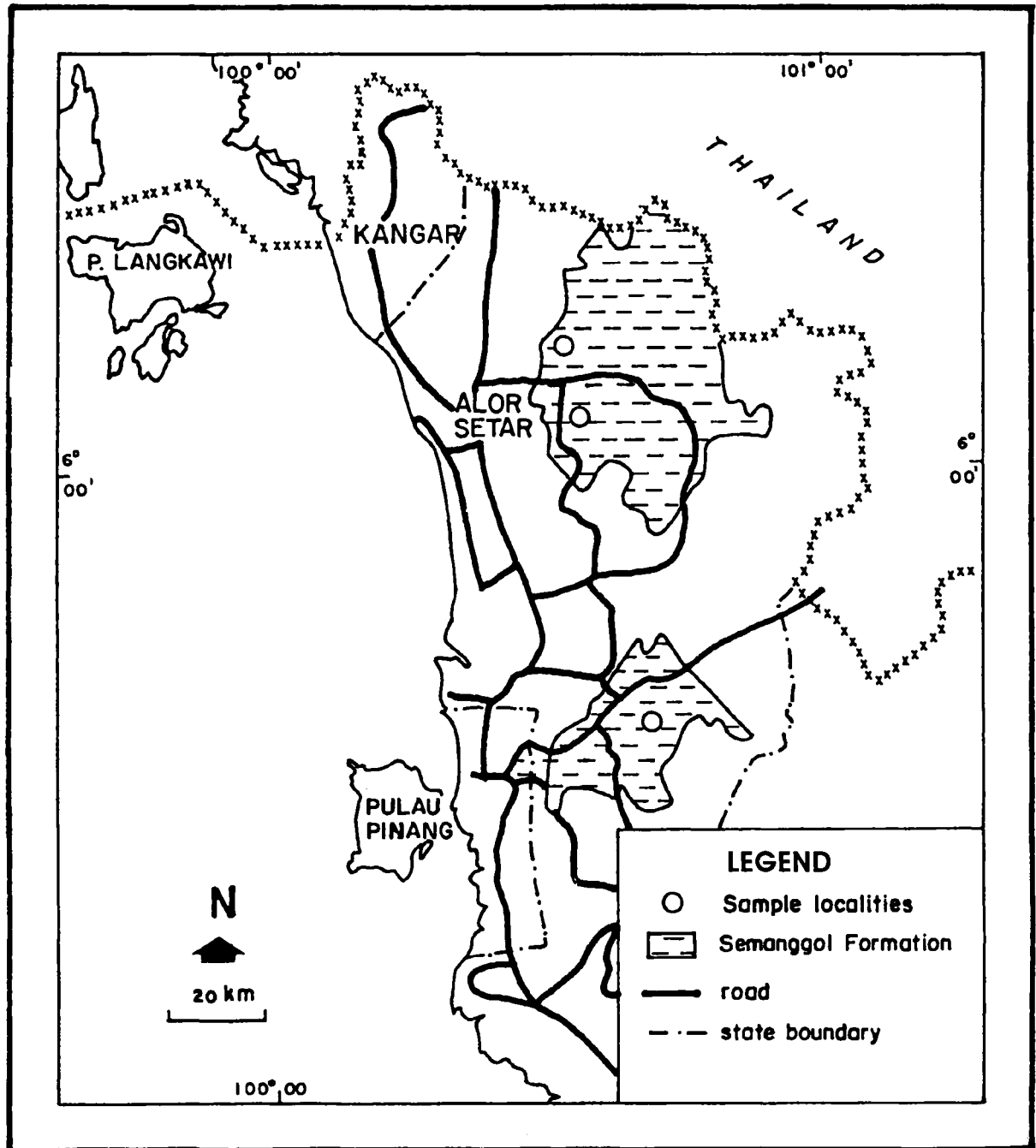


Figure 1. Map showing the sample localities in north and south Kedah.

residues were dried. Radiolaria were examined under a binocular microscope and picked by using a paint brush. The well preserved specimens were photographed by using scanning electron microscope.

RESULT AND DISCUSSION

Only 15 samples yielded well preserved radiolaria. The samples were collected from outcrops at Pokok Pauh, Bukit Tembaga near Pokok Sena (north Kedah) and from an outcrop near Merbau Pulas (south Kedah).

Thirteen species of radiolaria were identified. They are *Pseudostylosphaera coccostyla* (Rust), *Pseudostylosphaera magnispinosa* Yeh, *pseudostylosphaera japonica* (Nakaseko and Nishimura), *pseudostylosphaera compacta* (Nakaseko and Nishimura), *Parasepsagon variabilis* (Nakaseko and Nishimura), *Parasepsagon cf. asymmetricus* (Kozur and Mostler), *Hozmadia rotunda* (Nakaseko and Nishimura), *Eptigium manfredi* Dumitrica, *Acanthosphaera awaensis* (Nakaseko and Nishimura), *Triassocampe deweveri* (Nakaseko and Nishimura), *Triassocampe* sp., *Yeharaia japonica* (Nakaseko and Nishimura), *Cryptostephanidium* sp. (Plate 1) and many more species yet to be identified. Based on the stratigraphic distribution of some selected species proposed by Sashida *et al.* (1993a), the present radiolarian assemblage indicates that the age of the chert unit is Anisian to Ladinian, Middle Triassic. The detailed biozonation will be published elsewhere.

Recently, new discovery of the Permian radiolaria were reported by Sashida *et al.* (1992) and Sashida *et al.* (1993a). They discovered Upper Permian (Guadalupian) radiolarian representative of the *Neoalbaellella ornithoformis* and *Follicucullus monacanthus* Zones from the chert sequence exposed at Bukit Nyan and Bukit Barak, north Kedah. Metcalfe and Azhar Haji Hussin (1994) have extended the age of the Semanggol chert to Early Permian based on their discovery of radiolarian assemblage indicative of *Pseudoalbaellella lomentaria* Zone (Wolfcampian) near Kuala Nerang. They did not report any discovery of Triassic radiolaria. Metcalfe (1990) reported early Karnian conodont from the limestone at

Bukit Barak. This suggests that the age of the Semanggol Formation ranges from Early Permian to early Late Triassic (Metcalfe and Azhar Haji Hussin, 1994). It seems that the age of the Semanggol Formation is partly overlapping with the Kubang Pasu Formation. Where is the contact between the two formations? A detailed observation must be carried out.

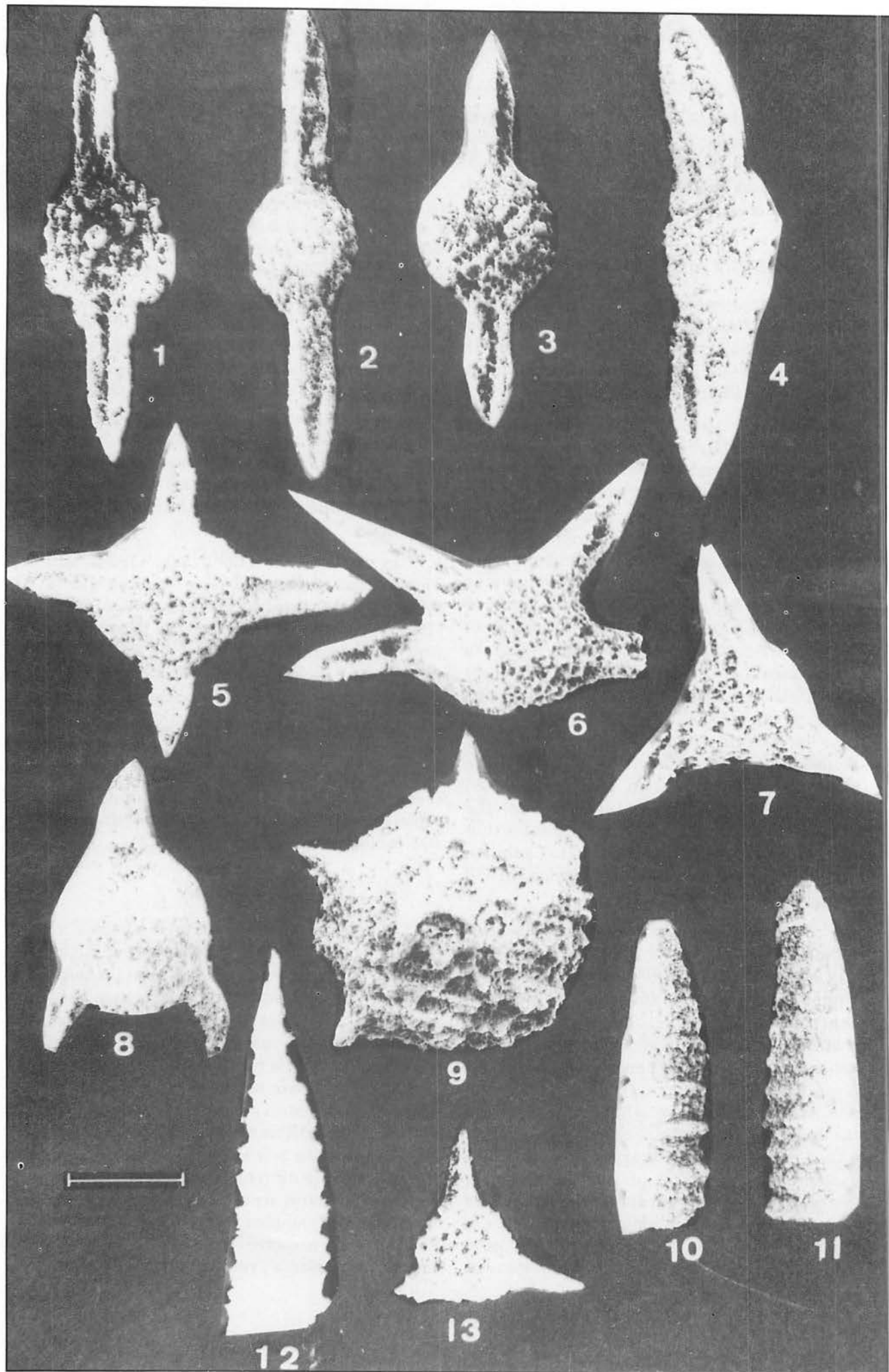
Several chert samples from Bukit Barak were examined. The radiolaria are poorly preserved. Several specimens of *Trissocampe deweveri* were identified. To date I have not discovered any Permian radiolaria from the Semanggol Formation. The chert at Bukit Nyan, which contains the Late Permian radiolaria (Sashida *et al.*, 1992) may represent the base of the Semanggol chert because that chert is very close to the contact with the Kubang Pasu Formation.

In north Kedah Kobayashi (1964) and Tamura *et al.*, (1975) have reported some Middle to Late Triassic bivalves and ammonites. Teoh (1992) reported that the age of the chert unit is Anisian to Ladinian based on the ammonites found near Pokok Sena. They did not find any Permian fossils from the formation.

In south Kedah the chert unit is bounded by the rhythmite unit (Burton, 1988). Burton (1988) reported that the age of the Semanggol chert in the area is Anisian to Ladinian. The radiolarian assemblage of the present study also indicates the same age.

CONCLUSION

The discovery of thirteen species of radiolaria namely *Pseudostylosphaera coccostyla*, *Pseudostylosphaera magnispinosa*, *Pseudostylosphaera japonica*, *Pseudostylosphaera compacta*, *Parasepsagon variabilis*, *Parasepsagon cf. asemmtricus*, *Eptigium manfredi*, *Hozmadia rotunda*, *Acanthosphaera awaensis*, *Triassocampe deweveri*, *Triassocampe* sp., *Yeharaia japonica* and *Cryptostephanidium* sp. from the north and south Kedah indicates that the age of the Semanggol chert may extend up to Anisian-Ladinian, Middle Triassic. The Permian radiolaria are not found in the present material. The samples from Bukit Barak also contains poorly preserved *Triassocampe deweveri* indicative of Middle Triassic age. The chert at



Bukit Nyan that contains Permian radiolaria may either represent the base of the Semanggol Formation or the top of Kubang Pasu Formation. A detailed study of the radiolaria from the Semanggol chert is being carried out. More information will be published soon.

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Manuscript received 14 May, 1994

Plate 1. (Scale bar = 100 μ m except Fig. 2)

- Figure 1. *Pseudostylosphaera coccostyla* (Rust)
 2. *Pseudostylosphaera compacta* (Nakaseko and Nishimura) (Scale bar = 133 μ m)
 3. *Pseudostylosphaera japonica* (Nakaseko and Nishimura)
 4. *Pseudostylosphaera magnispinosa* Yeh.
 5. *Parasepsagon variabilis* (Nakaseko and Nishimura)
 6. *Parasepsagon* cf. *asymmetricus* Kozur and Mostler.
 7. *Eptigium manfredi* Dumitrica
 8. *Hozmadia rotunda* (Nakaseko and Nishimura)
 9. *Acanthosphaera awaensis* (Nakaseko and Nishimura)
 10. *Triassocampe deweveri* (Nakaseko and Nishimura)
 11. *Triassocampe* sp.
 12. *Yeharaia japonica* Nakaseko and Nishimura
 13. *Cryptostephanidium* sp.

Souvenirs For Sale

In Response to requests by members, the Society has now prepared several souvenir items for sale as follows:

	Unit Price (RM)
1. Key Chain (brass with epoxy coating and Society Logo)	6.00
2. Tie Clip (with Society Logo)	7.00
3. Cap (dark blue, with Society Logo)	9.00
4. Hat (dark blue, with Society Logo)	10.00
5. Tie (dark blue with Society Logo)	30.00

Members can purchase/order these souvenir items by contacting:

Anna Lim

Geological Society of Malaysia

c/o Geology Department

University of Malaya

59100 Kuala Lumpur

Fax: (603) 7563900

Tel: (603) 7577036

CATATAN GEOLOGI

Geological Notes

Survey of slope failures for a rural road in Sarawak

TAN BOON KONG
Jabatan Geologi
Universiti Kebangsaan Malaysia
Bangi

Abstract: The cut-slope failures along the roadway from the KJD/Sarikei/Bintangor Junction to the Julau Junction in Sarawak are controlled by structural features in the rock, namely beddings, foliations and faults. The more severe slope failures are caused partly by faults dissecting the rocks, while the numerous localised bench failures are attributed to sliding or toppling of the beds that strike parallel or subparallel to the cut-slope. In view of the weak or soft nature of the shale and sandstone encountered, the more conventional rock support techniques (such as rock bolting, etc.) are inapplicable. However, simple remedial measures such as flattening the slope, providing toe restraint or safety berm are considered adequate.

INTRODUCTION

During the construction of a rural roadway from the KJD/Sarikei/Bintangor Junction to the Julau Junction in Sarawak, a series of cut-slope failures had occurred. A survey of the slope failures was thus undertaken to identify the causes and mechanisms of the failures, and to seek possible remedial measures.

This paper summarises the results of the survey.

GEOLOGIC SETTING

The roadway traverses rocks of the Belaga Formation, which, in accordance with Wolfenden (1960), comprises argillite, slate, rare phyllite, graywacke and graywacke conglomerate, and are of Lower Eocene and Paleocene age. The Belaga Formation is intensely folded, and shows low grade dynamic metamorphism. The rocks are predominantly steeply dipping, and thin quartz veins are common. The study by Thomas (1988) confirmed the intense folding of the Belaga Formation rocks in the Julau area.

The present study also shows the predominantly steeply dipping ($> 70^\circ$) beds of the argillite (shale, siltstone). For the roadway investigated, the predominant rock type is shale, with some sandstone beds being encountered in only a few of the cut-slopes. The predominance of shale along the roadway alignment was also indicated previously in the Site Investigation report by Dynamic Drilling (1986) where the boreholes penetrated mostly shale, mudstone and siltstone.

SLOPE SURVEY

A total of 20 cut-slopes were surveyed. Each cut-slope was surveyed for lithology, grade of weathering, structures (beddings, faults, etc.), and incidence and severity of slope failures. Based on the severity of the slope failures, the slopes are then categorised into the following:

- i) A — severe slope failures
- ii) B — some minor soil slips or localised bench failures only
- iii) C — generally stable (no apparent sign of instability)

The results of the survey are shown in Table 1, and discussed below. Some examples of the slope failures are shown in Figures 3-6.

Lithology

As mentioned previously, the predominant rock type as exposed by the cut-slopes surveyed is shale, which occurs generally as a greenish-grey rock, finely laminated, at the base and central core section of the cut-slope. Upon further weathering, this greenish-grey rock turns red/purple/orange/yellow due to the deposition of iron oxides and hydroxides. This change in colour is distinct and appears in most of the cut-slopes investigated. The shale is mostly soft and fissile, except at CH12700 where it is rather hard (too hard to rip).

Sandstone occurs as massive beds of up to 2 m thick in one or two cut-slopes only. However, due to intense weathering, the sandstone is mostly friable.

Grade of weathering

The grade of weathering for the shale is mostly IV and V, where IV is found at the base and central core of the cut-slope coinciding

with the greenish-grey shale, while V represents the more weathered red/purple/orange/yellow shale. Grade VI (residual soil) is seldom encountered, and even when encountered it consists of a thin (~ 1 m) veneer of top soil only. Grade III (much harder, less weathered) material was not encountered at the cut-slope, but was encountered at CH12700 where it forms a protruding knob too hard to rip in the midst of the roadway.

The one or two sandstone cut-slopes also consist of grades IV and V materials.

Structure and slope stability

The geologic structures surveyed are beddings, foliations and faults. These represent discontinuities or fractures in the rock and hence have a direct control over slope failures. The orientations of the various discontinuities (namely strike and dip) were measured at each cut-slope, as well as the strike and dip of the slope itself. These measurements are then plotted on stereonets and analysed for stability/instability in accordance with the method popularised by Hoek and Bray (1974). Examples of these stereoplots are shown in Figures 1 and 2.

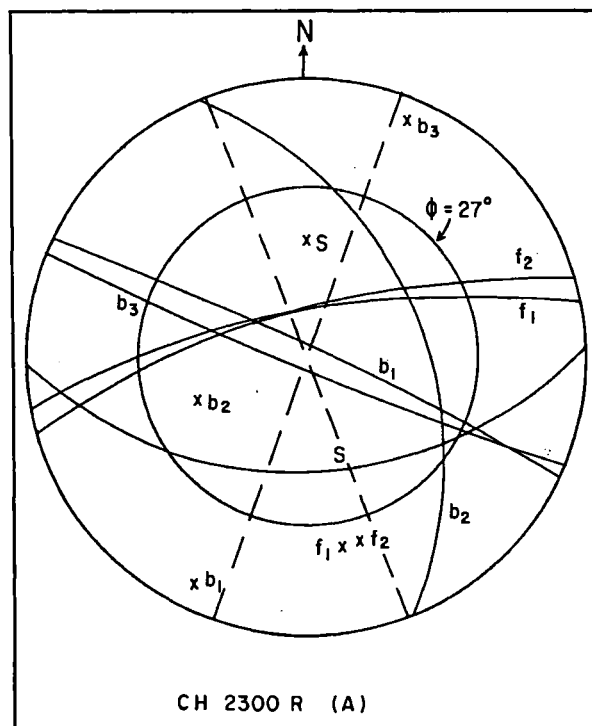


Figure 1. Stereonet of Category A Slope CH2300 R.

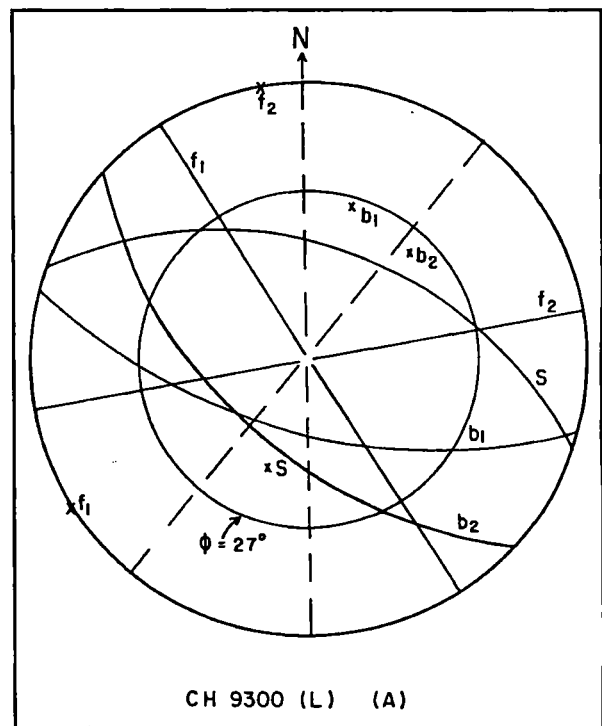


Figure 2. Stereonet of Category A Slope CH9300 (L).

Table 1: Structures and slope stability.

CHAINAGE (km)	DISCONTINUITY (strike/Dip)	SLOPE* (strike)	REMARKS
2300 L	288-290/80-90 120-130/30-70 f1 - 235/60	266	Failure along f1 = 235/60 Small bench failures along foliation (B)
2300 R	292-302/80-90 333/345/45 114/85 290/90 f1 = 260/70 f2 = 255/70	90	Major failures along f1 and f2. Large tension cracks at crest (A)
3100 R	280-290/80-85	90	Minor bench failures only (B)
5750 R	250-295/45-70	92	Stable, but foliations strike parallel to slope, dip into hill (C)
6000 R	94-105/60-85	102	Some soil slips. Potential slide (B)
6400 R	120/70 258/80	122	Generally stable, but foliations parallel to slope (C)
8100 R	117/90 288-290/60 f1 = 205/70	79	Block failures along f1 (B)
8400 R	128/45 306-308/85	68	Some soil slips (B)
9300 L	106/60 120-145/40-70 120-121/5-20 (disturbed?) f1 = 328/90 f2 = 80/90	290	Major failure of entire slope face Tension cracks at crest (A)
9300 R	104-114/70	115	Slabbing/sliding failure on right half. Potential Sliding (B)
11750 R	276-295/85-90	75	Small tension cracks at crest — incipient failure (B)
14500 L	110-120/80 240/45	280	Minor bench failures (B)
15100 L	104-118/80-85 271/85	280	Minor bench failures, generally stable (B)
15450 L	92-104/85-90 278/90	260	Generally stable except for localised bench failures (B)
16875 L	100-107/60-80 125/60	240	Generally stable except for erosion gullies on soil. Massive sandstone beds (C)
17725 L	124-140/45 100/70	252	Stable. Shale with interbedded sandstone (C)
17850 L	98-112/45	250	Stable (C)
18100 L	100-106/70-80	242	Stable (C)
19250 L	106-116/45-85	266	Localised bench failures (B)
21850 R	66-85/70-85	102	Some localised bench failures. Soil slip on right side (B)

* Dip of slope = 45° for all cases.



Figure 3. CH2300R. Grey shale with beds subparallel to the bench face. Prone to planar and/or toppling failure. Note hardly any residual soils over the shale.



Figure 4. CH9300R. Major failure on right side of the slope involving 6 benches — planar failure along beddings. Note contrasting colours between grade IV (lower, grey) and grade V (upper, red/purple/orange/yellow) materials.



Figure 5. CH9300L. Fault ($f_1 = 328/90$) on right side of slope along which failure has occurred.



Figure 6. CH9300L. Toppling and opening up of tension cracks along beddings. Note parallelism of slope with bedding planes.

From Table 1 and the stereoplots, the breakdown for the categories of slopes based on severity of the problems is as follows:

- i) 2 category A slopes (at CH2300R, CH9300L)
- ii) 12 category B slopes, and
- iii) 6 category C slopes

The category A slope failures have been caused partly by the presence of faults intersecting the rocks. The category B slopes which include many localised bench failures are partly attributed to the strike of the beds or foliations being parallel or subparallel to the slope surface, thus a tendency for planar or slab slides. This is particularly so when the benches are cut with a vertical face, as was the case here, thus allowing the discontinuities to "daylight". Some soil slips (mostly shallow) have also been included in the category B slopes and they involve mostly the thin layer of grade VI residual soil materials.

The category C slopes have the slope face cutting the discontinuities at an oblique or perpendicular direction, thus disallowing sliding of beds and hence improving stability.

Remedial measures

Some possible remedial measures for the failed slopes, especially the category A slopes (at CH2300R and CH9300L), are as follows:

- i) cutting back to a flatter slope. By cutting back to a flatter slope with benches at 60° instead of the current 90° benches, the steeply dipping (> 70°) discontinuity no longer daylights — hence increasing the stability.
- ii) providing restraint at the toe, e.g. gabion wall, or other suitable forms of retaining structures.
- iii) providing a wide berm at the base. This wide berm serves as a safety "catch" for failed materials in the future, but does not arrest or check future failures.

In view of the weak or soft nature of the shale and sandstone beds encountered, the other more conventional rock support techniques such as rock bolting, wire mesh, and shotcrete, etc. are not applicable here.

CONCLUSIONS

The results of the survey indicated that most of the slope failures are controlled by structural features or rock discontinuities, e.g. beddings, foliations and faults. The most severe slope failures are caused partly by faults dissecting the rocks, while the many localised bench failures are due to sliding or toppling of beds that strike parallel or subparallel to the cut-slope. Stability is enhanced when the slope face cuts the beddings/foliations obliquely or at right angle.

Simple remedial measures which can be adopted include: cutting back to flatter slope and benches, providing toe restraint such as gabion wall or other retaining structures, and providing a wide berm at the base of the slope to serve as a safety catch. In view of the weak or soft nature of the shale and sandstone encountered, other more conventional rock support techniques such as rock bolting, etc. are deemed inapplicable here.

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PERTEMUAN PERSATUAN Meetings of the Society

GSM-GSD-IGM Forum on "Geology & Hillside Development", 22nd July 1994, University of Malaya, Kuala Lumpur — Report

The Forum on "Geology & Hillside Development" was the fifth in the series of such forums organised by the Working Group on Engineering Geology & Hydrogeology, GSM. Five papers were received and presented at the Forum, and the list of papers is as shown below.

Chow Weng Sum & Zakaria Mohamed (Geosurvey Dept.)

Geological Input in Rock and Residual Soil Slope Stability Studies

Lee Chee Hai, Loke Kean Hooi & Oh Yong Ching (Nehemiah Reinforced Soil Sdn. Bhd. & Polyfelt Geosynthetics Sdn. Bhd.)

Design and Construction of Slopes Reinforced with Geotextile

Wong Boon Chong (Consultant)

Structural Foundations on Ex-Mining Area

Mohd. Asbi Othman, Azman A.S., Mat Barhan, H & Norman, M.Y. (IKRAM)

Some thoughts on the Collapse of the Highland Tower, Ulu Kelang, Selangor, West Malaysia

Tan Boon Kong (Universiti Kebangsaan Malaysia)

Geologic Input in Hillside Development — Some Case Studies

Unfortunately, submission of papers by geologists was rather disappointing, with several last-minute, unfulfilled promises. As such, the scope of the Forum was extended to include geotechnical aspects, and papers were solicited from engineers. Fortunately, in spite of the short notice, 3 papers were received from engineers.

The two papers on geology dealt with geological input for hillside development, including slope stability studies in rock and residual soil. Several local case studies were presented for illustration purposes.

The three papers on engineering dealt with slope reinforcement using geotextile, structural foundations on limestone, and the collapse of the Highland Tower.

Response to the Forum was overwhelming, with the Lecture Hall filled to maximum capacity (~120 participants). The number of engineers who attended was substantial (~50), perhaps the highest so far as far as GSM functions are concerned. Much interest was shown in all the papers presented, in particular the paper on the Highland Tower (for obvious reason), and many lively discussions followed each presentation.

A final 1-hour panel discussion/open forum also received very good response from the panelists as well as from the floor. To stir up the discussion, ~1/2 dozen questions were posed (as shown below).

Panel Discussion/Open Forum

1. Should geologic input be made mandatory for hillside development?
2. Isn't it sufficient for geologic input to be requested on a "where necessary" basis?
3. As a geologist, what types of geologic input would you consider as useful for hillside development?
4. As an engineer, what types of geologic input would you require for hillside development?
5. Do you accept that "geology as practised by experienced engineers" is adequate sometimes?
6. Other Comments/Suggestions/etc.

Once again, there was active participation from both engineers and geologists, with occasionally very frank and strong opinions expressed during the open forum — but all professionally conducted.

On behalf of the organisers, I thank all authors, co-authors and participants for their contributions and participations at the Forum; my helpers Joy, Tham Fatt, Azmi and Anna; and the Head of Department of Geology, University of Malaya, for use of the venue.

Tan Boon Kong
Chairman
Working Group on Engineering
Geology & Hydrogeology
23rd July, 1994

* Limited copies of the proceedings of the Forum are available for sale at RM15 per copy.

GSM-GSD-IGM FORUM ON "GEOLOGY & HILLSIDE DEVELOPMENT"

Captions to Photos

1. *"That's exactly RM15 for the proceedings".* And for the guy with his hand over his forehead: *"Alamak, I forgot to bring any cash, and knowing Anna, I won't be getting my personal copy of the proceedings!"*
2. *"Welcome to this Forum, the 5th in the series; and for those who have missed out on the previous four forums, it's time to sign up for membership of GSM!",* Mr. Tan B.K. with his opening remarks.
3. Mr. Zakaria Mohamad kicking off with the first presentation @ 3.00 pm sharp. Nice tie!
4. A question from Ir. Dr. Loke K.H. on how the stability of the rock slope was determined. The Speaker's (Zakaria) reply: *"It's based on observational method"* (or in other words, gut-feeling!)
5. Zakaria receiving a bundle of joy from none other than Ms. Joy Pereira, our Lady Geologist.
6. *"If you would just close your eyes a second and visualise what geotextiles look like",* Ir. Lee C.H. on Soil reinforcement with geotextiles.
7. Ir. Wong B.C. on his pet project — the suspension bridge over Sunway Lagoon, purportedly the longest suspension footbridge in the world!
8. Coffee time. The gentleman on the extreme right thinking to himself: *"Let's see if this cup can flip over on its own!"*
9. *"The condominium acted as a retaining wall. When it collapsed, down came the landslide!"* Ir. Dr. Asbi on one of the many "postulates" on the collapse of the Highland Tower.
10. Mr. Tan B.K. on several local case studies, *"Eh, I forgot which base camp/swimming pool this is?"*
11. The panelists at the Panel Discussion/Open Forum. The most colourful socks belong to!?
12. Sdr. Yogeswaran M., all the way from Kuching, *"In Sarawak, the geologists and the engineers worked along fine, i.e. only after we have thrashed out our "Lingo" problem"*.
- 13-14. Views of the audience. Recognise your friends, starting with Mr. Yin E.H. & Mr. Chong F.S. at the front

GSM-GSD-IGM FORUM ON "GEOLOGY & HILLSIDE DEVELOPMENT"



1994 AAPG–GSM International Conference & Exhibition Kuala Lumpur — Report

The Geological Society of Malaysia (GSM) played host again to an international conference on the 21-24 August 1994. This time with the American Association of Petroleum Geologists (AAPG), an International Organization, the Society hosted the 1994 AAPG International Conference and Exhibition with the theme "Southeast Asian Basins: Oil and Gas for the 21st Century" at the Putra World Trade Centre.

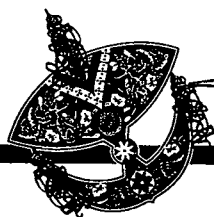
The Conference was declared open by the Minister in the Prime Minister's Department, YB Dato' Syed Hamid Albar. The Conference attracted well over 1108 participants and 66 exhibitors. A total of 120 papers and 40 posters were presented spread over 3 or 4 parallel sessions over three days.

Reminiscent of the familiar flavour of the Society's Annual Petroleum Geology Seminars were the 'icebreaker' reception, tea breaks, hospitality suites and lunches and in addition the participants were treated to an 8-course dinner and cultural show billed as *Malaysia Cultural Evening* at the Nirwana Ballroom, Hilton Hotel, courtesy of PETRONAS. A Student Reception was also held for our students to meet other students from all over the world and learn of AAPG's Student Chapter Programme.

At the Opening Ceremony, two prominent GSM members, namely, Dr. Charles S. Hutchison and Dr. Khalid Ngah received their prestigious AAPG's Special Commendation Awards. Dr. Hutchison in recognition of his outstanding contribution to geological research, regional synthesis, tectonic analysis, and an understanding of the hydrocarbon and mineral deposits of Southeast Asia; while Dr. Khalid Ngah was cited for achievements in Malaysia's petroleum industry as PETRONAS's explorationist and manager and for contribution to AAPG as regional advocate and outstanding conference chairman.

The Conference proved to be very successful and Dr. Khalid Ngah, General Chairman of the Organising Committee, and his tireless organising committee should be commended for a fine showing for such a big world-renown International Conference as AAPG's. The Society is also grateful to the many helpers, presenters and donors who made the Conference so memorable not only to GSM but to AAPG as well.

G.H. Teh



*1994 AAPG International
Conference & Exhibition*

Opening Remark by Dr. Khalid Ngah, General Chairman, at the 1994 AAPG–GSM International Conference and Exhibition, Kuala Lumpur

Yang Berhormat Dato Syed Hamid Syed Jaffar Albar, Minister of Law and Minister Responsible for Oil and Gas, The Honourable President of AAPG, Mr. Toby Carleton, President of GSM, Mr. Fateh Chand, Yang Berbahagia Tan Sri Azizan, Datuk-Datuk, Ladies and Gentlemen,

Assalamualaikum, and good morning.

Welcome to Kuala Lumpur, to PWTC and most importantly to this Conference and Exhibition.

Within these five minutes, allow me to tell you how this meeting came about, the organisations that have supported the meeting and the team that made it happened.

It was in 1988 when John Shelton, introduced me to Gary Howell, then Director of Science and International Affairs, AAPG. Gary told me that he was interested to look for ways to make AAPG not just a U.S. domestic science organisation, but an international one. He wanted to see AAPG playing a wider role, although at that time AAPG already had more than 30,000 members, and expressed the desire on the part of AAPG to see an active participation of international members in the Association.

We talked, and I proposed to him *"Why not take a look at Asia — China, Japan, Thailand, Indonesia, and Malaysia, and develop your opinion of the region. The region may not have many AAPG members, but it certainly has plenty of oil and gas"*.

We talked about Malaysia, and told him what K.L. could offer in terms of convention facility.

I did not hear from him for a while, until in 1990 when he told me that AAPG had decided that K.L. was one of the avenues for its many international meetings, and fourth in line, after London in 1991, Sydney in 1992 and The Hague in 1993. This was fantastic and a great news because it was not the usual cities of Singapore or Tokyo, it was K.L. Even more important was that the event coincides with the visit Malaysia Year '94.

In the same year, Gary and Ms. Sondra Biggs came to K.L. to talk to GSM Council Members of AAPG's decision, proposing GSM to host the meeting. I happened to be available to organise a meeting at that time, and GSM Council agreed that I took a lead in organising the meeting. A few individuals were approached to form an organising committee. I am very proud to introduce to you, and all of them are in this hall, six strong members of the committee, and they are:

- i. Mr. Johnny Hall, Exploration Manager, EPMI, Deputy General Chairman, and Oral Session Chairman
- ii. Dr. Roger Birch, Exploration Manager, SSB/SSPC, Technical Chairman
- iii. Dr. Azhar Hussin, Assoc. Professor, Department of Geology, University of Malaya, Field Trip Chairman
- iv. Dr. Kenneth Knoll, Ex-Director of Petronas Permata, Short Courses Chairman
- v. Dr. Ibrahim Komoo, Professor, Department of Geology, National University Malaysia (Ex-Exploration Technology Research Manager, Petronas Research), Poster Session Chairman, and of course

vi. Myself. I represent Petronas Research and Scientific Services.

The team examined the oil and gas scenarios, discussed a few good ideas, and finally focused on "Southeast Asia: Oil and Gas for the 21st Century" as the most appropriate theme for the meeting.

I am very proud to announce this morning that we have here in this hall, a total of 1,108 registered participants, from over 25 countries. Malaysia and Indonesia provide the most number of participants.

All of you are here to share and learn from each others' successes and failures, with the hope to enhance successes and reduce or even avoid failures.

Many oil companies, national and multi-nationals, big and small, independents or otherwise, services companies and individuals play some roles and bear significance in their own way. I wish to record the appreciations to the following:

1. The managements of Petronas, Esso, Shell, University of Malaya and National University, which have generously agreed to allow their senior officers to spend company/university time and money to organise this Conference.
2. The Managements of Petronas, Mobil, Occidental, Nippon Oil and Landmark Graphics for agreeing to sponsor dinner and luncheons: to-night's dinner and cultural night by Petronas, to-day's luncheon by Mobil (Mobil also sponsors to-day's student reception), tomorrow's luncheon by Occidental and Nippon Oil, and Landmark Graphics for Wednesday's luncheon.
3. Esso and Shell for sponsoring almost 130 students and lecturers to this Meeting,
4. Schlumberger for sponsoring Conference bags,
5. Many other companies that I don't know that sponsor some of the participants to this Meeting, without which they might not be able to participate, and
6. All Session Chairmen who have given the task to solicit papers from individuals or organisations.

I wish you all have a good meeting, and do put in your itinerary, visits to booths. There are many exciting things to see, if not to learn.

Thank you.

AAPG-GSM INTERNATIONAL CONFERENCE & EXHIBITION 1994

Captions to Photos

- | | |
|---|--|
| 1. The Minister being met on arrival at PWTC. | 15. Dr. Khalid Ngah being presented AAPG's Special Commendation Award by AAPG President. |
| 2-9. The large turnout at the Opening Ceremony. | |
| 10. The General Chairman, Dr. Khalid Ngah with his Opening Remark. | 16. Zainuddin Yusoff with visitors to his poster on the Jerneh Field. |
| 11. GSM President Fateh Chand, with the Welcoming Speech. | 17. Interested participants at Pecten's poster. |
| 12. AAPG President Toby Carleton with his Presidential Address. | 18-19. Students seemingly pleased with the Students' Reception. |
| 13. YB Dato' Syed Hamid Syed Jaafar Albar with the Opening Address. | 20. The main-table at the <i>Malaysian Cultural Evening</i> . |
| 14. Dr. C.S. Hutchison receiving AAPG's Special Commendation Award. | 21. "Look who came to dinner!" |

1994 AAPG-GSM International Conference & Exhibition



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**Welcoming Address by Mr. Fateh Chand,
President of Geological Society of Malaysia at
the 1994 AAPG-GSM International Conference
and Exhibition, Kuala Lumpur**

**Y.B. Dato Syed Hamid b. Syed Jaafar Albar,
The President, Americal Association of Petroleum Geologists
The General Chairman of the Organising Committee, Dr. Khalid Ngah
Ladies and Gentlemen,**

On behalf of the Geological Society of Malaysia, I wish to extend a warm welcome to Y.B. Dato Syed Hamid b. Syed Jaafar Albar and all the distinguished participants to the Opening Ceremony of this International Convention and Exhibition on Oil and Gas.

This Convention, as you are all aware, is being sponsored by the American Association of Petroleum Geologists or in short AAPG and the Geological Society of Malaysia is hosting it.

The Geological Society, whose objective is to promote advancement of the geological sciences particularly in Malaysia and nearby areas, traditionally hosts a number of events yearly of which the Petroleum Geology Seminar and the Annual Geological Conference are the key events.

This year the Annual Geological Conference was held in Kuala Terengganu in June with pre- and post-conference geological tours. In place of our Petroleum Geology Seminar we are now hosting this Convention. I also wish to inform you that last year we had roving workshops on Environmental Impact Assessment, 15 technical talks, 3 forums and 5 field trips. This year we held a forum on 'Geology and Hillside Development' in July and its findings will be submitted to the Ministry of Housing and Local Government.

This is to ensure that geology plays its due role in the construction industry, especially in mitigating against geological hazards.

Today we have about 1,000 participants and together with the spouses and the exhibitors they add up to about 1,500. This is certainly the largest event the Geological Society has hosted. We have here amongst us some of the best geoscientists in the world involved in the petroleum industry. This region, Southeast Asia, is experiencing very high growth rates and the demand for energy and petroleum and petroleum based products are rapidly increasing. It is certainly timely and meaningful to hold an international convention here especially with the theme "Southeast Asian Basins: Oil and Gas for the 21st Century". I am sure this will generate some exciting discussions as some 200 technical papers have been scheduled for presentation. Other activities at this convention will cover pre- and post-conference short courses, a pre-conference forum on generating successful oil and gas business in Southeast Asia and an exhibition on the state-of-art in the petroleum industry. Exciting pre- and post-conference field excursions have also been organised to enable you not only to get a better feel of the geology of this region but also to appreciate our heritage as this is a Visit Malaysia Year.

Ladies and Gentlemen,

So on behalf of the Society, I wish you all a fruitful convention and a pleasant stay in Malaysia.

Thank you.

Presidential Address by Mr. Toby Carleton, President of American Association of Petroleum Geologists at the 1994 AAPG-GSM International Conference and Exhibition, Kuala Lumpur

Thank you. Good morning Distinguished Guests, Ladies and Gentlemen. It is indeed an honor for me to represent the American Association of Petroleum Geologist at the 1994 International Conference and Exhibition here in Kuala Lumpur. Although I have been to Malaysia before, this is my first visit to Kuala Lumpur. This is truly a modern, dynamic city, and a hub for the oil and gas industry in Southeast Asia. It is especially fitting that this meeting is a prelude to national day celebrations, which commemorate 37 years of independence for Malaysia.

Not only am I impressed by the city, but by the warmth and hospitality that I have encountered since my arrival here. I am looking forward to the remainder of my stay in Kuala Lumpur and to the rest of this International Conference.

The AAPG is especially pleased to be the sponsor of this Conference, whose theme is: "Southeast Asia basins: oil and gas for the 21st century". This is truly an area with a future and we are excited to be a part of it! We are appreciative of and grateful to Fateh Chand and the Geological Society of Malaysia, which is the host for this meeting. Dr. Ngah and his organizing committee have done a superb job in putting together outstanding technical, educational and entertainment programs. We also thank the many volunteers and companies. This promises to be a rewarding experience on every count. I am sure that we will all leave here with fond memories and a greater understanding of the geology and energy potential of Southeast Asia.

The AAPG was founded in 1916 in Tulsa, Oklahoma as a regional association named: "The Southwestern Association of Petroleum Geologists". In 1918, to reflect our geographic boundaries, the name was changed to the "American Association of Petroleum Geologists". Since 1986, we have billed ourselves as "an international organization", and that motto appears on our letterhead. In keeping with that theme, I would like to apprise you of AAPG's increasing international involvement. This is part of an ongoing effort to expand our horizons to cover the broad spectrum of the geoscience community. It is not a shift away from our domestic core, but rather an effort to add to that base by accommodating other disciplines and other areas.

AAPG is the world's largest geological society with some 32,000 members in 104 countries. The foreign contingents, based on addresses, account for about 21% of the total membership (or about 6,700 members). Actually, those involved internationally make up a much larger percentage. Probably over 1/3. It is by far the fastest growing segment of our membership. This large group must be served if we are to remain in viable scientific society. Our most fertile recruiting areas are international. That's where the bulk of the world's oil and gas reserves are and that's where the bulk of the exploration and production will take place in the future. We can't ignore it. That's the way it is.

By my count, there are some 1,246 AAPG members who give their addresses as being in the Asia/Pacific area. Again, there are many more involved here than the number cited. We would like to see more members from Southeast Asia and urge you, if you like what you see here, to apply for membership if you are not already a member. If you are a member, please encourage your associates to make application. We need them and they need us.

The AAPG publishing program provides the world's largest geological publishing house. It includes our science journal (*The Bulletin*), a monthly newsletter (*The Explorer*) and special publications. An increasing amount of space is being given to international matters in these

publications, because that is where most of the action is. We owe it not only to our international members, but to our domestic members who are working internationally to adequately cover the international scene. The vast majority of major company earth scientists are working on international projects. A goodly number of independents — some very small — are also working in the international arena.

The AAPG education department has designed schools, short courses and training seminars both in and/or about international subjects. Two short courses are being held here. It also produces videotapes on international and domestic plays. In addition, they now have included international speakers in the North American distinguished lecture program, as well as sending North American speakers to tour internationally each year. These tours are funded largely by grants and endowments from companies, individuals and the AAPG foundation.

The theme at our annual meeting in Denver in June was "Analog for the world". Not only were many international papers presented, over 50 foreign countries had booths at an "International Pavilion", in which they touted their exploration and production potential.

In addition, the Association has committed to an ongoing series of non-North American conferences and exhibitions, beginning in 1991 and currently alternating between Europe and Asia/Pacific. In 1992, the international meeting was in Sydney, Australia; last year it was in the Hague, Netherlands and of course we are here this year. We will meet in Nice, France in 1995 and hopefully back to the Pacific in 1996. In addition, we are involved in a number of joint meetings around the world. Last year, we had a joint meeting with the Venezuelan Geological Society in Caracas. This year we sponsored a meeting in Bahrain and we will have a joint research conference with the Mexican Association of Petroleum Geologists in Mexico city. Other international meetings are already being planned in Caracas, Buenos Aires, Vienna and Bahrain. On my way here, I stopped off and visited with local geologists in Bangkok. When I leave here, I will go to Jakarta to address a joint meeting of the Indonesian Petroleum Association and the Indonesian Association of Geologists (IAGI). In October, I will go to Mexico city for the joint research conference. In November, I plan to attend meetings in Cairo and Lagos (depending on the situation there) as a guest of those societies. It will be back to Asia in December for the Offshore South East Asia Conference and Exhibition in Singapore. This is an addition to my US schedule. I'm not sure what 1995 holds in store for me, but I expect to be on the move somewhere.

AAPG has 23 affiliated societies located outside of the United States. These are on par with and have the same obligations and privileges as other affiliated societies located in the United States. In addition, AAPG has 5 associated societies. These include groups that want to associate with AAPG because of mutual interests and benefits.

The International community is represented in the AAPG house of delegates by members of your affiliated societies. The more affiliated societies, the more representation. I think that you need representation on the executive committee also. This will come in time, whether by by-laws changes or by the political clout of numbers. The more members you have, the better your chances to elect members to the executive committee that should be incentive enough to recruit new international members.

Another indication of AAPG's international commitment is the ceremony which is to follow later in the program. The AAPG Executive Committee has authorized awards to be given to individuals who have distinguished themselves through outstanding contributions to the science of geology and/or to the AAPG. These are well deserved awards. I congratulate the recipients in advance for being so recognized. That's all of my time. Thank you for yours! Have a great convention!

Opening Address by the Honourable Minister of Law YB Dato' Syed Hamid Syed Jaafar Albar at the 1994 AAPG-GSM International Conference and Exhibition, Kuala Lumpur

Mr. Toby Carleton
The Honourable President of American Association of Petroleum Geologists,
Mr. Fateh Chand
The President of the Geological Society of Malaysia,
Dr. Khalid Ngah
Chairman of the Organising Committee,
Datuk-Datuk,
Ladies and Gentlemen,

Good morning.

First and foremost, I would like to extend a very warm welcome to all of you who have come from near and far to partake of this conference and exhibition. Let me wish you "Selamat Datang" to Kuala Lumpur and to beautiful, tropical Malaysia. Our country is strategically located in the heart of Southeast Asia which together with East Asia makes up the world's most dynamic growth areas. Malaysia has one of the fastest growing economies in the Pacific rim. The Malaysian GDP registered a healthy growth of 8.4% in 1993 with the inflation rate maintained at 3.4%. Stably governed since independence by a government committed to encouraging private sector foreign investment, Malaysia's political stability, vibrant economy, excellent infrastructure and communications network, advanced telecommunications services, abundant natural resources and the availability of highly skilled labour is thrusting us headlong towards industrialisation and our goal of achieving developed nation status by the year 2020. Malaysia, ladies and gentlemen, is truly a land of golden opportunities.

I must say that it is an honour for Kuala Lumpur to have been chosen as the venue for this year's International Conference and Exhibition and for me to have been called upon to address this gathering of distinguished geoscientists and oil industry professionals from around the world. I am told that there are over 1,000 registered participants attending this Conference, and more than 150 papers and posters will be presented; in addition to this 80 companies, by themselves icons in the fields of hydrocarbon exploration and exploitation, are taking part in the exhibition. This is an excellent achievement and I wish to congratulate the Organising Committee Members for their successful organisation of this AAPG-GSM International Conference and Exhibition.

Over the past few years we have witnessed numerous changes that have had tremendous impact on the worldwide petroleum industry. In the forefront of these changes are the oil prices which have continued to remain depressed, the shrinking exploration funds brought about by the current depressed oil prices and escalation of exploration and development costs. Against this background, the future of our upstream industry lies in our ability to increase the application of advanced technologies to reduce costs in E & P activities, find more reserves and to allow the feasible development of marginal fields. This Conference and Exhibition, I am sure, will afford all of you the opportunity to be aware of all the latest tools and technologies available in the market.

The petroleum industry in Malaysia unfolded when the first exploration well was drilled in Sarawak in 1910, making the activity almost a century old. To date more than 900 exploration wells have been drilled. Hydrocarbon exploration activities have resulted in the discovery of several major oil and gas fields. To date, Malaysia's remaining reserves stand at about 4 billion

barrels of oil and 80 trillion standard cubic feet of gas. Currently production is 610,000 barrels of oil per day and 2.6 billion standard cubic feet of gas per day mainly from 3 major sedimentary basins, these being the Malay Basin in Peninsula Malaysia, and the Sarawak and Sabah basins in East Malaysia. Even so, we note that not all of the Malaysian sedimentary basins have been fully explored and new techniques and ideas suggest the viability of further hydrocarbon exploration in all of them.

As our sedimentary basins become more and more explored, there is an increasing tendency for the remaining prospects to become smaller and more subtle. In view of this and to increase their chances of success, oil companies must consider innovation and state-of-the-art technology in their oil and gas exploration and exploitation activities; at the same time, efforts to search for oil and gas must also be extended to some of the more unconventional areas such as the deepwater acreages where in the past very limited exploration activities were carried out due to technological constraints and high investment costs. This Conference would be the most appropriate forum for the exchange and acquisition of ideas and technologies towards the aforementioned goal.

All companies, including oil companies, investing in Malaysia expect a reasonable return on their investments. Although Malaysia has always been and still is an attractive locale for investment by oil companies, Petronas took cognizance of the fact that further incentives were needed to further encourage investment in the Malaysian oil industry. After studying what other countries had to offer, Petronas recently developed a new set of PSC terms to cater for the deepwater ventures. In the deepwater PSCs, the exploration period was increased from 5 to 7 years, the development period was increased from 4 to 6 years and the production period was increased from 15 years to 25 years, reflecting the longer lead time needed to explore and develop hydrocarbon resources in such operating environments. In addition, cost oil ceiling has been raised to 70% for areas with water depths between 200 m to 1,000 m and to 75% for areas beyond water depths of 1,000 m to allow for faster cost recovery in view of the high-cost nature of deepwater ventures. To provide a reasonable return on investments to deepwater PS contractors the profit splits have also been increased significantly in the contractor's favour:

1. For areas between 200 m and 1,000 m the profit splits are:
70% for the first 50,000 barrels of oil per day
55% for the next 50,000 barrels of oil per day, and
50% beyond 100,000 barrels of oil per day
2. For areas beyond 1,000 m the profit splits have been increased to:
86% for the first 50,000 barrels of oil per day
82% for the next 50,000 barrels of oil per day, and
63% beyond 100,000 barrels of oil per day.

Our government is aware of the fact that oil companies producing in Malaysia are subjected to comparatively higher taxes as compared to other industries. The Malaysian government is committed to ensuring that hydrocarbon exploration and exploitation activities in Malaysia are maintained at current levels if not even increased. In this the government has played its role by reducing the petroleum income tax rate from 45% to 40% effective 1st January 1994 and the export duty rate from 25% to 20% effective 1st January 1995.

Deepwater hydrocarbon exploration in Malaysia has only just begun. To date, 2 deepwater blocks have awarded to Mobil and Petronas is currently negotiating 3 more deepwater blocks with foreign oil companies. Although conceptual designs for deepwater drilling, development and production are available today, the success of our deepwater programme will depend on the ability of our deepwater PS contractors to apply these innovative concepts to suit the local geological and reservoir conditions in a cost effective manner. Malaysia has a lot to catch up on in the field of deepwater technology. Therefore, the transfer of technology is an important thrust in our efforts to keep abreast with technological advancements and thereby pave the way for the development of local expertise and a domestic industry catering to deepwater E & P activities.

The exploration efforts in the shelfal and onshore areas have been focused mainly on the

search for oil. Over the past few decades this has inadvertently resulted in a rather significant portion of our exploration plays and prospects being sidelined as they were considered to be viable only for gas accumulations. Many of the gas fields that were discovered in the past were made during the search for oil in our sedimentary basins. Today, exploration for gas has taken on a new perspective and importance globally as environmental awareness becomes ingrained and the search for an alternative cleaner and safer energy source heightens. In Malaysia, our concern for a cleaner environment has elevated the importance of gas as an alternative energy source. As such there is a need for hydrocarbon exploration in Malaysia to shift towards the active search for gas resources in addition to oil. I believe the potential for gas in Malaysia remains bright. Recent gas discoveries which include the Ular and Laho Fields in Peninsular Malaysia, the Jintan Field in Sarawak and the Keabangab Field in Sabah are testimonies to this belief.

Ladies and Gentlemen,

In an effort to expand our hydrocarbon reserves, as an investment opportunity and the desire to learn more about exploitation scenario, the Malaysian National Oil Corporation, Petronas, recently became an international oil company when it acquired acreages in Vietnam, China, Syria and Yemen through its own subsidiary, Petronas Carigali. These acquisitions have all at once placed Petronas on the other side of the negotiating table, a position we enjoy and have since become well accustomed to. Petronas is fully aware that it still has much to learn about E & P business, especially in an international environment.

As I have previously mentioned, Malaysia has always been and still is an attractive place for oil companies to invest in. The geological settings of its sedimentary basins are conducive for hydrocarbon generation and accumulation, the country is politically stable and her fiscal regime provides a fair return to investing oil companies. I perceive that the hydrocarbon exploration fraternity in Malaysia is well-prepared and ready to face any challenges. All in all I am sure that this augurs well for the future of the Malaysian petroleum industry.

I wish you success in the Conference and Exhibition, and if you have the opportunity, I encourage that you take some time to see Kuala Lumpur in specific, and Malaysia in general.

Thank you.



1994

AAPG International Conference & Exhibition

**Southeast Asian Basins: Oil and Gas for
the 21st Century**

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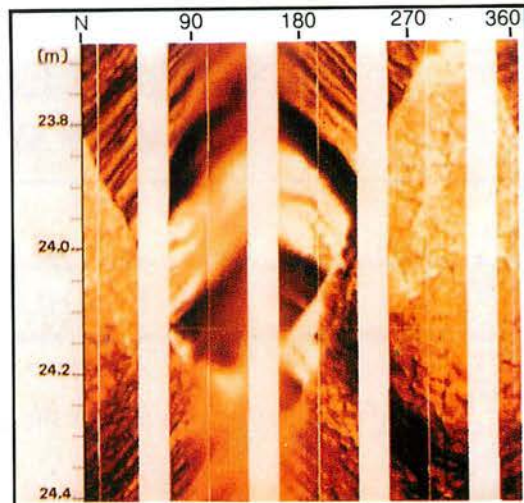
Fullbore Micro Imager*

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.

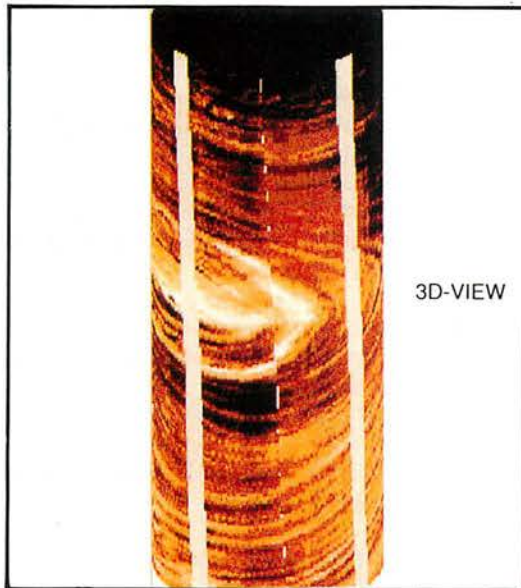
The FMI log, in conductive muds, provides electrical images almost insensitive to borehole conditions and offers quantitative information, in particular for analysis of fractures.

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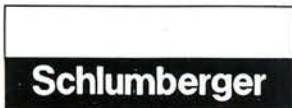
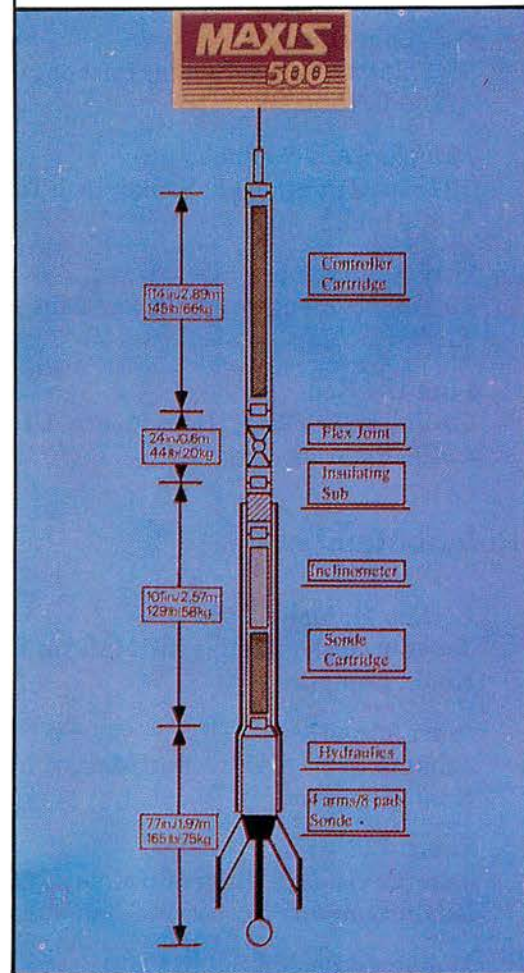
The tool's multiple logging modes allow wellsite customization of results to satisfy client needs without compromising efficiency.



Fault without associated drag



"Bullseye" structure



BERITA-BERITA PERSATUAN News of the Society

KEAHLIAN (Membership)

The following applications for membership were approved:

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- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Goh Lam Hoo
76, Jalan Helang 4, Bandar Puchong Jaya,
47100 Puchong. 2. Manohar A/L Suppiah
10 Laluan Perajurit 8, Taman Ipoh Timur,
31400 Ipoh. 3. U.W.A. Sirisena
30 Taman Liong Seng Off 2nd Mile Rock
Road, Kuching. 4. Lum Hoi Kon
52 Jalan SS22/13, Damansara Utama,
47400 Petaling Jaya. | <ol style="list-style-type: none"> 6. Mohd Fairuz Hj Mohamed Isa
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Kuala Lumpur. 9. Phlemon George
Jabatan Geologi, Universiti Malaya, 59100
Kuala Lumpur. 10. Mohd Shah Sulaiman
Jabatan Geologi, Universiti Malaya, 59100
Kuala Lumpur. |
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- | | |
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18. Zaidi Hashim
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20. Magdeline Pokar
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21. Then Pit Fan
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22. Terence Gerad Krishnasamy
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54. Gan Joo Kee
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55. Mohd Nazly Nsir Mohamad
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56. Andrese Glabi
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57. Uzrizuddin Uyop
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58. Norhazli Ibrahim
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59. Mohd Rozi Umor
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60. Dana Anak Badang
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Jabatan Geologi, Universiti Kebangsaan
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64. Murtadha Fathul Ariffin
Jabatan Geologi, Universiti Kebangsaan
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65. Rosli Mamat
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi.
66. Marilah Sarman
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi.

Associate Member

1. Goh Kim Chuan
Division of Geography, NTU, 469 Bukit
Timah Road, Singapore 1025.

PETUKARAN ALAMAT (Change of Address)

The following members have informed the Society of their new addresses:

- | | |
|--|---|
| <p>1. Tan Kim Yoke
c/o Sg. Way construction Sdn. Bhd., 12
Jalan Suria 19, Taman Putera, 81100 Johor
Bahru, Johor Darul Takzim.</p> | <p>3. Mohd. Redzuan Mohd. Ramli
No. 17 Jalan Selangor, Bukit Persekutuan,
50480 Kuala Lumpur.</p> |
| <p>2. Occidental Petroleum (Malaysia) Ltd.
18th Floor, Menara Tan & Tan, 207 Jalan
Tun Razak, 50400 Kuala Lumpur.</p> | |

PERTAMBAHAN BAHARU PERPUSTAKAAN (New Library Additions)

The Society has received the following publications:

- | | |
|--|---|
| <p>1. USGS Professional Paper: 1993: 1519,
1521, 1497-C, 1527, 1537, 1530-A, 1524,
1550-C, 1514.</p> <p>2. USGS Circular: 1993: 1083, 1090, 930-N,
1102, 1096, 1098, 1120-C.</p> <p>3. USGS Bulletin: 1993: 2048, 1787-II, 2038,
3032-B, 2068, 2040, 2065, 1917-P, 2062,
1981, 2000-E, 2051, 2053, 1917-M, 2034-A.
1994: 2059-B.</p> <p>4. AAPG Bulletin vol. 78, no. 6 & 7, 1994.</p> <p>5. Transformists' petrology edited by F.K.
Drescher-Kaden & S.S. Angustithis.</p> <p>6. Synchrotron radiation applications in
mineralogy & petrology.</p> <p>7. 100th Anniversary of the birth of F.K.</p> | <p>Drescher-Kaden.</p> <p>8. AAPG Explorer, Aug. 1994.</p> <p>9. Commonwealth Science Council,
Newsletter, Jan-Feb 1994.</p> <p>10. Turkiye Jeoloji Bulteni, vol. 36(2), 1993.</p> <p>11. Bibliography of Taiwan Geology (1849-
1990), 1993.</p> <p>12. Bulletin of the Institution of Mining &
Metallurgy, no. 1019, 1994.</p> <p>13. AGID News, no. 76, 1994.</p> <p>14. Seatrad Centre, annual report 1993.</p> <p>15. Bulletin of the Geological Survey of Japan,
vol. 45(1-4).</p> <p>16. CCOP Technical Bulletin vol. 24, 1994.</p> |
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WARTA GEOLOGI — Forthcoming papers

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The Fifth Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst

Gatlinburg, Tennessee

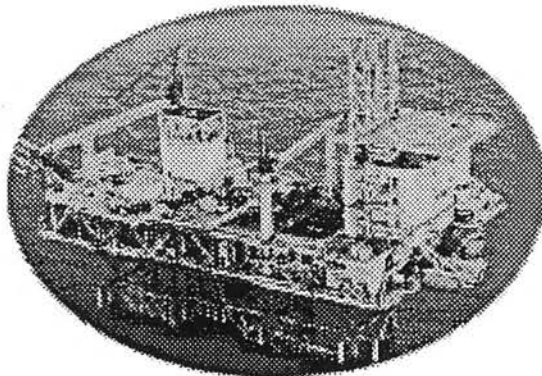
2-5 April, 1995

Call for Papers

The fifth Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst™ will be held on April 2-5, 1995, in Gatlinburg, TN, gateway to the great Smoky Mountains National Park. Dr. Andrew Merritt, an internationally recognized Engineering Geologist who has worked on dams and tunnels in karst terrane all over the globe, will be the banquet speaker. A field trip emphasizing the engineering geology of karst in east Tennessee will be led by Mr. Harry Moore, Engineering Geologist for the Tennessee DOT.

Papers are invited from engineers, geologist, hydrogeologists, geographers, planners, and all interested parties dealing with applied science and engineering in karst terrane. International contributions are especially encouraged. A special session on "Governmental Regulations specific to Karst Terrane" is being organized. Deadline for receipt of abstracts will be **September 2, 1994**. Abstracts and further requests for information should be sent to: Dr. Barry F. Beck, P.E. LaMoreaux & Associates, Inc., Box 4412, Oak Ridge, TN 37831; or Telephone (615) 483-7483 and ask for a meeting brochure.

This meeting is co-sponsored by the Institute for Geotechnology of the University of Tennessee, the Tennessee Section of ASCE, the Karst Waters Institute, and P.E. LaMoreaux & Associates, Inc.



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- have a sound knowledge of stratigraphical methods and techniques.
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Shell Companies in Malaysia form part of the worldwide network of the Royal Dutch/Group of Companies. In Malaysia we have been operating for more than a century and we look forward to even more exciting and challenging years ahead. We are made up of a group of wholly owned, joint venture and subsidiary companies engaged in the full spectrum of the petroleum and chemical business. Whilst our "upstream" companies are involved in the exploration for and production of oil and gas, our "downstream" companies are involved in the manufacturing, marketing and distribution of oil, gas, chemicals and related products.

SARAWAK SHELL BERHAD and SABAH SHELL PETROLEUM CO. LTD. make up our "upstream" companies based in Sarawak and Sabah. Our employees reside mainly in Miri, Kota Kinabalu, Labuan and Bintulu. As a Production Sharing Contractor to PETRONAS, we operate at the forefront of the Oil and gas industry. With the effective blend of the best in technology and human resources, comprising more than 3,000 dedicated multi-racial and multi-national employees, we play a critical role in meeting the energy needs in Malaysia through on-going petroleum exploration and production.



**SHELL COMPANIES
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Local News

Tin research, development centre to be dissolved

THE South East Asian Tin Research and Development (Seatrad) Centre here, which was set up in 1977, is to be dissolved at the end of the year.

Its acting director, Mr. S. Senathi Rajah, said this was because its objective had been achieved and also largely owing to the prevailing unhealthy state of the tin mining industry in the centre's member countries.

He said the decision was taken at a board of management meeting in Johor Baru in December.

"The board has appointed a dissolution committee to unwind the centre's activities and operation," he said at his office in Ipoh on Thursday.

The committee is chaired by the principal assistant secretary in the Primary Industries Ministry, Encik Mohd Zarif Mohd Zaman.

The Seatrads centre was jointly set up by Indonesia, Malaysia and Thailand — once the world's leading major tin producing countries — to promote, conduct and coordinate research and training on tin and its associated minerals, covering exploration, mining, mineral processing and smelting.

These countries during their heyday contributed slightly more than two-thirds of the global tin output but now their share is reduced to less than one-third.

Senathi Rajah said the current tin price was low and miners in Thailand and Malaysia could not even recover their production costs to continue their operations.

Only Indonesia is still producing on a large-scale because it has vast tract of virgin mining land and an extremely cheap labour force.

The entry of China and Bolivia into the market has further compounded the problem as it is said both countries had flooded the market and this contributed the price to plunge.

In addition to the work being conducted at the laboratories in the centre, field projects are maintained in the member countries.

Besides the research and development programme, the centre also seeks to increase and broaden technological knowledge within the tin industry by establishing training course, promoting, lectures, symposia, on-the-job and other means of training for development of the personnel in member countries.

To support the training and the other research activities of the centre, a documentation unit was established for the collection, development and dissemination of information relating to the tin industry.

The centre was financed by equal contribution from member countries and during the initial period it received technical assistance from the United Nations Development Programme in the form of personnel, equipment and fellowship.

The six professional and 32 supporting staff would be retrenched and the dissolution committee was looking into their welfare.

"We are drawing up an acceptable retrenchment benefits for the staff who have served between 5 and 15 years," he added.

NST, 2.4.1994

Perak wants geological reports for projects

IPOH: Developers will, from now, have to submit to the state government a geological report of the site for any major project before it is carried out.

This is to ensure optimum use of the state's depletable raw materials, like ball-clay and limestone.

State Land and Mines Department director Datuk Haji Samat Sabri said yesterday approval for large projects to be carried out would be

based on the study.

"This is to ensure that raw materials extracted in the state are put to good use," he said.

"There have been cases where marbles have been unwittingly used in land filling. I think this is a loss to the state."

He said the geological report would help check indiscriminate use and extraction of raw materials before his department finalised its

policy on the extraction of ball-clay and limestone.

Samat, who is heading a committee to draft the policy, said anyone could now sell and transfer raw materials extracted from the state.

This, he said, was a waste as the materials could be processed into value added products.

He said the state was collecting only RM5 in docket fee per lorry of such materials when those extracting them could sell them for thousands of ringgit.

(Perak does not want a repeat of what has happened to mining land which has turned into scarred landscape.)

On a call to review the state's decision not to renew mining leases, Samat said leases for mines which were in operations could be renewed.

"We do not renew mining leases of miners who want to supply sand or those who have stopped mining but want to resume operations," he said.

Star, 6.4.1994

News that China has joined ATPC boosts tin prices

TIN prices rose last Friday on the local tin market on news that China, the world's largest tin producer, had signed up in Bangkok to join a global pact as its eighth member, traders said.

The Kuala Lumpur Tin Market shot up seven sen to close at RM14.43 from RM14.36 a day earlier.

China formally signed Friday an agreement at the Thai foreign ministry to join the 10-year-old Association of Tin Producing Countries (ATPC) that groups Australia, Bolivia, Indonesia, Malaysia, Nigeria, Thailand and Zaire.

Jumrus Atikul, the executive secretary of the Kuala Lumpur-based ATPC, said China's membership of the ATPC was important in enhancing the effectiveness of the association's rationalisation scheme (SRS) aimed at improving prices.

China's membership is expected to expedite this process. The significance of its membership is underlined by the fact that it is currently the world's largest supplier," Atikul said.

Traders said China's decision to join the ATPC raised hopes that tin, which had long been in the doldrums largely due to oversupply, could very soon regain its lustre.

Tin prices had peaked at RM29.15 per kg in

the mid-1980s before the tin market crashed in October 1985. Prices have remained low over the past five years due to high excess stocks and poor demand.

The global overhang of stocks stood at 39,700 tonnes at the end of July last year, ATPC said.

The ATPC, which accounts for 67 per cent of the world's supply of tin, launched the SRS in 1987 to try to normalise the market and bolster prices.

China and Brazil, which although not yet a member but cooperating fully with the ATPC in the scheme, account for another 13 per cent of global supply.

"China's entry will lend new credibility to the ATPC as an organisation that has more clout to sway world tin markets and can change the world demand-supply equation for the metal," said local commodities analyst T.L. Kwong.

A Thai foreign ministry official said in Bangkok Thursday that "it was quite difficult to get China to join. But finally they saw the advantage of being in."

China, after being courted for several years, had in October 1991 pledged to join the ATPC, but "the restructuring of the management system in Beijing" had delayed the process, ATPC officials said. — AFP

Star, 3.5.1994

Higher M'sian tin output in January

MALAYSIA produced 719 tonnes of tin-in-concentrates in January, up 24 per cent from 582 tonnes in December 1993 but down by 37 per cent from its output of 1,146 tonnes in the same month of last year.

The Statistics Department said in the latest monthly tin statistics that Malaysia's imports of

tin-in-concentrates and tin metal also dropped by 21 per cent to 2,675 tonnes from 3,387 tonnes in the preceding month but was higher by 19 per cent when compared to 2,239 tonnes in January 1993.

About half of the imports were from two countries, Portugal (669 tonnes or 25 per cent) and Peru (639 tonnes or 24 per cent), the

department said.

Other main suppliers were Australia (398 tonnes or 15 per cent), Vietnam (362 tonnes or 14 per cent), China 171 tonnes or six per cent), and Britain (127 tonnes or five per cent).

Exports of tin metal in January rose by 18 per cent to 3,292 tonnes from 2,786 tonnes in December last year but was lower by four per cent when compared to exports of 3,416 tonnes in the same month in 1993.

Exports were mainly to Japan (695 tonnes or 21 per cent), the Netherlands (653 tonnes or 20 per cent), South Korea (441 tonnes or 13 per cent), Germany (415 tonnes or 13 per cent),

Taiwan (260 tonnes or eight per cent), Australia (225 tonnes or seven per cent), India (208 tonnes or six per cent), and Singapore (164 tonnes or five per cent).

Local consumption stood at 431 tonnes, down by eight per cent from 471 tonnes in the preceding month but was significantly higher by 52 per cent against consumption of 284 tonnes in January last year.

The tin mining industry employed a total of 2,116 people in January, a decline of eight per cent from 2,296 people in December and a fall of 54 per cent from 4,607 people employed in January last year. — Bernama

Star, 3.5.1994

Bullion worth RM5.6 m from sole gold processing factory =

KUALA Terengganu, Mon. — Peninsular Malaysia's only gold processing plant, located in Lubok Mandi in Marang near here, has produced 166 kg of gold bullion worth RM5.6 million since it started commercial production in January this year.

Terengganu State Economic Development Corporation (TSEDC) general manager Datuk Hamzah Mohamad said the gold mining and processing venture, undertaken by its subsidiary Permint Mineral Sdn. Bhd., was a profitable business.

Production of gold bullion on a bigger scale could be done in the near future considering the sizeable reserves of deposit found in the 130 ha mining area.

"We are pleased with the smooth implementation of the plant although there were several technical hitches initially which affected the production and quality of the gold," he said after briefing Public Enterprises Minister Datuk Dr. Yusof Nor during a visit to the plant yesterday.

Hamzah said the plant, employing 113 workers, including 13 Filipinos, was capable of producing gold bullion at an average of 1.5 kg per day, worth about RM34,000 each kilogram in the open market.

The bullion is being stored at the plant's vault.

He said all bullion processed at the plant is sold to a Penang-based gold wholesaler for distribution throughout the country.

"Most of our foreign workers are handling the highly specialised jobs which are still alien

to the locals. Once the transfer-of-technology is completed, we will phase out the foreign workers," he said.

He added that although exploration work began in 1986, the RM22-million plant only started producing gold on a trial basis late last year.

The plant can produce between two and three kilogrammes of gold bullion per day with the improvement in its worker efficiency and better machinery.

"As it is, we are all still in the learning process since gold processing is new to us. We will improve ourselves as we go along by trying our best to upgrade the quality of gold from the present 92.8 per cent to 99.9 per cent purity," he said.

The plant and machinery bought from an Australian gold mining plant, which was then re-assembled here, can process 600 metric tonnes of ore per day.

"Our cut-off point is 1.2 gm of gold deposit in the mineable ore, which is basically mixed in the gravel, stones, sand and earth dug from the surrounding areas."

The company is now in the first phase of mining work and it will proceed to the next phase, which will be less expansive and easier to conduct as all the hard rocks and hills will have been stripped.

Meanwhile, Yusof praised the company which is the only State Government owned venture in the gold processing industry.

"We strongly believe that the plant will be able to recover all its investments in the next two years," head said.

NST, 7.6.1994

Rahman Hydraulic plans to mine gold

RAHMAN Hydraulic Tin Bhd., which is chalking up profits from its tin mining operations, plans to venture into gold mining and quarry works.

And it is looking towards Australia and China for these ventures.

Chairman Tan Sri Ahmad Sabki Jahidin said this was part of the company's plans to identify new areas of growth and investment.

Mining, however, would remain the group's core business.

"We want to utilise our expertise in mining in our expansion which will also encompass mining-related products," he said after the company's annual meeting at Hotel Istana in Kuala Lumpur yesterday.

Ahmad, however, said the group would not rush into these new ventures.

"The company is stable now and we are doing well in our current industrial ventures. So, we can be selective in choosing the right opportunities ..."

On tin mining, Ahmad said Rahman Hydraulic was probably the only mining company which was making a profit from these operations.

It recorded a profit of RM342,000 from 1,829 tonnes of tin-ore production last year.

This was due to the effective cost management programme implemented last year.

In Kedah; wholly-owned subsidiary Rahman Hydraulic Development Sdn. Bhd., which is developing a 130-hectare site in Sungai Petani, has already embarked on Phase Two of its housing project.

NST, 23.6.1994

Sabah Shell discovers area with vast reserves

SABAH Shell Petroleum Co. has discovered a new area with a significant volume of gas in the Kebabangan well in Sabah waters, 100 km west of Kota Kinabalu.

This is the second find after the 1988 discovery of hydrocarbon reserves in the Kinabalu well also located in the same area which was awarded to Sarawak Shell under the 1987 Production Sharing Contract with Petronas.

Sarawak Shell is the operator with 40 per cent stake while Shell Sabah Selatan Sdn. Bhd. and Petronas Carigali hold 40 and 20 per cent, respectively.

In the latest edition of *Sesama Kita*, a monthly newsletter of the Shell Companies in Malaysia, it was reported that the latest discovery was made possible in just 68 days instead of the original schedule of 75 days.

Sarawak Shell rig superintendent Mike Tolstyko said the gas strike was made 18 days after the deployment of the rig.

"In fact, six out of the 18 days were actually spent sailing from Terengganu."

Tolstyko said the first indication of a find came on the 12th day of drilling upon reaching

some 1,600 metres beneath the seabed.

"The well kicked and we subsequently weighed up the drilling mud to counter balance the pressure in the rock formation," he said.

He said an evaluation was conducted and the discovery was confirmed. A production test showed flow-rates of up to some 48 million cubic feet of gas per day.

He said new appraisal wells would be drilled later on to ascertain the volume of hydrocarbon reserves.

Tolstyko said under normal circumstances, the planning and drilling of an exploration well could stretch up to between nine and 12 months.

He said the drilling operation was concluded seven days before the scheduled 75 days, thus only utilising RM21 million of the RM23.85 million budget.

He said the discovery was the reward for many years of hard work, which included special studies applying Shell's leading technology and worldwide experience.

"This discovery also gives us tremendous encouragement to continue with our exploration efforts," he said.

NST, 8.7.1994

Oil, gas strike by Esso

ESSO Production Malaysia Inc. and Petronas Carigali Sdn. Bhd. have made an oil and gas discovery at Block PM-8 on the Langat Structure, offshore Terengganu.

Esso is the operator of Block PM-8, holding 80 per cent interest in the block, while Petronas Carigali holds the remaining 20 per cent.

Langat is situated 290 km off the coast of

Terengganu in the South China Sea. Esso, in a statement yesterday, said the oilfield was located in the southeastern part of the PM-8 area within the Malay Basin, four km southeast of the Lawang field.

The Langat-1 wildcat was completed on May 12, 1994. It intersects oil and gas reservoirs between the depths of 1,000 and 1,500 metres.

NST, 8.7.1994

Petronas plans to drill more wells off Vietnam

PETRONAS Carigali expects to drill new wells to appraise a site off the southern coast of Vietnam where it has found high-quality oil in potentially commercial quantities, said an industry source on Wednesday.

Results from tests at the *Ruby-1* well, 155 km east of Vung Tau port, were "quite encouraging," said the source. The new drilling programme, likely to begin by early next year, could include additional exploratory wells.

More work needs to be done before Petronas

can assess the size and potential of the oil and gas deposits at *Ruby-1*, the first of the firm's three exploratory wells in Vietnamese waters to show favourable results, according to the source.

The aggregate flow from the first three tests at *Ruby-1* measured nearly 3,000 barrels of oil per day and several million cu ft of gas, said Al Troner, the Asian-Pacific bureau chief for the publication *Petroleum Intelligence Weekly* by telephone from Singapore. — AP

Star, 13.8.1994

Petronas to drill seven new wells in Sabah

PETRONAS plans to drill six new oil wells in Sabah this year and one more next year, its general manager for Sabah and Labuan, Encik Masri Yusof, said yesterday.

He said Petronas, through its production sharing contractors, will continue to invest substantially to explore and develop Sabah's oil and gas reserves.

"Sabah's oil production has been on a gradual decline since 1991 because no new oil wells of commercial quantity has been developed," he said in his briefing to a group of officials from the Institute for Development Studies (IDS) led by its chairman, Masidi

Manjun.

Currently Sabah produces 94,000 barrels of oil per day which is about 15 per cent of the total output of oil produced by Malaysia.

Aside from oil exploration, he said Petronas would also appraise and develop gas reserves in Sabah, and if proved economical, could complement the State's energy production.

Masri also said Petronas' operations in Sabah had created many employment opportunities for the people of Sabah.

He said the office in Kota Kinabalu currently employs 707 staff of whom 82 per cent are locals.

NST, 27.7.1994

OBITUARY

Günter Harald Moh

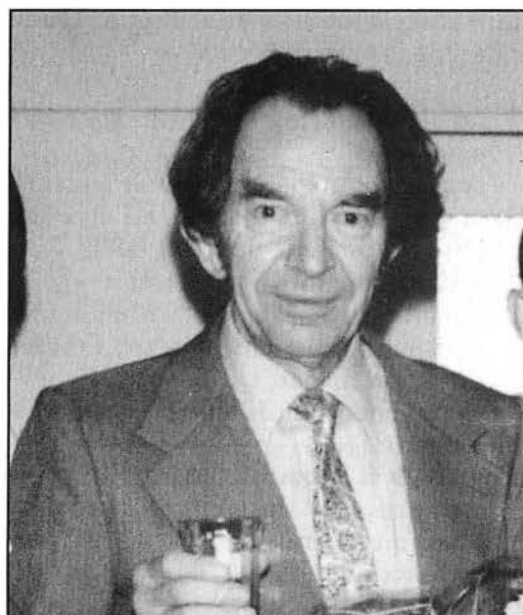
2 May 1929 – 16 May 1993

Günter Moh, who died at the age of 64 was one of the active foreign members of the Geological Society of Malaysia.

Prof. Moh is fondly remembered for his frequent visits to Malaysia, giving lectures and talks and seeing to the progress of the many Malaysians he has helped through the German Student Exchange Scholarships (DAAD).

He was born in Leignitz (Silesia). In July 1959, he received his Ph.D. Degree in Natural Sciences from the University of Heidelberg. The famous Prof. P. Ramdohr was the supervisor of his thesis topic on experimental petrology. He was an assistant to Prof. Ramdohr for 3 years before taking up the post of post doctoral research fellow with Dr. G. Kullerud at the Geophysical Laboratory, Carnegie Institution of Washington from 1962 to 1964. Back at the University of Heidelberg at the end of 1964, he was appointed Professor of Mineralogy and Petrology in June 1972 and then made a Full Professor and Head of the Laboratory of Experimental Mineralogy.

During the last three decades, he undertook a large number of geological fieldtrips and lecture tours to numerous European, African as well as Asian countries (especially Japan, China, India and Malaysia) and various universities and institutions.



In 1982, in recognition of his untiring research in the field of experimental mineralogy, a new mineral 'mohite' (Cu_2SnS_3) was named after him by the USSR Academy of Sciences, Moscow. Since 1988 he held the title of Concurrent Professor of the Department of Geology, Nanjing University, China and Honorary Professor of Wuhan-Hubei University of Geosciences, China, and in 1989 he received a Honorary Doctorate and was elected a member of the Chinese Academy of Geological Sciences, Beijing.

He is survived by his wife, Ursula and daughters Susanne and Annette.

G.H. Teh

Department of Mining and Metallurgical Engineering,
Faculty of Engineering, and
Faculty of Environmental Management Establishment Program,
Prince of Songkla University's

First Announcement and Call for Participation

International Conference on TOWARDS RELATIVELY SUSTAINABLE ENERGY AND MINERAL RESOURCE Development in Developing Countries

Venue: Hat Yai, Thailand
Date: 8-10 November 1995

Co-organizers:

- United Nations/Economic and Social Commission for Asia and the Pacific (UN/ESCAP)
- The Canadian International Development Agency (CIDA)
- Geological Survey of Japan (GSJ)
- Department of Mineral Resources, Thailand (DMR)
- Office of Environmental Policy and Planning, Thailand (OEPP)
- The University of Waterloo, Canada (UW)
- Chulalongkorn University, Thailand (CU)
- Chiangmai University, Thailand (CMU)
- Petroleum Authority of Thailand (PTT)
- Electricity Generating Authority of Thailand (EGAT)

RATIONALE

Energy and mineral resources have been vital to material well-being and industrialization in many countries for several decades. Concerns about resource depletion and adverse impacts of resource development have also increased over time. The global concern about environmental degradation which gave rise to the acclaimed concept of sustainable development do not exclude energy and mineral resource development. Issues such as whether energy and mineral resources are really exhaustible, whether the sustainable development ideal can be applied to them, and so on, however, remain arguable. Such factors call for a series of international conferences that may lead to resolution and relatively sustainable energy and mineral resource development in the future. This conference will provide a forum for pertinent discussion.

CONFERENCE PROGRAM

The conference is in a preliminary planning stage. Likely topics to be addressed should fall under the following categories:

- fossil fuel and mineral exploration, and the environment;
- surface mining and the environment;
- underground mining and the environment;
- offshore mineral dredging and petroleum activities, and the environment;
- mineral processing and the environment;
- post-mining activities, rehabilitation and the environment;
- environment and development in developing countries;
- geological sciences, energy and mineral resources, and the environment;
- economics and reality of exhaustible resources;

- economics of environmental compliance and risk management;
- the role of sciences and technology;
- wastes in energy and mineral industry, technology and management;
- material technology, substitution, and mineral conservation;
- mining and its impacts on water resources;
- health and safety issues in energy and mineral industry;
- environmental impact assessment and reporting;
- relatively sustainable energy and mineral resource development;
- enviromines and/or biomines — concepts and practices;
- energy and mineral resource and database and computer assisted management system;
- optimization, and energy and minerals resource development;
- system approaches to energy and mineral resource, and environmental management;
- geographical information systems and other software development, potential and practical uses;
- remote sensing and energy and mineral resource, and environmental management; and
- social impact of and conflicts in energy and mining industry.

Papers in related areas will also be considered.

POST CONFERENCE PROGRAM

Either of the following excursions will be arranged.

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- presenting a paper entitled
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Papers of Interest

ADVANCES IN PETROLEUM GEOLOGY & GEOPHYSICS 1

Study on the limestone porosity by seismic inversion and attribute for Parigi Formation, West Java Basin

- *Dr. Djoko Santoso, Dr. Lilik Hendrajaya & Mr. Alfian Babar*, Bandung Institute of Technology Indonesia;
Mr. Sulistiyono & Mr. Purwoko, Pertamina Indonesia

Information management: Surfing the internet for geological and geophysical data.

- *Dr. Edna D.F. Reid*, Nanyang Technological University Singapore;
Ms. Kelly Smoot, Straits Energy Consultants Singapore

The North Sea Troll Field: A multi-disciplinary approach to recovery from thin oil zones combined with large scale gas production

- *Mr. Tore Lilloe-Olsen, Mr. Svein Erik Wennemo & Mr. Kjell Arne Oppeboen*, Norsh Hydro A.S. Norway

Seismostratigraphic analysis and relative sea level changes in parts of Upper Assam Basin with special reference to Paleocene-Eocene Formations

- *Mr. Sachidanand Rath, Mr. Bikranaditya Bbarali, Mr. Arun Kumar Setbi*, Oil India Limited India

Redirecting exploration strategies in Offshore Central Philippines

- *Mr. Freddie G. Rillera & Dennis V. Panganiban*, E.F. Durkee and Associates, Inc. (EFDA) Philippines;
Philip M. Rimando, Trans-Asia Oil & Mineral Development Corporation Philippines

ADVANCES IN PETROLEUM GEOLOGY & GEOPHYSICS 2

Commercial gas possibilities in Manila bay and its environs

- *Mr. Alessandro O. Sales & Ms. Maria Victoria M. Martinee*, Comexco Inc. (Consultants) Philippines; Comexco Inc. (Consultants) Philippines;
Mr. Dennis V. Panganiban, E.F. Durkee & Associates Inc. Philippines

Carbon isotopes in Southeast Asian lacustrine sourced oils and source rocks

- *Ms Sandra Lee Williams & Mr. Harold H. Williams*, Sunwapta Minerals Ltd. Canada

Determination of potential yield and volatile hydrocarbons from well logs in potential source rocks

- *Dr. Lin Jing Long*, Daqing Petroleum Institute Australia
Dr. Henry A. Salisch, Centre for petroleum engineering, University of New South Wales Australia

Southwest Palawan, Philippines: A case study in seismic imaging and interpretation of complex structures

- *Mr. Philip M. Rimando, Mr. Gerardo A. Manuel & Mr. Raymundo A Reyes Jr*, Trans-Asia Oil & Mineral Development Corporation Philippines

Management of subsurface uncertainties during phase I development of the D35 Field, Offshore Sarawak, Malaysia

- *Mr. George F. Canjar*, Sarawak Shell Berhad Malaysia

NSO 'A' Field: A new model, incorporating results of an integrated study of 3D seismic analysis and geological well data

- *Mr. Arman C. Sunaryo*, Mobil Oil Indonesia Inc. Indonesia

RESERVOIR DEVELOPMENT

Overpressure in the Malay-Penyu Basin and its effect on drilling programmes

- *Mr. Mohd Shariff Kader*, Petronas Carigali Sdn. Bhd. Malaysia

Characterisation of oil field recovery using geostatistical cross-sectional models

- *Dr. W.E. Gerbacia, Mr. H.P. Pristiwanto & Mr. Agus Rahardja*, PT Caltex Pacific Indonesia

Multiphase flow pressure drop in horizontal wells: Is it significant?

- *Mr. Azmi Mohd Arshad, Mr. Muhammad A Manon & Mr. Abdul Razak*, Universiti Teknologi Malaysia, Malaysia.

Horizontal well reservoir simulation for further development planning and maximising the recovery in the Baronia Field, Sarawak, Malaysia

- *Dr. Elden Jaafar & Mr. Tee Chew Poh*, Petronas Carigali Sdn. Bhd., Malaysia.

Use of reservoir simulation to resolve geological uncertainties and optimise development in the Complex E14 Reservoir, Dulang Field

- *Mr. Azly Aziz, Mr. Kartikay Sonrexa & Mr. Mohd Khalid Embong*, Petronas Carigali Sdn. Bhd., Malaysia.

Paramagnetism resonance: A tool for logging

- *Dr. R.K. Sharma, Mr. T.K. Das, Mr. S.K. Sood & Mr. J.M. Kothe*, Oil & Natural Gas Corporation Ltd., India.

A new method for determining the fractal dimensions of pore structures and its application

- *Mr. Shen Pingping & Mr. Li Kewen*, Research Inst. of Petroleum Exploration & Devt, PRC.

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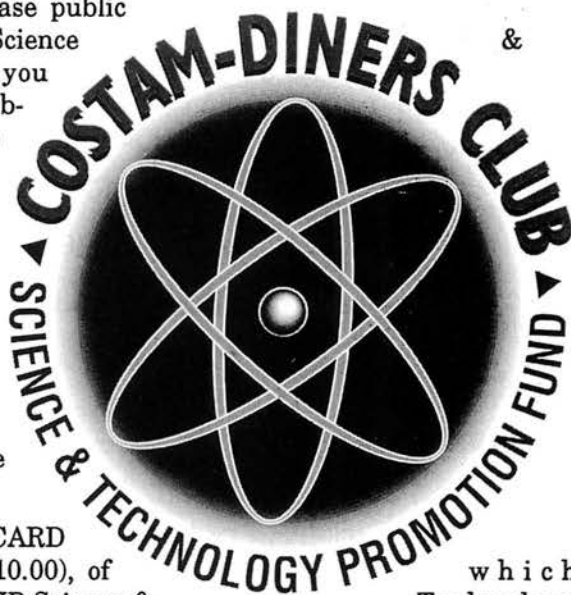
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The new book "*Mineral Resources of China*" comprehensively and systematically presents, for the first time, the current status and situation of mineral resources in China to readers at home and abroad, and discusses separately the reserves and resources of 68 of China's 149 minerals with an explored reserve, their positions in the world, their geographic distribution, major types and geological features of relevant mineral deposits, conditions for their exploitation and utilization, related production, demand and imports and exports. This book not only summarizes and scientifically analyses energy, metallic and nonmetallic mineral resources, but also puts forward the strategy and policies for the exploitation of mineral resources.

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**Special Session of CLIP (CLIMATES OF THE PAST)
at the Southeast Asia Conference on Geomorphology
18-23 June 1995
Singapore**

The above conference is under the auspices of the International Association of Geomorphologists and its organizing chair in Singapore has approved CLIP's request for a special session at the conference. CLIP (Climates of the Past) is a joint Unesco-IUGS project that until this date has had topical meetings in Durban, South Africa (January 1993), Barbados (November 1994), and Bali-Lombok-Sumba, Indonesia (August-September 1994). In 1995 a meeting in Venezuela is planned. Below is a brief on CLIP and its objectives.

As Asia-correspondent of CLIP, I would like to take this opportunity to invite interested members of your organisation to participate in the Special Session by contributing their results on topics related to CLIP's objectives. The special session will follow the main conference rules of 15 minutes of presentation and 5 minutes for discussion. Advanced registration will close on 15 November 1994. Please contact the Co-chair of the conference:

*Dr. Avijit GUPTA
Department of Geography
National University of Singapore
Singapore 0511
Fax: 65-7773091*

CLIMATES OF THE PAST

The CLIP (Climates of the Past) joint Unesco-IUGS project was adopted in Kyoto based on a draft prepared by N. Petit-Maire after consultations with the IUGS Bureau and the Directors of the Earth Science and Programmes Divisions at Unesco Headquarters (Drs. Eder and Misotten). A first organizational meeting took place in South Africa January 10-16, 1993. The meeting was also attended by one scientist each from Brazil, Indonesia, and Morocco. The following decisions have been taken:

I. Objectives of the Project

Determine and understand the natural variability of climate in the tropical belt through observation of high resolution dating of geological records in coastal areas.

- The natural variability must be known in order to detect man-made effects.
- The transitional tropical area is the most sensitive to rainfall variability and is also the most densely populated of world areas.
- Understanding of climatic shifts can only be achieved if **precisely dated** and correlated with other regional and global changes.
- Geological records in **coastal areas** are the key to interaction of changing oceanic and atmospheric patterns.

II. Four time scales will be considered:

1. **The last climate cycle** (with eventual extension to 2-3 cycles, within the range of U/Th dating): Minimal resolution 1,000 years.

2. **The last 20 ka** which include an extreme cold stage, a deglaciation and a warm optimum. Minimal resolution: 100 years.
3. **The last 2 ka** showing the neoglacial natural trend, the Middle Ages warm episode and the Little Ice Age. Minimal resolution: 50 years.
4. **The last few centuries** recording the interannual and seasonal variabilities. Minimal resolution: 1 season.

III. Location of research

Priority will be given to key areas relative to oceanic/atmospheric large-scale circulation patterns for:

1. The Indian Ocean
2. The region between the Indian and Pacific Oceans
3. The Pacific Ocean
4. The Mid-Atlantic Ocean (West and East)

Project Leader:

Nicole PETIT-MAIRE,
Laboratoire de Geologie du Quaternaire,
CNRS Luminy Case 907,
13288 Marseille Cedex 9, FRANCE.
FAX 91 26 66 38
TEL 91 41 38 56

H.D. Tjia

KALENDAR (CALENDAR)

1994

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October 4-7

BASIN FORMATION AND INVERSION IN EUROPE-ENDOGENOUS AND EXOGENOUS ASPECTS (Annual Meeting of German Geological Society), Heidelberg, Germany. (Professor Th. Bechstädt and Professor R.O. Greiling, Geologisch-Palaeontologisches Institut, Ruprecht-Karls-Universität, Im Neuenheimer Feld 234, D-6900 Heidelberg, Germany. Phone: (06221) 562831; telefax: (06221) 565503; telex: 461515 unihd)

October 15-26

JURASSIC STRATIGRAPHY (4th International Congress), Mendoza-Neuquen, Argentina. (Dr. A.C. Riccardi, C.C. 886, 1900 La Plata, Argentina. Phone: 54-21-39125; telefax: 54-21-530189)

October 23-27

SOCIETY OF EXPLORATION GEOPHYSICISTS (64th Annual Meeting). Los Angeles, California, USA. (Convention Assistant, Society of Exploration Geophysicists, P.O. Box 3098, Tulsa, OK 74101, USA)

October 24-27

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Seattle, Washington, USA. (Jean Kinney, GSA Headquarters, P.O. Box 9140, 3300 Penrose Place, Boulder, CO 80301, USA. Phone: (303) 447-2020)

1995

January 18-19

SOUTH EAST ASIAN ON SYMPOSIUM ON TUNELLING AND UNDERGROUND SPACE DEVELOPMENT, Bangkok Thailand. (SEASTUD Secretariat in Thailand, c/o M. Sugimoto (Dr.), Division of Geotechnical and Transportation Engineering Asian Institute of

Technology, G.P.O. Box 2754, Bangkok 10501, Thailand. Phone: +66-2-5245517; Fax: +66-2-5245509; Telex: 84276TH)

February 14-18

GEOSEA '95, Mandaluyong, Metro Manila, Philippines. (Dr. Guillermo R. Balce, GEOSEA '95 Secretariat, National Institute of Geological Sciences, University of the Philippines, Diliman, Quezon City 1101, Philippines. Phone: 97 60 46, 97 60 47 Fax: (632) 711 3077, (632) 712 4656, (632) 95 1635, (632) 99 85 44)

February 20-25

SOUTH ASIA GEOLOGICAL CONGRESS, COLOMBO, SRI LANKA. (N.P. Wijayananda, GEOSASS II Secretariat, NARA, Crow Island, Mattakkuliya, Colombo 15, Sri Lanka. Phone: 941 555008. Fax: 941 522932)

March 5-8

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

March 6-9

SOCIETY FOR MINING, METALLURGY, AND ENGINEERING, ann. mtg., Denver. (SME, Box 625002, Littleton, Colo. 80162-5002. Phone: 303/973-9550. Fax: 303/979-3461)

April 2-5

5TH CONFERENCE SINKHOLES, ENGINEERING AND ENVIRONMENTAL IMPACTS IN KARST, Gatlinburg, TN. Abstracts deadline: September 2, 1994. B.F. Beck, P.E. Lamoreaux & Associates, Inc., Box 4412, Oak Ridge, TN 37831-4412

April 10-13

GEOLOGY AND ORE DEPOSITS OF THE AMERICAN CORDILLERA, mtg., Reno/sparks, Nev. (Bob Hatch, Geological Society of Nevada, Box 12021, Reno, 89510. Phone: 702/323-4569. Fax: 702/323-3599)

May 15-19

EXPLORING THE TROPICS, int'l mtg., Townsville, Queensland, Australia. (Russell Myers, 171GES, National Key Centre in Economic Geology, James Cook University, Townsville, 04814. Phone: 077-814486. Fax: 61-77-815522)

May 29-June 2

EUROPEAN ASSOCIATION OF EXPLORATION GEOPHYSICISTS (57th Annual Meeting and Exhibition), Glasgow, UK. (Evert van der Gaag, European Association of Exploration Geophysicists, Utrechtseweg 62, NL-3704 HE Zeist, The Netherlands. Phone: (03404) 56997; Telefax: (03404) 62640; Telex: 33480)

June 5-12

XVIII PACIFIC SCIENCE CONGRESS: POPULATION, RESOURCES AND ENVIRONMENT — PROSPECTS AND INITIATIVES, Beijing China. (Mr. XIAO Jianzhang, Dept. Exhibition, China International Conference Center for Science and Technology, No. 44 Kexueyuan Nanlu Rd., Shuangyushu, Haidian District, Beijing 100086, China. Tel: (+86)-1-2575672 Fax: (+86)-1-2575691/2546498)

June 11-16

AMERICAN NUCLEAR SOCIETY, ann. mtg., Atlantic City, N.J. (ANS, 555 N. Kensington Ave., La Grange Park, III. 60525. Phone: 312/352-6611)

June 12-16

ORDOVICIAN SYSTEM, int'l. mtg., Las Vegas, Nev. (Margaret Rees, Dept. of Geosciences, University of Nevada, Las Vegas, 89154-4010. Phone: 702/739-3262. Fax: 702/597-4064)

June 18-22

RAPID EXCAVATION AND TUNNELING, mtg., San Francisco. (Society for Mining, Metallurgy, and Engineering, Box 625002, Littleton, Colo. 80162-5002. Phone: 303/973-9550. Fax: 303/979-3461)

June 18-23

INTERNATIONAL ASSOCIATION OF GEOMORPHOLOGISTS SOUTHEAST ASIA CONFERENCE ON GEOMORPHOLOGY, Singapore. (Dr. GOH Kim Chuan, Division of

Geography/NE Nanyang Technological University, 469 Bukit Timah Road, Singapore 1025. Fax: 65 469 8433)

July 2-14

INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS, mtg., Boulder, Colo. (IUGG General Assembly, c/o American Geophysical Union, 2000 Florida Ave. N.W., Washington, D.C. 20009)

August 28-September 1

TECTONIC AND METALLOGENY OF EARLY/MID PRECAMBRIAN OROGENIC BELTS: AN INTERNATIONAL CONFERENCE, Montreal, Canada. (J.A. Percival, Geological Survey of Canada, 601 Booth St., Ottawa, Ontario, Canada, K1A 0E8. Phone: (613) 995-4723; Fax: (613) 995-9273)

August 28-September 2

ORIGIN OF GRANITES, Hutton Symposium, College Park, Md. (Michael Brown, Dept. of Geology, University of Maryland, College Park, 20742. Phone: 301/405-4082. Fax: 301/314-9661)

October 10-14

PALEOCEANOGRAPHY, int'l mtg., Halifax, Nova Scotia. (Larry Mayer, Ocean Mapping Group, Dept. of Surveying and Engineering, Box 4400, Fredericton, New Brunswick, Canada E3B 5A3)

November 6-9

GEOLOGICAL SOCIETY OF AMERICA, ann. mtg., New Orleans. (Vanessa George, 3300 Penrose Place, Boulder, Colo, 80301. Phone: 303/447-2020. Fax: 303/447-1133)

1996**August 4-14**

30TH INTERNATIONAL GEOLOGICAL CONGRESS, Beijing, China. (Prof. Zhao Xun, Deputy Secretary General, 30th IGC, P.O. Box 823, Beijing 100037, P.R. China)

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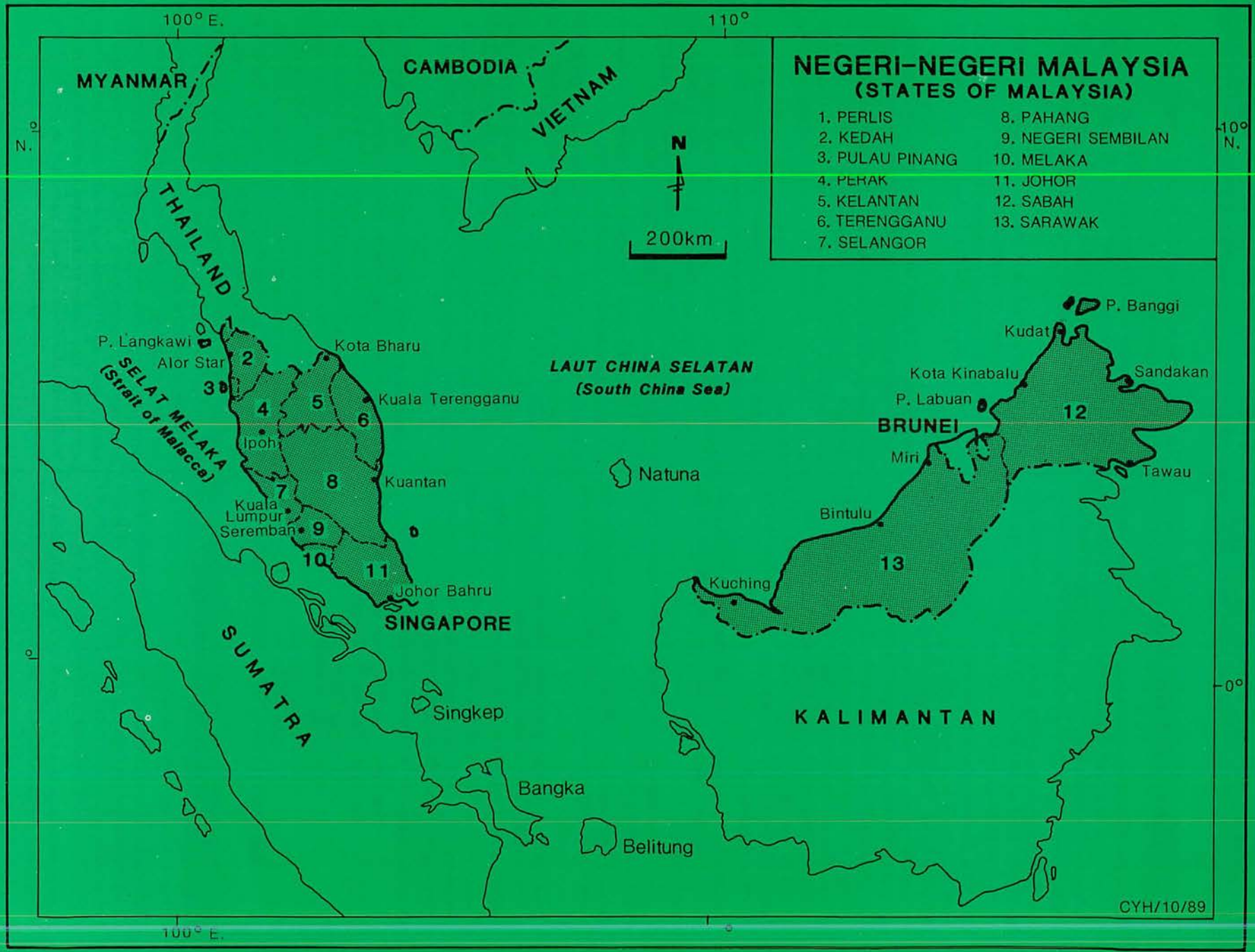
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