

PERSATUAN GEOLOGI MALAYSIA

WARTA GEOLOGI

NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MALAYSIA

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Occurrence and chemistry of clouded apatite from the Perhentian Kecil syenite, Besut, Terengganu

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Abstract: The clouded mineral found in the Perhentian Kecil syenite has been reexamined and the composition has been determined. It has been found that the mineral is apatite — an early crystallising accessory mineral. The result contradicts Mac Donald (1967) who suggested that the mineral is beryl. Microprobe analysis shows that the clouded part of the mineral is Fe rich.

INTRODUCTION

Mac Donald (1967) reported the occurrence of a clouded accessory mineral in the syenitic rock from Perhentian Kecil Island and suggested the mineral as beryl. In this paper the mineral has been reexamined and the composition has been determined. It has been found that the mineral is not beryl as suggested by Mac Donald (1967) but it is a common igneous accessory mineral — *apatite*. The aim of this paper is to report a characteristic appearance of the clouded apatite in the Perhentian Kecil syenite and to discuss the possible cause of its formation.

DESCRIPTION

The study area is a group of islands situated about 15 km off the northeast coast of Terengganu, West Malaysia (Fig. 1). The two main islands in the area, Perhentian Kecil and Perhentian Besar, are underlain by igneous rocks namely the Perhentian Kecil syenite (SPK) and Perhentian granite (GP). The SPK consists of a gradational sequence of intermediate igneous rocks ranging in composition from syenitic to monzonitic. The main rock types are pink or grey megacryst syenite and make up about 90% of the total of SPK pluton.

Field relations show that the SPK has been intruded by a younger GP (Fig. 1) (Azman, 1992). This is based on (a) the occurrence of a syenitic block in the granitic rock (Loc: Tanjung Batu Nisan) (2) cross cutting relation of the contact between the rocks (Loc: Tanjung Batu Nisan, Pasir Patani, Pasir Karang and along Tanjung Batu Peti to Tanjung Batu Sireh) (3) offshoot of microgranite vein from granite to syenite (Loc: Tanjung Batu Nisan and Pasir Patani). Both igneous phases were emplaced into the Upper Paleozoic metasedimentary rock.

For the purpose of this study, two samples were collected from the SPK, one each from syenite and monzonite. Petrographically, both samples are made of K-feldspar, quartz, plagioclase, hornblende, biotite, sphene, magnetite, apatite, allanite and zircon. Apatite can occur up to 2.2% in a single thin section. It can be up to 0.5 mm in size. The mineral is euhedral to anhedral and appear to be one of the earliest mineral to crystallize in the rocks. It usually occurs as inclusions in hornblende-biotite clots (Fig. 2). One of the prominent characteristics of the apatite is that it shows clouding either at the core or as a zone (Fig. 3). The shape of clouding do not follow any preferred orientation and it either has a gradational or

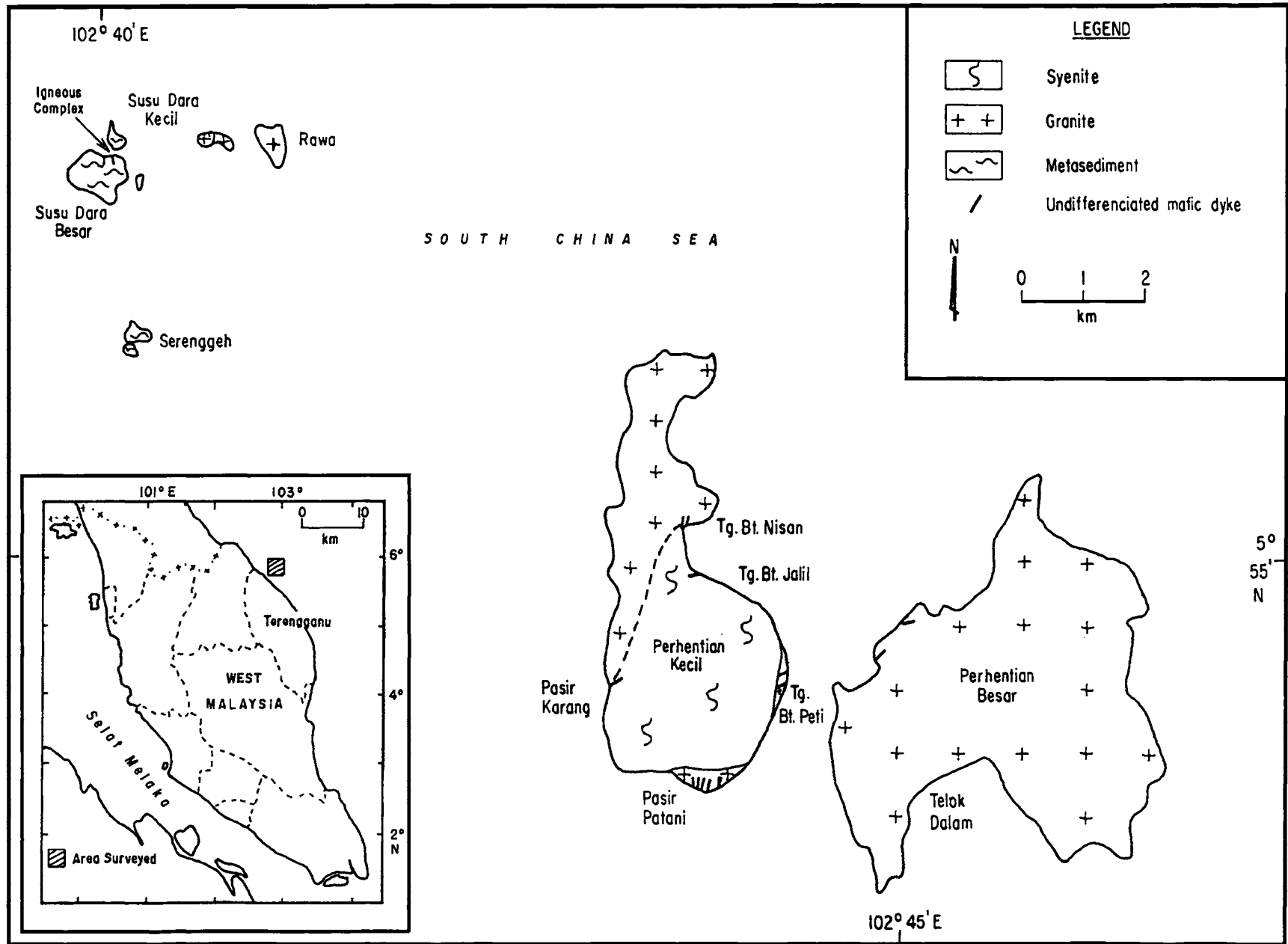


Figure 1. General geology of the Perhentian area.

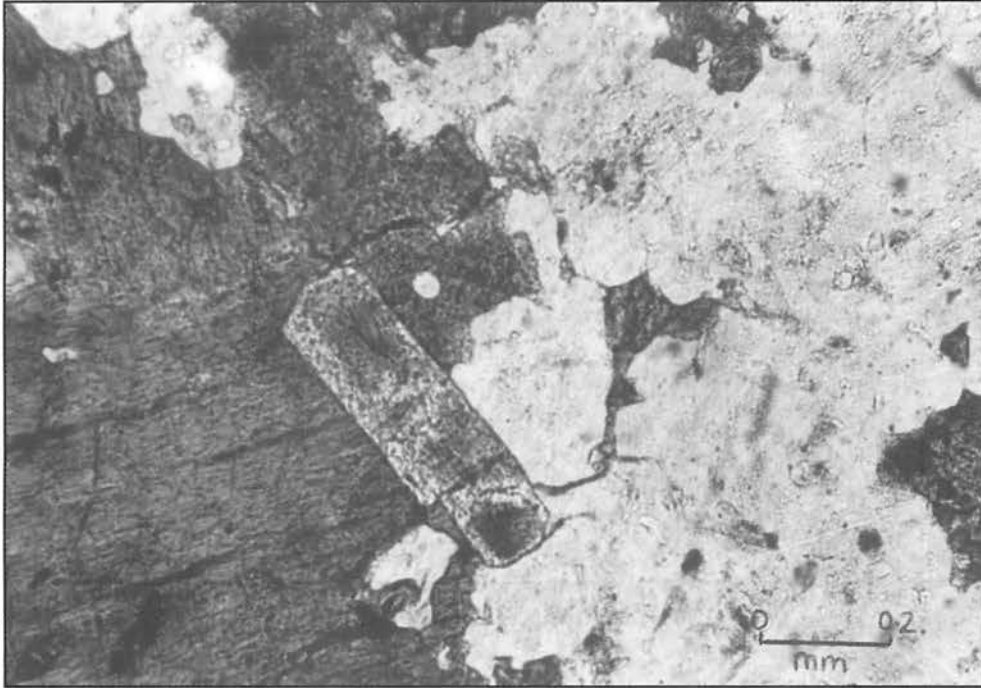


Figure 2. Photomicrograph showing euhedral clouded apatite in the Perhentian Kecil syenite.

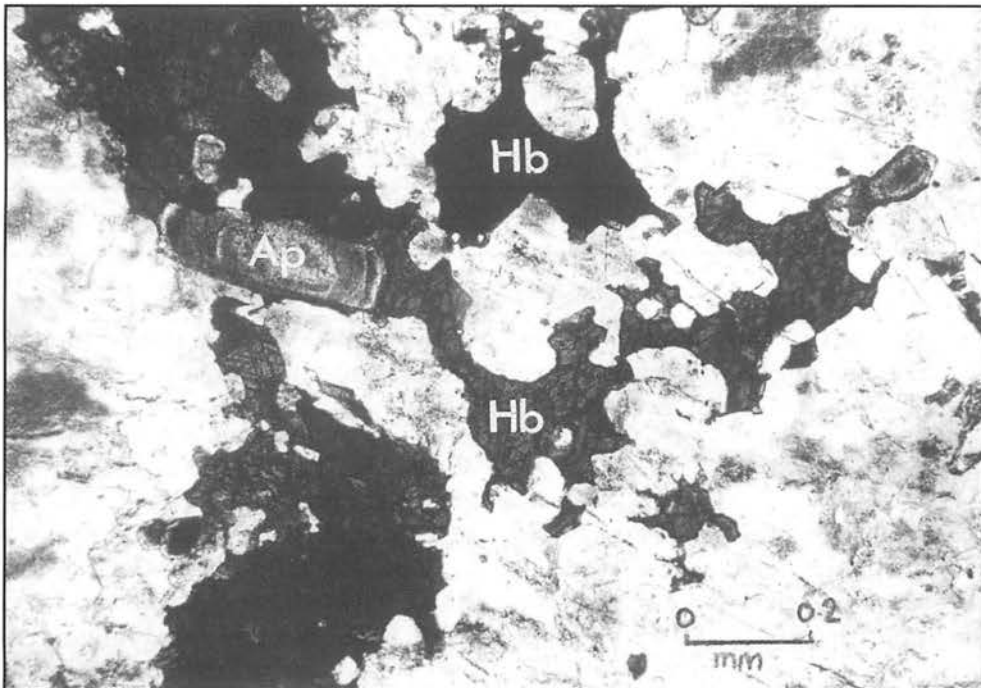


Figure 3. Photomicrograph showing euhedral apatite associated with anhedral hornblende in the Perhentian Kecil syenite. Note the zoned clouding in the apatite crystal.

Table 1. Representative analyses of the apatite from Perhentian Kecil syenite. (a) clear part, (b) clouded part of apatite.

(a) clear part of apatite							
SiO ₂	0.64	0.29	0.37	0.53	0.25	0.15	0.40
TiO ₂	0.00	0.03	0.10	0.00	0.07	0.02	0.00
Cr ₂ O ₃	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Al ₂ O ₃	0.11	0.00	0.01	0.09	0.01	0.02	0.15
FeO	0.15	0.34	0.26	0.18	0.12	0.01	0.01
MnO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MgO	0.05	0.08	0.04	0.15	0.05	0.00	0.03
Na ₂ O	0.12	0.19	0.10	0.28	0.05	0.04	0.06
K ₂ O	0.05	0.08	0.07	0.09	0.03	0.07	0.01
CaO	54.29	54.96	54.53	54.49	55.11	55.42	55.60
P ₂ O ₅	42.49	42.69	43.01	42.49	43.40	43.51	43.41
BaO	0.10	0.00	0.00	0.07	0.00	0.00	0.00
Total	98.00	98.64	98.49	98.34	99.07	99.28	99.67
(b) clouded part of apatite							
SiO ₂	0.88	0.40	0.47	0.93	0.44	0.21	0.47
TiO ₂	0.00	0.08	0.00	0.00	0.00	0.00	0.00
Cr ₂ O ₃	0.00	0.00	0.00	0.00	0.00	0.00	0.06
Al ₂ O ₃	0.03	0.14	0.00	0.10	0.06	0.13	0.00
FeO	0.47	0.35	0.01	0.65	0.25	0.02	0.71
MnO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MgO	0.00	0.07	0.00	0.02	0.01	0.11	0.13
Na ₂ O	0.13	0.19	0.03	0.18	0.07	0.22	0.32
K ₂ O	0.12	0.15	0.05	0.11	0.07	0.05	0.08
CaO	53.37	53.40	54.64	55.81	54.13	55.10	54.37
P ₂ O ₅	41.56	42.15	42.79	42.11	42.83	43.24	42.36
BaO	0.00	0.00	0.04	0.00	0.33	0.19	0.00
Total	96.56	96.92	98.12	97.90	98.18	99.27	98.49

sharp contact with the host apatite. Interestingly, the clouding do show pleochroism, X = grey and Y = black.

GEOCHEMICAL RESULT

The composition of the apatite has been determined by using electron microprobe analysis located at the University of Manchester. The instrument (modified Cambridge Instruments Geoscan) was running under the following conditions: EDS analysis, 15 kV beam accelerating potential, 3 nA specimen current on cobalt metal with a count time of 40 liveseconds. Both the clear and clouded parts

of the apatite were analysed and the results are presented in Table 1.

The compositional ranges for 11 analyses of the clear part of the apatite (in wt percent) are : SiO₂, 0.15 to 0.64; TiO₂, 0 to 0.1; Al₂O₃, 0 to 0.15; P₂O₅, 42.69 to 43.51; FeO (total), 0.01 to 0.34; MgO, 0 to 0.15; CaO, 54.29 to 55.60; Na₂O, 0.04 to 0.28; K₂O, 0.01 to 0.09 and BaO, 0 to 0.1. The compositional range of the clouded part of the apatite are SiO₂, 0.21 to 0.93; TiO₂, 0 to 0.19; Al₂O₃, 0 to 0.14; P₂O₅, 41.56 to 43.24; FeO (total), 0.01 to 0.71; MgO, 0 to 0.13; CaO, 53.37 to 55.81; Na₂O, 0.03 to 0.32; K₂O, 0.05 to 0.15 and BaO, 0 to 0.33. The compositional

differences of the clear and clouded parts are summarised below:

1. The clouded part has higher SiO_2 , K_2O , FeO and BaO compared to the clear part.
2. Both CaO and P_2O_5 have wider range in the clouded part compared to the clear part of the apatite.

DISCUSSION

In his original memoir, Mac Donald (1967) stated that "*Beryl in many cases cloudy due to incipient alteration to kaolin, occurs as individual grains and as inclusions in amphibole*". This paper reexamined and confirmed that the mineral, claimed to be beryl by Mac Donald (1967) is actually apatite. The mineral is composed mainly of CaO and P_2O_5 , in contrast to beryl analyses which contain mainly of SiO_2 , Al_2O_3 and BeO (Deer *et al.*, 1996). Petrographic observations show that the apatite crystallised early in the SPK magma. The mineral usually euhedral to subhedral, occur as inclusions in plagioclase and hornblende and is associated with the mafic clots suggesting that the mineral is of magmatic origin.

The clouded characteristics shown by the apatite from the SPK is not uncommon. Clouded apatite has been reported in granitic rocks (Fleet and Smithson, 1928; Baker, 1941; Gottsmann and Wirth, 1997) and metamorphic rocks (Pan *et al.*, 1993). Pan *et al.* (1993) found that the clouded core of apatite from Hemlo gold deposit, Ontario, Canada has high SiO_2 and FeO (cf. to the microprobe result of the present study). Gottsmann and Wirth (1997) also found that the clouded cores of apatite from granitic rocks from Germany have high FeO and SO_2 . Gottsmann and Wirth (1997) found that very fine grained ($< 1 \mu\text{m}$) pyrrhotite specks and rods caused the clouding in the apatite and suggested that the apatite host and pyrrhotite inclusions crystallised simultaneously, forming oriented intergrowths. The clouded cores of apatite crystals were also

assumed to be caused by inclusions of submicroscopic minerals e.g. opaque mineral, hornblende, biotite, hematite, ilmenite and manganite by other workers (e.g. Smithson, 1928; Groves and Mourant, 1929; Hoppe, 1962). Clouding of the apatite in the Perhentian Kecil syenite is likely to be caused by Fe rich fine grained mineral such as hematite, ilmenite, pyrrhotite or other opaque phases. This is based on the fact that the analyses of the clouded part is higher in Fe.

ACKNOWLEDGEMENTS

En. Roshdy is thanked for drafting the figures. Useful comments from Dr. T.T. Khoo are much appreciated.

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CATATAN GEOLOGI

Geological Notes

Field relations and petrology of the igneous rocks from Perhentian Island, Besut, Terengganu, Peninsular Malaysia

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Abstract: The Perhentian area is a group of islands situated about 15 km off the northeast coast of Terengganu and consists of 6 main islands: Perhentian Besar and Kecil, Rawa, Serenggeh and Susu Dara Besar and Kecil. The area is underlain by two main types of igneous phases namely Perhentian Kecil syenite (SPK) and Perhentian granite (GP) which intruded the Cretaceous metasedimentary rocks. Field evidence shows that the GP is relatively younger than the SPK. The later consists mainly of syenite to monzonite rocks whereas the biotite granite make up much of the GP. Field, petrographic and chemical evidence suggest that the SPK and GP are not co-magmatic.

INTRODUCTION

The study area is a group of islands situated about 15 km off the northeast coast of Terengganu (Fig. 1). They consist of 6 main islands: Perhentian Besar and Kecil, Rawa, Serenggeh and Susu Dara Besar and Kecil. The area is underlain by three main rock types namely the Perhentian Kecil syenite (SPK), Perhentian granite (GP) and metasediments. However, previously no detail field relationships study has been undertaken to established the contacts relationships of the rocks in this area. Excellent coastal exposure in the study area reveal a wide variety of field relations between the rocks. The aim of this paper is to describe the field relationships of the various igneous and metasedimentary rocks in the Perhentian islands and its surrounding area.

GENERAL GEOLOGY AND FIELD RELATIONS

Geologically, the Perhentian group is located in the Eastern Belt of Peninsular Malaysia. The igneous rocks (SPK and GP) of

Perhentian area lies to the north of the Kapal batholith and have been considered geographically an extension of the batholith which has geological and geochemical affinities to the Eastern belt of Peninsular Malaysia (Cobbing and Mallick, 1987). The rocks intruded the Upper Paleozoic metasedimentary rocks. The contact between the GP and SPK plutons and their host rock in the study area are nowhere exposed, but at Susu Dara Besar Island, the metasedimentary rocks are intruded by granite porphyry, microgranite, dolerite and other igneous rocks forming an Igneous Complex (Fig. 1) (Azman, 1992).

The metasedimentary rocks are well exposed at the northwestern part of the study area, that is at Serenggeh, Pulau Susu Dara Besar and Susu Dara Kecil islands. The main rock types, broadly can be divided into two, namely pelitic and quarzitic rocks. These rocks usually occur as interbeds and the thickness of the bedding range from 1 to 5 cm. Euhedral to subhedral pyrite crystals (1 to 3 cm across) can be seen throughout the rocks. Mineralogically, the metasediments consists of quartz,

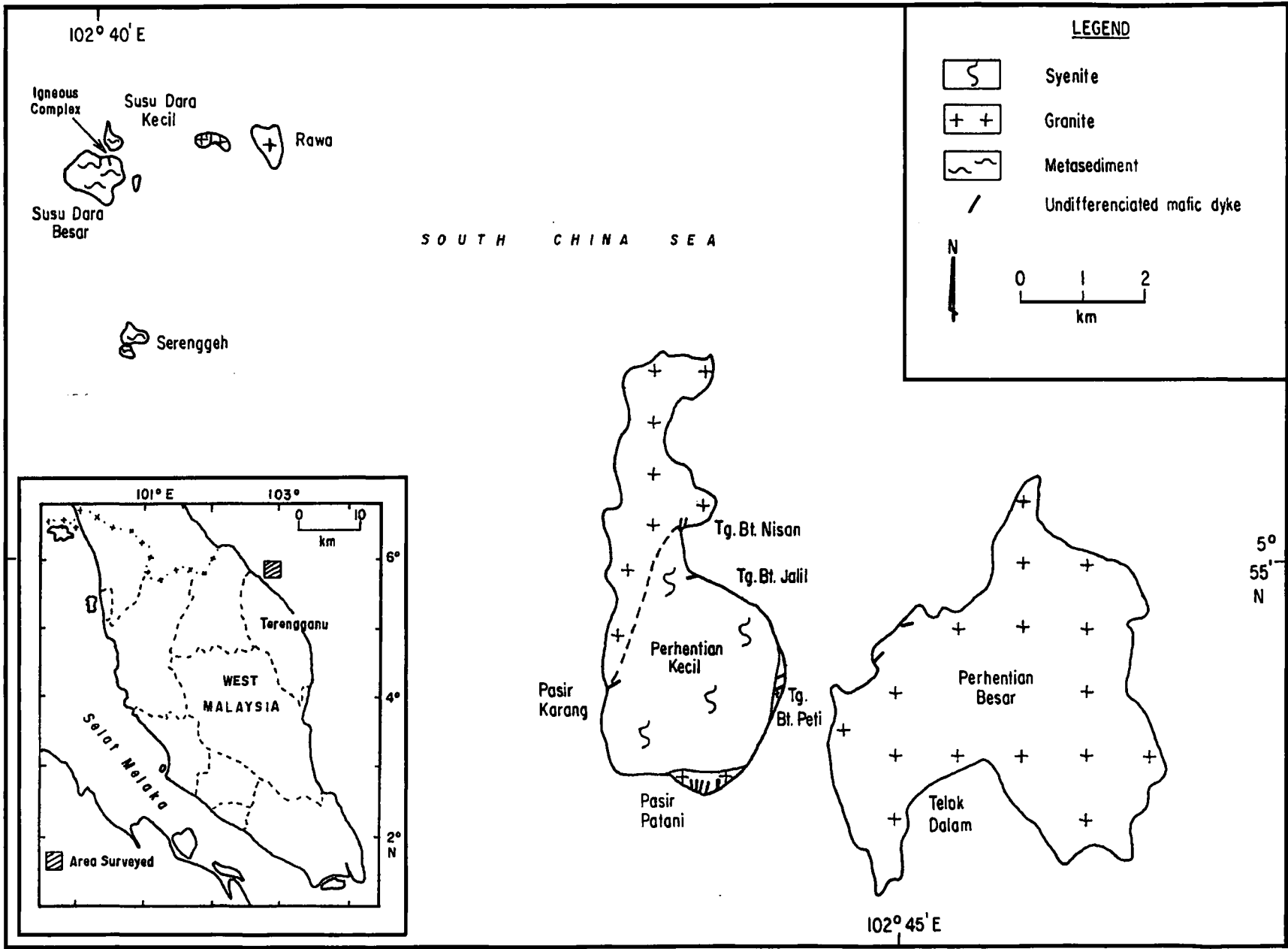


Figure 1. General geology of the Perhentian area.

tourmaline, biotite, muscovite and andalusite. In some places, andalusite porphyroblasts with chiasolite patterns are seen in the rock. Possible contact between the metasediments and Perhentian granites is shown in Figure 2.

Perhentian Kecil syenite (SPK)

The SPK form a circular outcrop at the central part of Perhentian Kecil Island. Although from the maps it appears to intrude the surrounding granitic body (GP), field evidence to be discussed later shows that the GP is relatively younger than the SPK. The pluton consists of a variety of igneous rocks ranging in composition from syenitic to monzonitic and even gabbroic rocks. The monzonitic rocks can be found at Tanjung Batu Nisan about 10 m from the contact between SPK and GP. In terms of percentage the syenitic rock comprises almost 90% of the SPK pluton. Epidote nodules and veins (thickness from 2 to 5 cm) can be seen throughout the pluton. The gabbroic rocks are found as boulders mainly at Kampung Pasir Hantu and Pasir Patani and they usually contain hornblende as the main mafic phase.

Various types of structures can be found in the SPK such as synplutonic dykes, hornblende rich enclaves and amphibolite blocks. The synplutonic dykes can be found at Tanjung Batu Sireh and Tanjung Batu Peti. They usually show amphibolitic mineralogy suggesting a basic origin. They are also disrupted into several parts or sometimes necked along its length suggesting that the dykes were intruded during the semi-solid state of the SPK magma. Hornblende rich enclaves are invariably finer grained and darker coloured than their syenitic host. The enclaves are found at Teluk Aur and Tanjung Batu Peti. They usually show sharp contacts with their host. Mineralogically, the enclaves are similar to their host but in different proportions. The enclaves consist of hornblende, plagioclase, opaque phase, sphene and K-feldspar with size up to 30 cm across. The amphibolite blocks are found in Pasir Patani and Pasir Keranji (Fig. 3). The blocks are larger than the hornblende rich enclaves and show a typical amphibolitic texture. The rock is usually medium grained equigranular and consists of accicular shaped amphibole crystals (up to 2 mm long).

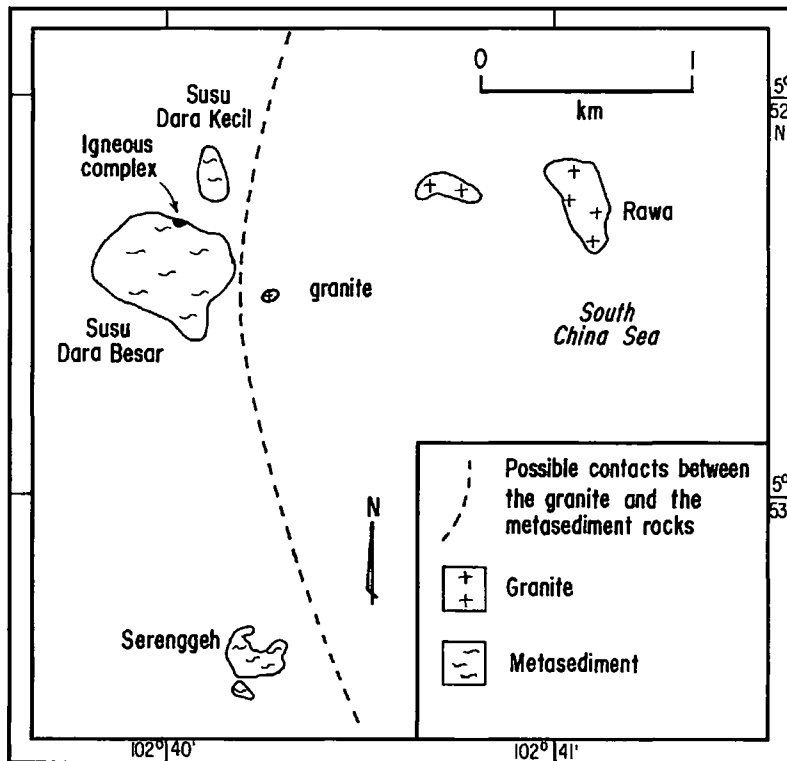


Figure 2. General geology of northwest of study area and possible contact between the Perhentian granite and the metasedimentary rocks.

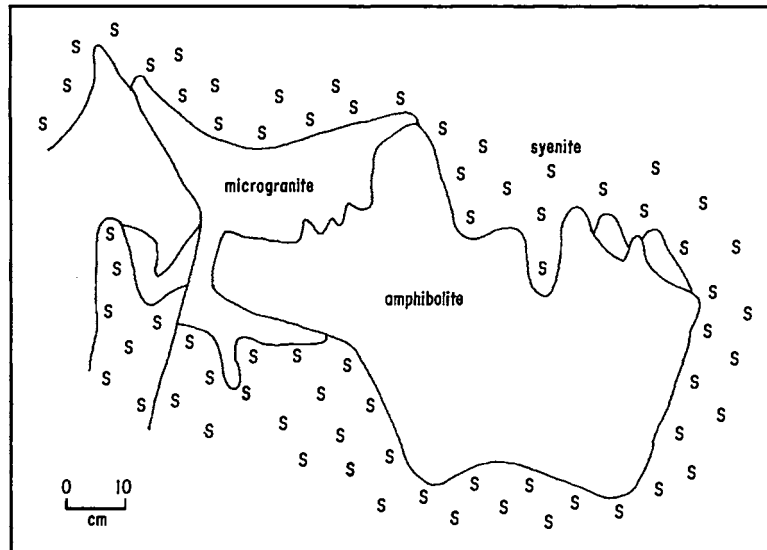


Figure 3. Field relation of amphibolite block in the Perhentian Kecil syenite. Location: Pasir Patani.

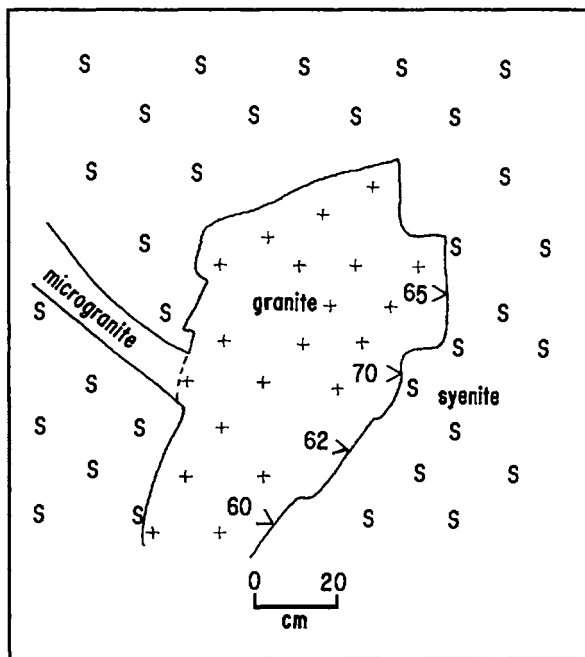


Figure 4. Part of the Perhentian granite intruding into syenitic rock. Note the microgranite vein extruding out from the granite. Location: Pasir Patani.

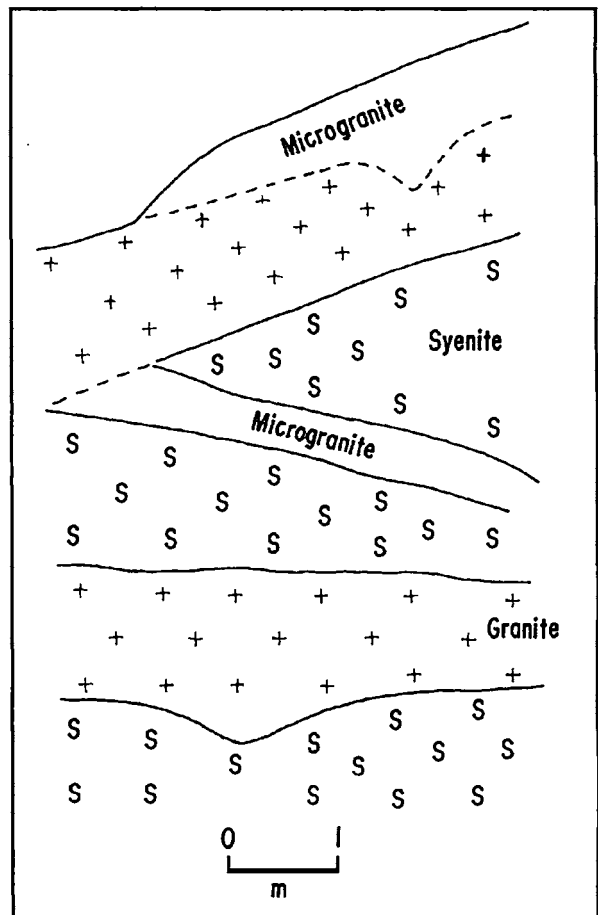


Figure 5. Field relation of the contacts at Tanjung Batu Nisan.

Perhentian granite (GP)

The Perhentian granite make up the whole of Perhentian Besar, Rawa, Tengku Burung islands and the northern and southern parts of Perhentian Kecil Island. The Perhentian granite has been divided into 2 varieties by Cobbing and Mallick (1987) namely hornblende-bearing and hornblende-free granite. The main body of GP consists of medium to coarse grained granite and is well exposed along the coast of Pulau Perhentian Besar, northern and southern parts of Pulau Perhentian Kecil and the whole of Pulau Rawa (Fig. 1). Microgranite and granite porphyry are found at contacts with SPK. The former is well exposed at Pasir Patani, Pasir Karang and Tanjung Batu Nisan. Sometimes they are pegmatitic, characterised by large plates of muscovite, biotite and K-feldspar. The boundary of the microgranite and the GP proper is sharp. The granite porphyry is only found at one location that is at Tanjung Batu Nisan about 20 m from the SPK-GP contact. The rock is characterised by quartz and plagioclase (up to 2 cm across) phenocrysts set in a fine grained groundmass of the same composition.

CONTACT BETWEEN SPK AND GP

The contact between SPK and GP can be found at Pasir Karang, Pasir Patani, Tanjung

Batu Nisan and along Tanjung Batu Peti to Tanjung Sireh (Fig. 1). The contact at Pasir Patani shows the GP intruded the SPK with the contact dipping 60° to 70° towards the GP rocks (Fig. 4). Boundaries between them is angular suggesting the GP intruded through an early joint system developed in the SPK. Emplacement of granitic magmas along joints are also noted by Pitcher (1953, p. 163) in the Rosses pluton, Donegal. A microgranite vein (width 10 to 12 cm) issuing from the GP projects into the SPK and this represents a rapidly cooled injection of GP magma into an early joint (note the vein is parallel to one of the angular edges of the adjacent GP shown in Figure 4).

The best contact to confirm that the GP is younger than the SPK is at Tanjung Batu Nisan. Here the GP formed a network of dykes (up to one metre width) intruding the SPK (Fig. 5). The dykes are medium to coarse grained granite and from them thinner microgranite veins can be seen injecting into the SPK as well. The microgranite may represent an earlier injection of GP magma forming a vein which was reopened by another surge of magma which cooled less rapidly giving rise to the coarse texture (dykes). A subangular syenitic block (30 cm long and 20 cm maximum width) can be seen in the granite host. It has been cut by a microgranite vein

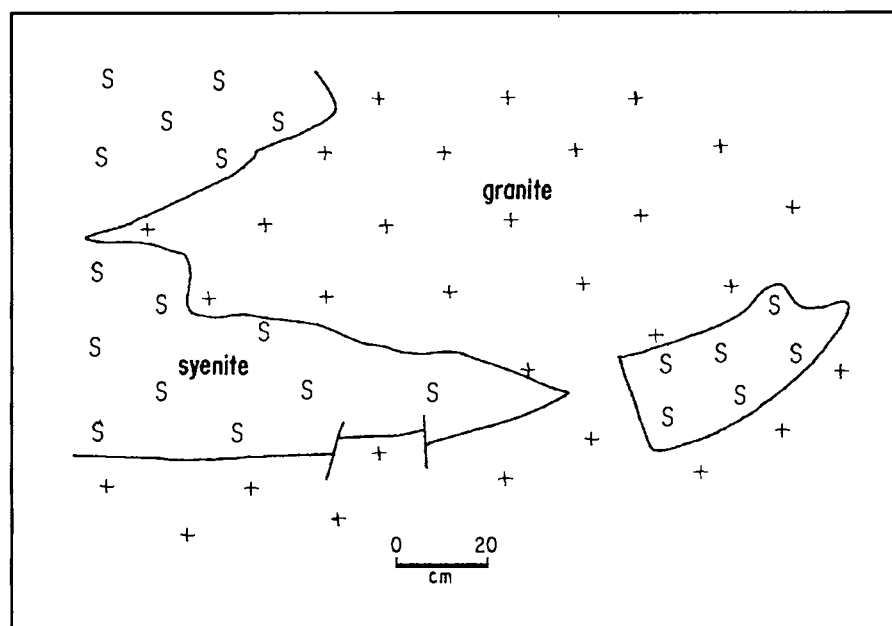


Figure 6. Contacts found along Tanjung Batu Nisan to Tanjung Batu Sireh. Note the syenite block in the granite.

Table 1. Relative age of the rocks from the study area.

		Metasediment	↑ OLD YOUNG ↓
SPK	{	Amphibolite block (?)	
		Gabbro	
		Syenite/Monzonite/Synplutonic dyke	
GP	—	Granite	
		Dolerite dyke	

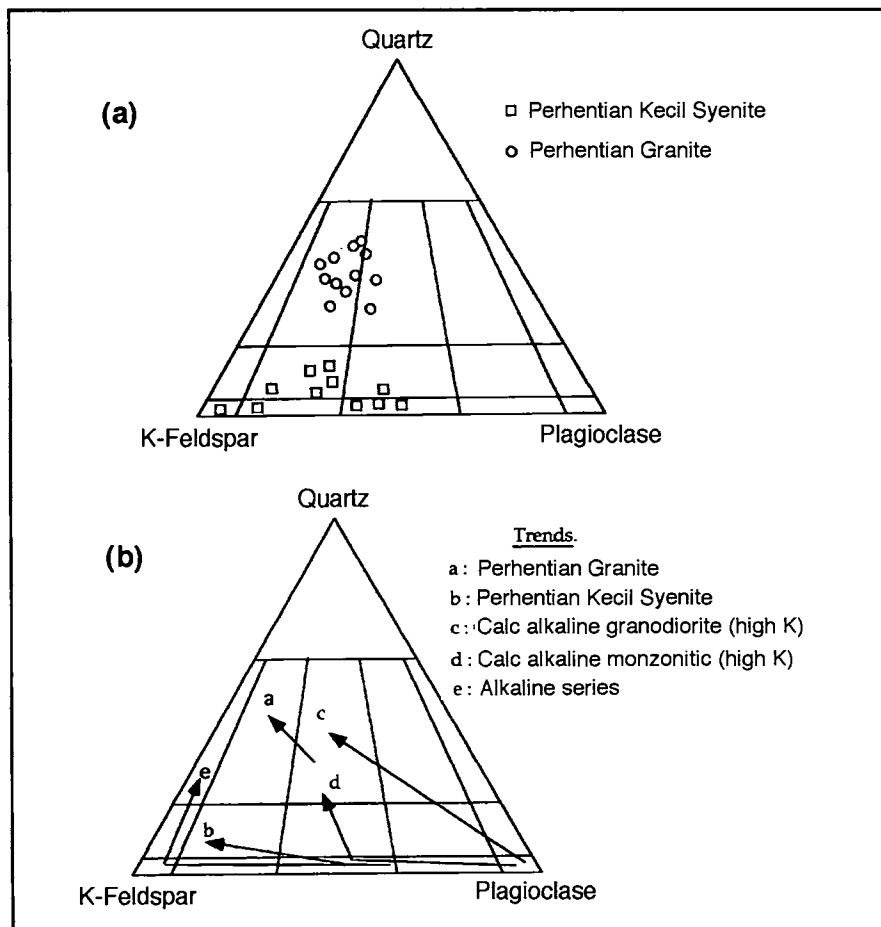


Figure 7. (a) Modes representative of the Perhentian granite and Perhentian Kecil syenite. (b) General trends of both Perhentian granite and Perhentian Kecil syenite on QAP diagram. Also shown in the diagram is trends from Calc-alkaline granodiorite, Calc-alkaline monzonite and Alkaline series (Lameyre and Bowden, 1982).

(width 4 to 6 cm). It probably is a result of dislodgement along early joint planes during the uprising of the GP magma. The contacts between SPK and GP at Tanjung Batu Peti to Tanjung Sireh have been cut by several sets of minor faults and the boundary between them are angular (Fig. 6). A subangular syenitic block occurs in the granitic body near the contact (Fig. 6).

PETROLOGY

Modal analyses

Modal analyses for the SPK and GP is summarised in Table 1 and plotted on a Q-A-P diagram (Streckeisen, 1976) (Fig. 7a). All GP samples plot in the syenogranite field whereas the SPK samples grade from monzonite to syenite. Also shown is mineralogical lineages in the QAP plot (Fig. 7b) (Lameyre and Bowden, 1982; Bowden *et al.*, 1984). Bowden *et al.* (1984) showed that each of the series has its own chemical characteristics and some are different in source material. Both plutons show different trends, thus the SPK samples show a similar trend to the rocks from alkaline province (e.g. Bowden and Turner, 1974) whereas the GP samples plot in the field of granitoid formed by crustal fusion (e.g. Lameyre, 1966; Ashworth, 1976).

Perhentian Kecil syenite

The essential mineral in SPK are K-feldspar, plagioclase, hornblende, pyroxene, quartz, biotite, sphene, epidote, apatite, zircon and magnetite. Large alkali feldspars, up to 3 cm across often give the rock a distinctly porphyritic appearance in hand specimen. It is subhedral to anhedral and sometimes highly sericitised. Plagioclase is subhedral to anhedral and ranges in size between 1 to 2 mm across. It usually shows albite, Carlsbad-albite and pericline twinning.

Biotite is subhedral to anhedral and occurs as elongate crystals or aggregates associated with hornblende and sphene. Hornblende is euhedral to anhedral. The most common pleochroic scheme is X = light yellowish green, Y = Z = dark green. It sometimes poikilitically encloses K-feldspar, apatite, sphene, zircon and

anhedral quartz crystals.

Euhedral to subhedral sphene is the most common accessory mineral and is preferentially associated with hornblende and biotite or as individual crystals. It is sometimes cracked probably as a result of thermal shock during magma ascent. Apatite occurs as inclusions in hornblende, biotite, plagioclase, quartz and microcline. It occurs in 2 habits i.e. small prismatic to acicular crystals and euhedral to anhedral squat shaped crystals. Epidote is greenish yellow and occurs as anhedral crystals. It occurs in veins, as inclusions in biotite and in the sericitised parts of plagioclase.

Perhentian granite

The microscopic study shows that the main granite types are medium to coarse biotite granite, biotite microgranite and pink weakly porphyritic biotite granite. The main mineral assemblages are K-feldspar, plagioclase, quartz, biotite, hornblende, allanite, zircon, epidote and opaque phase. Plagioclase is equigranular, subhedral to anhedral and usually occurs as clusters. Hall (1966) reported the presence of such plagioclase aggregates from the Rosses granite, Donegal sharing common outer zones. The clusters may represent early plagioclase which crystallised from melt. The sericite is present mainly at the centre of the mineral. Zoning is rarely observed.

The K-feldspar is orthoclase with average size ranging from 5 to 20 mm. Coarse perthite texture is common, sometimes visible in hand specimen. The texture can be up to 2 mm long. Rarely the crystals show oscillatory zoning (Cox, 1994) which vary from fine to approximately 0.3 mm thick, and appears to run continuously round the crystals. Quartz occur as large anhedral grains displaying shadowy extinction indicating strain. Cracks are common in this quartz but not in the adjacent feldspar. The higher crack densities in quartz compared to adjacent feldspar grains indicates that the initiation of microcracking is genetically related to internal stresses in the crystals. The deformation features in the quartz crystals probably developed during cooling and uplift of the Perhentian granite magma (Vollbrecht *et al.*, 1991; Azman, 1998).

Biotite is the main constituent of mafic aggregates. Two types of biotite are present i.e. green and brown biotite. Its pleochroic scheme varies from X = dark brown to green and Y = brown to yellowish brown. Sometimes the mineral is altered to chlorite at the margin. It occurs as anhedral plates up to 7 mm long. Biotite commonly encloses numerous small crystals of apatite, small biotite, zircon and magnetite. Apatite occurs as prismatic inclusions in all other minerals, being most abundant in biotite, quartz and plagioclase. Allanite varies considerably in colour from pale brown to brown yellow. It commonly exhibits euhedral zoning and is often twinned. Euhedral crystals have a length to breadth ratio of 3:1. Epidote occurs as secondary mineral associated with sericitised plagioclase and biotite.

In some parts of the GP, the K-feldspar together with quartz and plagioclase are set in the finer grained groundmass of similar composition. This texture is also known as two phase variant (e.g. Pitfield *et al.*, 1990; Cobbing *et al.*, 1992) and its occurrence suggests that, in some parts of the granite, the crystallization sequence has been interrupted probably as a result of infiltration of a volatile rich residual granite melt into wholly or partially consolidated granite host (Cobbing *et al.*, 1992).

In conclusion, the modal analysis and petrographic study clearly shows that the SPK and GP are different. The GP rocks are similar to the highly evolved granite elsewhere (e.g. Rosses granite, Donegal; Hall, 1966) whereas the SPK consists of more basic rocks and contain hornblende as a main mafic phase. These features are probably best shown on a QAP diagram. On this diagram, the GP samples plot in a separate field from those of SPK. Both plutons show a different trend in the diagram (Fig. 7b).

GEOCHEMICAL EVIDENCE

In order to support the earlier interpretations, it necessary to present several geochemical plots in order to show the differences between the SPK and GP plutons. Full major, trace and rare earth elements analyses and the modelling of both plutons will be presented

elsewhere. 35 rock samples (+7 from Cobbing *et al.*, 1992) from the SPK and GP were analysed for major, trace and rare earth elements.

On a K_2O vs SiO_2 plot (Fig. 8), the GP samples plot in the high-K calc alkali whereas those from SPK plot in both high-K calc-alkali and shoshonite fields. The rocks from both plutons also have different trends especially the SPK rocks which grades from high-K calc alkali to shoshonite fields. Roberts and Clemens (1993) showed that a parent magma with a given K_2O and SiO_2 content will evolved within the particular field in the diagram. For magma to evolve into the adjacent field some process other than crystal-liquid separation must operate. This clearly indicates that the SPK and GP plutons are very different and probably have different sources.

The difference between the SPK and GP is also damarcated on a $ACNK$ (mol $Al_2O_3/CaO + Na_2O + K_2O$) vs SiO_2 plot (Fig. 9). Both plutons show different trends, thus the $ACNK$ values increase with SiO_2 in the SPK rocks whereas in the GP rocks the values decrease. Also evident in the diagram are that (1) all the analysed SPK rocks are metaluminous whereas the GP rocks grades from metaluminous to mildly peraluminous and (2) both SPK and GP samples plot in the I-type field of Chappell and White (1974).

DISCUSSION

Relative age of the rocks in the Perhentian area

The field evidences discussed above is contrary to the interpretations of Dawson (in MacDonald, 1967) which suggested that the syenite (SPK) intruded the granite (GP). Evidence which support the younger age of the GP are listed below:

1. occurrence of a syenitic block in the granitic rock (Loc: Tanjung Batu Nisan),
2. cross cutting relation of the contact between the rocks (Loc: Tanjung Batu Nisan, Pasir Patani, Pasir Karang and along Tanjung Batu Peti to Tanjung Batu Sireh),

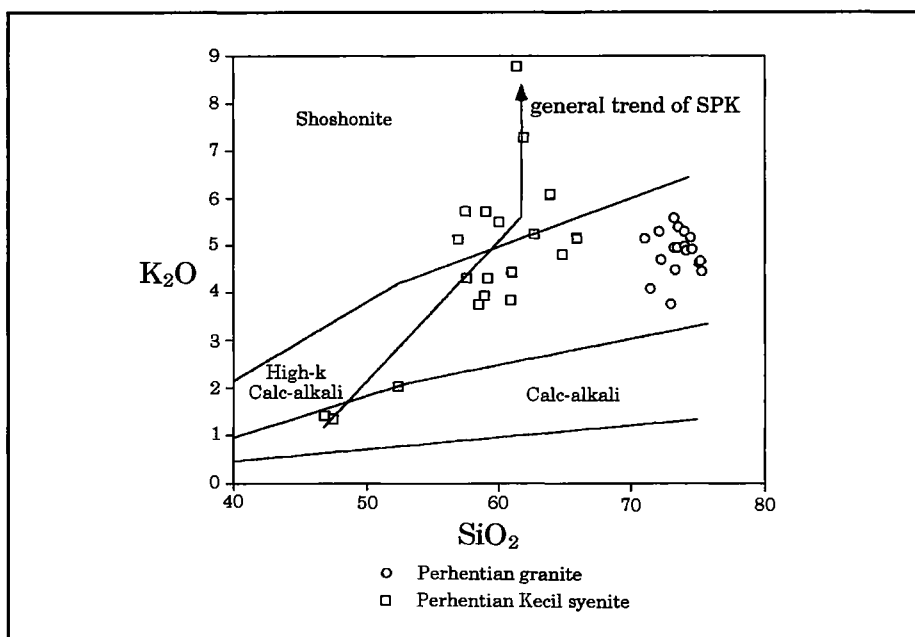


Figure 8. K₂O vs SiO₂ diagram of the Perhentian granite and Perhentian Kecil syenite.

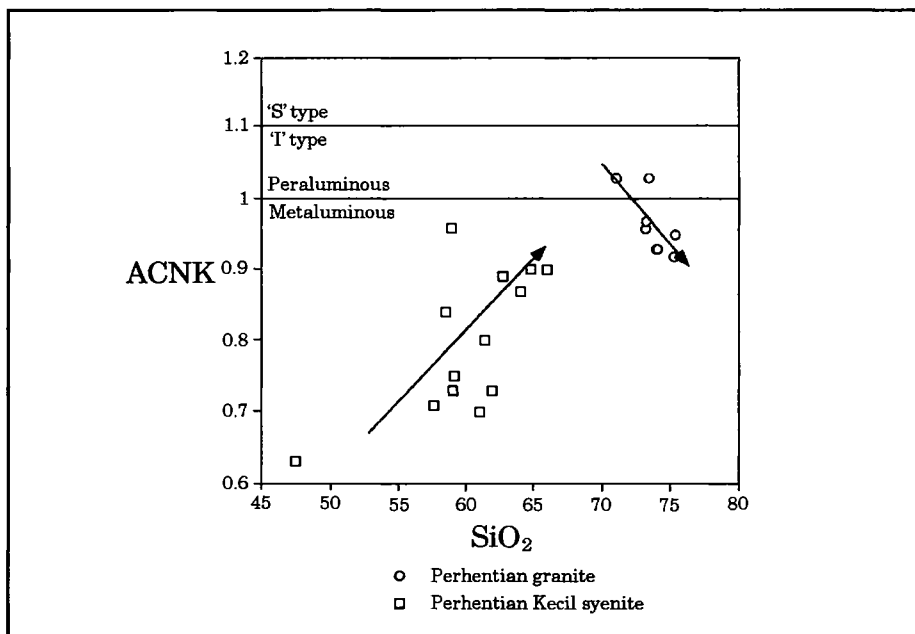


Figure 9. ACNK vs SiO₂ plot for the Perhentian granite and Perhentian Kecil syenite. Note different trends shown by the plutons. I and S type granite field after Chappell and White (1974).

3. offshoot of microgranite vein from granite to syenite (Loc: Tanjung Batu Nisan and Pasir Patani),
4. occurrence of microgranite and porphyritic rocks in the GP at the contact, which suggests that the GP magma quickly chilled against cooled SPK rocks.

More detail relative age of the rocks from the study area are shown in Table 1. The exact relationship between the gabbroic rock and the SPK is still uncertain because the gabbroic rocks are only found as *in situ* boulders. The field and petrographic study also revealed two generations of dykes in the study area. They are (1) early synplutonic dykes coeval to the SPK and (2) later dolerite dykes which post date all rocks in the study area. The latter probably have similar ages to dolerite dykes exposed in the Eastern Belt of Peninsular Malaysia.

Emplacement of the granite

The angular character of the contacts strongly suggest that the GP magma intruded along early joints or fractures of the SPK pluton. Occurrence of syenitic blocks adjacent to the contacts suggests that the granitic magma forced its way up into fractures in its roof and probably helped to detach lumps of overlying syenite. This mechanism is known as stoping (e.g. Pitcher and Berger, 1972; Hall, 1987). However, no large syenitic blocks are found, so direct evidence of large scale stoping is presently unavailable. The emplacement of the GP magma was probably late enough to chill against the contacts (cf. Pitcher and Berger, 1972). This is evident from the occurrence of microgranite and porphyry granite at all places where the contacts are found in the study area.

Relationship between SPK and GP

Petrographic evidence do not show any continuous lineage between the SPK and GP to suggest that they are comagmatic. On a QAP plot, the GP samples fall in a separate field from those of SPK. Furthermore, the rocks from both plutons are not represented in a single lineage on a QAP diagram (Lameyre and Bowden, 1984).

The fact that both SPK and GP are not comagmatic is supported by the major element geochemistry. On a K_2O vs SiO_2 diagram, rocks from both plutons show different trends which may suggest that they evolved differently. In this diagram, the SPK trend which cross different field boundaries do not suggest simple crystal-liquid fractionation as the main process that operated in the magma chamber. Other processes that might produce the observed SPK trend is magma mixing (Roberts and Clemens, 1993). A different trend of the plutons is also shown by the ACNK vs SiO_2 plot. The increasing trends show by the SPK pluton have been ascribed by Cawthorn and Brown (1976) to be due to the precipitation of metaluminous hornblende from the magma.

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PERTEMUAN PERSATUAN Meetings of the Society

Ceramah Teknik (Technical Talk)

Modern approaches to explorations in fractured reservoirs

RON NELSON

Laporan (Report)

Dr. Ron Nelson delivered the above talk on 17 July 1998 at 2:30 pm at the Shangri-La Hotel, Kuala Lumpur. The talk was attended by more than 50 participants. High Tea was served afterwards, courtesy of Schlumberger Oil Services. This is the second talk that was jointly organised by the Formation Evaluation Society of Malaysia (FESM) and the Geological Society of Malaysia. FESM is the local chapter of the SPWLA.

Dr. Ronald A. Nelson is the AAPG Foundation's Dean A. McGee Distinguished Lecturer. He is currently on a lecture tour of Asia and Australia. He has a degree in Geology from the Northern Illinois University in 1970, a Masters from Texas A & M University in 1972 and a Ph.D. from the same university in 1975. He has since enjoyed a varied career with Amoco, working in various Research, Technical and Management positions. He is currently the Geology Discipline Coach in the Exploration and Production Technology Group in Houston. His principle research interests include the technical and economic evaluation of fractured reservoirs, structural and stratigraphic styles in rift terrain, and application of structural and rock mechanics concepts to petroleum geology. He is currently a member of the Advisory Council of the AAPG, and the Chairman of the AAPG Technical Program. He is also a Past President of the Houston Geological Society.



Dr. Nelson began his talk by showing that fractured reservoirs have been an important part of the history of the petroleum industry worldwide, always challenging by their complexity and seemingly unpredictable nature. It has been difficult to accurately determine their volumes and predicting their performance over time. The talk focussed on the determination of fracture origin, quantification of reservoir properties, determining the fracture-matrix communication, recognising the reservoir type according to the fracture system, locating optimum drilling locations and well path, and developing good reservoir management strategies. Recent developments that were discussed were log characterisation, spacing estimation, fracture identification, reservoir simulation, azimuth prediction, and the effects of fracture and diagenetic history. The message conveyed was not to avoid fractured reservoirs but to use the latest techniques in delineating the reservoirs and minimising the risks involved.

Che Noorliza Lat

Geotechnical investigation of Malaysian ethylene/ polyethylene project

NG CHAK NGOON

Laporan (Report)

Mr. Ng from Subsurface Engineering, gave the above talk on Friday 7 August 1998 at the Geology Department, University of Malaya. His talk focussed on the site investigation works conducted for an industrial complex in Terengganu where geologists and engineers worked closely together to collect enough topographical, geotechnical and drainage data of the site to enable adequate and economic detailed design of the facilities in a lump sum turnkey engineering, procurement and construction contract. The site investigation works include aerial photographs interpretations, and numerous boreholes with associated field and laboratory tests. The determinations of the depths to bedrock and the groundwater table (and its fluctuations) were some of the primary objectives of the investigations. An account of the selection and use of the design parameters for the various soil strata was also presented during discussion.

The talk was attended by about a score of members and was chaired by Mr. Tan Boon Kong standing in for Mr. Muhinder Singh.

Tan Boon Kong



GEOSEA '98

Ninth Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia — Report

17–19 August 1998, Shangri-La Hotel, Kuala Lumpur

The Society conceived the idea of the GEOSEA Congress and hosted its inaugural GEOSEA Congress in 1972. The last GEOSEA Congress organised by the Society, GEOSEA V in April 1984, was held at the Federal Hotel and was a grand affair and a success. However, when it came to the Society's turn again in August this year to host GEOSEA IX at the Shangri-La Hotel, the increased number of participants, papers presented, workshops, booths and other activities clearly showed that the GEOSEA Congress has grown in size and stature and established itself as *the* Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia.

The organisation of GEOSEA IX started very early, in fact just after the last GEOSEA in 1995 at the Philippines. Things started at a slow pace initially but slowly warmed up and intensified as more papers trickled in for presentation from all the GEOSEA core countries.

Despite the economic down turn, the Council decided that “the show must go on” and this prompted the Organising Committee to change its organisational strategy, making sure all efforts are made to see that the members from the core countries will be in KL in large numbers not only to present papers but also participating in all other programmes drawn up. Special funds were made available to ease the burden on certain participants and group travel by coaches were also arranged for the neighbouring countries.

From the experiences gained from organising the Annual Petroleum Geology Conferences and Annual Geological Conferences and joint organisation of international conferences with the Circum-Pacific Council for Energy and Mineral Resources (CPCEMR) and the American Association of Petroleum Geologists (AAPG), the Society has shown again that it is highly capable of successfully organising international conferences.

The organising chairman Prof. Hamzah Mohamad and members of Organising Committee, in particular Dr. T.T. Khoo, the Scientific Programme Chairman, should be highly commended for the efficient organisation of this highly successful GEOSEA IX, a befitting finale to the GEOSEA Congresses for this millennium and we look forward to the first GEOSEA Congress of the new millennium in Jakarta in the year 2001.

G.H. Teh

Ninth Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia — GEOSEA '98
17 – 19 August 1998 • Shangri-La Hotel, Kuala Lumpur, Malaysia



GEOSEA '98

**Welcoming Address by Prof. Dr. Ibrahim Komoo,
President, Geological Society of Malaysia**

17-19 August 1998, Shangri-La Hotel, Kuala Lumpur

Terima kasih Tuan Pengerusi Majlis,

*Yang Berhormat Dato' Seri Dr. Lim Keng Yaik
Menteri Perusahaan Utama Malaysia,*

*Yang Berbahagia Datuk Harun Siraj
Ketua Setiausaha, Kementerian Perusahaan Utama Malaysia,*

*Yang Berusaha En. Chen Shick Pei
Ketua Pengarah, Jabatan Penyiasatan Kajibumi Malaysia,*

*Yang Berusaha Profesor Dr. Hamzah Mohamad
Pengerusi, Jawatankuasa Penganjur Kongress GEOSEA '98 Kuala Lumpur,*

Dato' Seri, Datuk, Dear Participants, Ladies and Gentlemen,

On behalf of the Geological Society of Malaysia I would like to welcome all of you to the Regional Congress on Geology, Energy and Mineral Resources of South East Asia. We are particularly privileged today to have with us Dato' Seri Dr. Lim Keng Yaik, Minister of Primary Industries. Dato Seri's Ministry regulates the primary industries in this country, including tin, rubber, palm oil and timber.

Tin has been an important commodity for this country ever since the first time it was discovered. It was a major income-generating commodity, until several years ago. For this reason the geologists' task and contribution to national development have always been under the auspices of this very important Ministry. So your presence here, Dato Seri, is especially significant to us.

The Geological Society of Malaysia is honoured to host this Ninth Congress. This is the third time we are hosting it since its inception. This triennial Congress is hosted by the members of the GEOSEA Union and it is particularly meaningful for us to have it again here because the idea of this Regional event was conceived in Malaysia and we organised the first Congress.

The Geological Society of Malaysia has worked very hard to make sure that this Congress is a success. For this we are grateful to Professor Hamzah, the organising committee chairman, who, together with a great team, has managed to gather 500 participants, 150 of whom are speakers, and 180 papers for the proceedings. The scientific programme will consist of plenary sessions, technical sessions, field trips and training courses.

Because there are many papers which need to be presented in the very short time that we have, the technical sessions will be broken up into three parallel sessions everyday. These parallel sessions will be divided into seven subject matters. We are well aware that participants want to attend every technical session that they are interested in. For this reason we have arranged the parallel sessions in such a way that as many people will benefit optimally and not miss their favourite subjects. But, of course, we will not be able to cater for every individual and

some of you may have to make some hard choices in the next few days. We apologise for this, but I hope you will forgive our limitations.

The big number of participants seen at this Congress is an indication of the importance attached to it in this region. Representation from 18 countries, covering not only the Asian region but from all over the world, also indicates the relevance of this region to the countries outside. This means that in our deliberations, we shall not only gather information and discuss issues crucial to the region, but we shall be able to see the global perspective as well.

While regional issues affect us closely, we cannot ignore the international scenario because of the globalisation that has taken place. I'd like to give you an example of how geological issues permeate the entire global market. When gold was discovered in Busang, Indonesia, North Americans made the most money from the share market. But, of course, they also made the biggest losses when it was found that the geological data had been tampered with and the whole business was a fraud.

Ladies and Gentlemen,

As an effort to bring the importance of geology to the decision makers, the Geological Society of Malaysia and the Institute of Geology Malaysia are supporting the Regional Dialogue on Geoinicators for Sustainable Development held in conjunction with the Congress. This Dialogue will be organised by the Institute for Environment and Development, Universiti Kebangsaan Malaysia, the Geological Survey Department and the Commission on Geological Sciences for Environmental Planning of the International Union of Geological Sciences.

This is the first time The Geological Society of Malaysia is involved in the effort to highlight the significance of geological parameters in achieving sustainable development. I am delighted to report that the response from our target groups, which include government agencies and environmental groups, has been overwhelming. In fact, we now need to limit participation. But this clearly indicates that the relevant decision making bodies are ready to listen from us geologists on how to take geological considerations into account when planning for development. I would like to invite some of you to take part in this Dialogue to provide the expert input necessary.

Ladies and Gentlemen,

I began this speech by indicating the importance of tin mining as a primary industry. And that is why geological issues are handled by the Ministry. However, if you look at the various other important sectors in the country, we can also see that geology is important in many other respects.

Whenever a crisis occurs, the geological input becomes critical. I'd like to describe several recent incidents in Malaysia to illustrate this point. At the Highland Tower Tragedy, the state of the offending slope became a matter of crucial importance and the geologists were called to make an assessment. At the Genting Sempah debris flow tragedy, information on the nature of the residual soil in the hilly terrain was vital in determining the cause. Again the geologists were called in to map the area. The Pos Dipang Debris Flood tragedy which engulfed an Orang Asli settlement was the result of numerous landslips in the mountainous area. Once again, the geologists had to carry out the survey.

These geohazards reveal the significant roles of the geologists, which the public is beginning to understand today. But the recent water crisis in the State of Selangor, also needed the assistance of geologists, even though all matters pertaining to water are controlled by a special agency. This is because, due to the water shortage, an effort was required to look for underground water. Here again, the geologists are well equipped to handle the situation.

I am sure you are beginning to see the multi-faceted role geologists play. There are many experiences in our region and all over the world, where in issues of national significance for safety and security, the geologist's involvement is crucial. It is, therefore, not enough for us to look at our profession from our own specialised viewpoint. We urgently need to seriously look at our contribution beyond traditional boundaries. When we cooperate with people in other specialised fields, such as planning, engineering and environment, (pause) and other sectors, such as infrastructure development, manufacturing, tourism and agriculture, we will be able to chart the geologist's greater role in nation building.

Because of the multi-sectoral demands for geological inputs, and because our contribution is specialised, there is a vital need to regulate the profession in order to safeguard the public interest and to maintain standards as well as our integrity. For this reason, we must recognise a professional group, which is established by law. Several countries have already moved in this direction.

Through the Institute of Geology Malaysia, of which the Director General of the Geological Survey Department is president, we have formulated a draft of the Geologist Act. This Act will regulate the profession and prevent non-specialists from carrying out the tasks of the geologist and thereby compromise the validity and importance of the geological input. Inaccuracies in the data produced can jeopardise public safety or even make some projects economically nonviable because of the escalation in cost. The main philosophy of this Act is not to encroach on other professions, but rather to protect ours, in order that we can contribute in the most effective fashion.

Yang Berhormat Dato' Seri Dr. Lim, this Act has been submitted to your Ministry for consideration some three years ago. While we understand that the process of legislation cannot be done overnight, this issue is now critical. We need your support to carry the Act through to its enactment, because it is imperative that the geological contribution be formalised. From this, the nation will be able to harvest the maximum benefit from the geological profession.

I would like to thank Yang Berhormat Dato' Seri once again for taking the time to be here with us today and especially for acting as the patron of this Congress. On behalf of the Geological Society of Malaysia, I would also like to thank all collaborators, sponsors and companies who have participated in the exhibitions, for helping us make this a success. Special mention must be made of Professor Hamzah's committee and all subcommittees for their courageous efforts in organising the Congress during these difficult times.

To all participants, who have come from near and far, I am delighted and honoured to be in your company for the next few days. I hope you will bring back new knowledge, new friendships and sweet memories that you will treasure. Thank you.

GEOSEA '98

Opening Address by Y.B. Dato Seri Dr. Lim Keng Yaik,
Minister of Primary Industries Malaysia

17-19 August 1998, Shangri-La Hotel, Kuala Lumpur

Tuan Pengerusi Majlis

*Y. Bhg. Encik Ahmad Zaini Muhamad
Timbalan Ketua Setiausaha II
Kementerian Perusahaan Utama Malaysia*

*Y. Berusaha Prof. Dr. Hamzah Mohamad
Pengerusi Jawatankuasa Penganjur
Kongress GEOSEA '98*

*Y. Berusaha Prof. Dr. Ibrahim Komoo
Presiden, Persatuan Geologi Malaysia*

Dato'-Dato', Tuan-Tuan dan Puan-Puan,

Distinguished Guests, Ladies and Gentlemen,

Selamat pagi dan salam sejahtera kepada para hadirin sekalian. Terlebih dahulu saya ingin mengucapkan terima kasih di atas penghormatan yang diberikan kepada saya untuk berucap dan seterusnya merasmikan Kongress GEOSEA '98 pada hari ini.

It is indeed an honour for me to be invited by the Geological Society of Malaysia to deliver the Opening Address to the participants of this Ninth Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia, popularly known as GEOSEA '98.

First of all I would like to congratulate the Geological Society of Malaysia, the collaborating and co-operating organisations for the efforts that they have undertaken in the preparation for the hosting of this Ninth GEOSEA Congress, which is being held for the third time here in Kuala Lumpur, Malaysia.

I was informed that more than one hundred foreign participants are with us this morning. To all our foreign guests I greet you with "Selamat Datang Ke Malaysia". In addition, about three hundred local participants are also attending this congress. To you also I extend my warmest welcome. I understand that the foreign participants come not only from our close neighbours like Indonesia, Thailand, The Philippines, Brunei and Vietnam, but also from countries such as China, Japan, India, Pakistan, Australia, United Kingdom, France, United States, Guam, Canada, Papua New Guinea, Iran and Russia. This long list indicates how intensely this part of the world is being scientifically studied, and also proves that there does exist international collaboration and a wide area of research in this region.

Ladies and Gentlemen,

With the next Millennium just round the corner, the time is just right for the geologists to reevaluate and redefine their respective roles in the various sub disciplines. As you may be well aware, the term geology was coined about 200 years ago, and soon became the youngest branch of knowledge among the natural sciences. Although initially it was too descriptive in nature and

emphasised more on the understanding of the planet earth, especially its composition and processes, over the last few decades the field of geology has evolved with the needs of the times and has responded fairly well to the changes in the socio-economic scenario of our dynamic world. Today, more and more members of the general public are beginning to appreciate the significant and direct contribution of geology to the betterment of the quality of life, which is effected through the various applied branches of geology, such as geochemical exploration, hydrogeology, economic geology, petroleum geology, and engineering geology. I believe that this may be the appropriate approach in the application of the geological sciences if they are to be of any benefit to mankind.

In view of the linkages that exist between mineral and energy resources on the one hand, and the wealth formation and economic strength of a nation on the other. I find that the organising of this GEOSEA '98 Congress is indeed very timely. The theme chosen for the Congress, namely "The earth sciences in support of growing Southeast Asian economics", is also meaningful and relevant, especially so at this particularly difficult time when many of the Asean countries are experiencing an unprecedented economic down turn. I believe therefore, that the objective of this Congress may be achieved to a certain degree, if a significant role could be identified for the geologist to undertake that would contribute to the economic recovery of these countries.

I was informed that the Organising Committee had started the preparation of this big event soon after the closing ceremony of the Eighth GEOSEA Congress which was successfully hosted by the Philippines in 1995, that is during a period where most of the Southeast Asia countries were still enjoying robust economic growth. However, it is rather unfortunate that the one decade of resilient economic growth enjoyed by these countries, has declined significantly since about a year ago. Thus the present economic scenario may provide a good opportunity for the geoscientists in this region to reflect on their role and responsibility. I feel that they should not only be playing a supporting role, but also be more proactive in developing programmes that would contribute to promoting the economic growth of the country. More specifically, they should be contributing to the development of a country's mineral and energy resources which are essential ingredients for industrialisation and national development.

This task of the earth scientists can be accomplished in two ways. First, a more intensive effort should be undertaken to identify and assess the mineral endowment of the country more accurately. This would lead to the increase in the production of metallic minerals, precious metals, industrial minerals, as well as petroleum, gas and coal. This could be done by adopting more aggressive exploration programmes combined with the application of the state-of-the-art technology by government agencies as well as by private companies to locate new mineral deposits, oil and gas fields. We should consider this move as a "back to basics" approach. We should always remember that although geological sciences have progressed and developed significantly, the prime role of geoscientists still remains the same, namely to undertake basic geological and geochemical surveys to locate mineral resources that would lead to mining activities, which would in turn contribute to the economic development of the country and hence the subsequent betterment of the quality of life of the people.

For example, to meet this challenge, the Geological Survey Department under my ministry, as the national geological survey of Malaysia, is actively involved in carrying out basic geochemical survey programmes as a first level exploration to identify and delineate areas that have potential for minerals. This information is very essential to the potential investors who may be interested to select the areas for the undertaking of further detailed exploration with a view to assess the economic viability of the mineral deposits. It is based on this reassessment that decisions are made as to whether the deposit is worth mining. Similarly the department has in

the past decade carried out an extensive programme to identify industrial mineral resources such as ball clays, kaolinitic clay, silica sand, limestone and granite. The development of these resources supply the much needed raw materials that are required for a wide range of mineral based manufacturing industries.

Although Southeast Asian countries in general receive high rainfall, nevertheless due to rapid urbanisation, diminishing water catchment areas, and the occurrence of recurrent dry spells, groundwater becomes an important source of water in many places. In some areas it acts as a supplementary source of water. This important role of groundwater had been felt only too acutely during the recent prolonged dry spell in some of the states in Malaysia under these circumstances, the geologist is given the task of identifying groundwater resources which could be developed to supplement the much reduced and inadequate surface water supply.

Similarly, geologists in the engineering geological field must use their expertise more widely in order to give inputs of a geotechnical nature before large scale infrastructure and other development and construction projects are undertaken. This is to prevent or avert catastrophies such as rock and land slides, slope and foundation failures and thereby prevent or reduce damage to properties and loss of lives.

The second approach for the geologists, which has longer term objective is to encourage more focused, and problem solving basic researches in all major fields of the geosciences. The findings of these basic researches must meet the important criteria, that is their ability to be readily utilised by the applied arms of the geosciences, that is in the economic, engineering and petroleum geology. In short, the findings of basic researches should satisfy two requirements. First, to fulfil the traditional needs of generating knowledge, and secondly to catalyse and facilitate applied research which can contribute to more effective exploration of our mineral and energy resources. I believe many papers scheduled for presentation in this Congress are relevant to these objectives.

Ladies and Gentlemen,

The prerequisite of high quality basic researches is to have sufficient number of geoscience graduates to carry on specific tasks under the supervision of more senior and experienced researchers. The student quality normally relates to the quality of the geoscience curriculum. The ever increasing demand for high quality graduates also widens the role of the academia. The immediate challenge to them is to formulate a refined geoscience curriculum with the following quality: the furnish of relevant and up to date knowledge; adapability to sudden changes in the market demand, the creation of clear linkages between knowledge and practical applications, and the development of basic skills in the specialised area, including skills in scientific communication.

We cannot deny the fact that some content of our present curriculum needs revision. Nowadays, there is a greater degree of public awareness towards the need to preserve and manage the environment as compared to thirty or forty years ago. How do we address the issue of environmental protection when we are talking about exploration for minerals and groundwater, and mining? The other important issue is of course the effect of other technological advances on the geosciences. How do the rapid advances in computer and information technology affect the way we gather, process and evaluate our data? Should we rely solely on the triangulation method to locate a position on a map, while we have the most sophisticated and accurate satellite aided global positioning system? It appears that the advances made in technology seem to have an impact on almost all aspects of the activities undertaken by a geologist. In this regard members of the geological profession, like any other professionals or administrators, need to keep abreast of all these developments in order to work better and faster.

Ladies and Gentlemen,

There are diverse issues that need to be addressed and solutions have to be identified. I am very pleased to learn that this is exactly what the GEOSEA '98 Congress is trying to achieve, through its scientific sessions and other activities. For that, I would like to congratulate the Organising Committee for the comprehensive agendas and the careful arrangement of the various programmes. To all the participants, I wish you all the best and hope that you would have fruitful deliberations during the Congress.

Finally, to all the foreign participants, I hope you would enjoy the sights of Kuala Lumpur and the other places during your geological trips and the sight-seeing tours that have been specially organised for you. I would like to wish all of you a very pleasant stay in Malaysia and hope that you would take back fond memories of our lovely country.

And on that note, I have great pleasure in declaring open this Ninth Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia.

Terima kasih.

GEOSEA '98

**Closing Remarks by Organising Chairman GEOSEA '98,
Prof. Dr. Hamzah Mohamad**

17–19 August 1998, Shangri-La Hotel, Kuala Lumpur

Thank you very much Mr. Chairman,

*Prof. Dr. Ibrahim Komoo,
President of Geological Society of Malaysia*

*Mr. Yanto Sumantri,
President of Ikatan Ahli Geologi Indonesia*

*Mr. Phisit Dheeradilok,
President of Geological Society of Thailand*

*Mr. Romeo Almeda,
President of Geological Society of the Philippines*

Participants, Ladies and Gentlemen.

I would like to present to you a brief summary on what we have achieved through this GEOSEA '98 Congress.

Participation

According to our record, we have about 500 registered participants; 300 of which are Malaysians and the rest are foreign participants.

The foreign participants represent sixteen countries and are as follows: Indonesia, Thailand, Philippines, Vietnam, Laos, Papua New Guinea, Japan, China, Australia, New Zealand, United States of America, Canada, United Kingdom, France and Iran.

We, the Organising Committee feel very satisfied with the participation — not only on the number but the involvement of countries outside Malaysia as well.

Scientific Programme

We are glad to note that all the 11 sessions we planned for the Congress have gone smoothly, without any fatal disruption. The number of papers actually presented is 156, i.e. 22 papers short of the number listed in the programme, due to the failure of authors to turn up at this Congress. The break-down of presented papers according to sessions is as follows:

Plenary Session	3
Mineral Resources	20
Petroleum & Energy Resources	23
Environmental Geology	14
Engineering Geology	15
Regional Tectonics	17
Geoscience Education, Research and Development	9
General Geology	17

IGCP 383	13
IGCP 350	6
Poster Session	19

Again, the Organising Committee is greatly satisfied with the number of papers presented, especially on the wide spectrum of geoscientific knowledge they covered.

Fieldtrips

The pre-congress fieldtrip *Geology of Kuala Lumpur and the surrounding area* was attended by 11 participants.

Two post-congress fieldtrips, which will depart immediately after this closing ceremony also attracted a handsome number of participants; they are the *Mesozoic-Cenozoic of Central West Sarawak fieldtrip*, 13 participants, and *Geology of the Langkawi Island fieldtrip*, 9 participants. However, we have to call off the other two fieldtrips due to lack of sufficient response. They are the *Stratigraphy and Tectonics of Sabah* and *Geology of the Baram delta in North Sarawak & Brunei fieldtrips*.

Training Course

I was informed that the pre-congress training course on *Sense Indicators on Fault Planes and in Fault Zones* was well attended and successfully organised.

Regional Dialogue

To our surprise the *Regional Dialogue on Geoinicators for Sustainable Development*, scheduled for tomorrow at Universiti Kebangsaan Malaysia, Bangi has attracted some 70 participants, including about a dozen participants from this Congress.

Exhibition

As you can see, the Congress had been made more lively by the presence of many exhibitors. Out of the 22 booths available, 21 were taken up by 14 companies at the first offer. To promote geoscience in Malaysia and the region, we have allocated "free of charge" a booth for that purpose. I am particularly happy to note that the Geological Survey of Malaysia, Malaysian Institute of Geology, Universiti Kebangsaan Malaysia and University of Malaya have benefited from the booth.

Sight-Seeing Tours

Despite a rather small number of participants, we still managed to arrange two city tours, and a Malacca tour during the Congress.

Publication

I was informed by the Publication Committee that until now we have received about 30 full manuscripts. To enable us to publish the papers presented in this Congress as a special issue of our *Bulletin Geological Society of Malaysia* at the end of this year, please make an effort to submit your full manuscripts before 31st October 1998.

Apart from what I have reported, many of you may not be aware that during the three-day Congress, four business meetings were successfully held for IGCP 350, IGCP 383, IGCP 411 and the GEOSEA Union. The important agenda in the Geosea Union Meeting held yesterday was to elect the host country for the 2001 GEOSEA. I will leave it to Prof. Dr. Ibrahim Komoo to announce the outcome later.

Ladies and Gentlemen,

Organising a Congress is something like building a house. While a house cannot be built without many components, a Congress will never have materialised without the support and help from individuals, groups, and even institutions.

As for GEOSEA '98, it is almost impossible for me to mention every name here, but always remember, they have contributed one way or another toward the organisation of this Congress, and their roles are equally important. Please refer to the Programme and Abstracts volume for the full list of the individuals, groups and institutions involved.

In particular, allow me to thank and appreciate the contribution of the following:

1. The Geological Society of Malaysia for the full confidence given to us to organise such a big and important scientific meeting,
2. The authors, speakers and presenters, for they are the building stones of the Congress,
3. Our three keynote speakers for the Plenary session,
4. Conveners and co-conveners, who have managed their sessions,
5. The Session Chairmen. We are aware that to ensure a session is completed within time allocated is always a difficult task,
6. The staff and students from Universiti of Malaya and Universiti Kebangsaan Malaysia who have handled the audio-visual equipments very competently, and
7. Mrs. Anna Lim and her crew who have done a great job and practically being involved in almost all aspects of the organisation. In fact, her "loud and clear" voice has made the conference lively all the time.

We would also like to thank:

8. The Geological Societies of Indonesia, Thailand and the Philippines for their effort to encourage their members to participate in this Congress.
9. The IGCP 383 lead by Dr. Findlay and IGCP 350 lead by Dr. Okada for their offer to hold their project symposia as a part of GEOSEA '98,
10. Prof. Tjia Hong Djin for running the training course.
11. Donors,
12. Sponsors, and
13. Exhibitors

Last but not least, I want to personally thank members of my own committee and subcommittees who have been working really hard, especially for the last few months in order to ensure everything is going according to plan. Please refer to their names in page 2 of the Programme and Abstract volume.

Ladies and Gentlemen,

No matter how good we planned to achieve a defect-free Congress, shortcomings and inconveniences may have cropped out here and there during the Congress. If these ever happen to you, please accept our sincere apology because they are beyond our control and unforeseen to us.

With these remarks, I wish you the best of luck.

Thank you.

GEOSEA '98

**Closing Speech by Professor Dr. Ibrahim Komoo,
President, Geological Society of Malaysia**

17-19 August 1998, Shangri-La Hotel, Kuala Lumpur

*Mr. Yanto Sumantri, President,
Ikatan Ahli Geologi Indonesia*

*Mr. Phisit Dhee-ra-di-lok, President,
Geology Survey Thailand*

*Mr. Romeo Almeda, President,
Geology Survey Philippines*

*Professor Hamzah,
Chairman of the Organising Committee*

Esteemed Ladies and Gentlemen,

We have now come to the last session of the Congress and it is my pleasure to present my own reflections.

You will agree with me that it has been a hectic three days for all of us. There were so many papers to choose from. To fit in as many papers as possible, we began our sessions at 8 am and ended after 6 pm. But the attendance at the early morning and evening sessions was consistently high. Needless to say, the other sessions also saw almost full attendance. Through out the three days, I saw a lot of enthusiasm and lively discussions, and many of you used the beautiful facilities of this hotel to network. To me, this indicates that the Congress has been a success and I presume you are all happy.

For this, we should thank Professor Hamzah and his various committees for their untiring efforts in keeping the Congress running smoothly. Please, let us give them a big applause.

Of course, I should also say a big thank you to each and everyone of you for your participation. Without you, the Congress would not have achieved the prestige it now has. Your commitment makes up the heart and soul of the Congress. For this, I, on behalf of the Geological Society of Malaysia, would again like to express our heartfelt thanks.

Ladies and Gentlemen,

You are all aware that we held the GEOSEA Union meeting last night. This time the meeting was able to gather all member presidents, representing Indonesia, Philippines, Thailand, and Malaysia. There were observers from Vietnam, Laos and Papua New Guinea. The discussions were extremely constructive and it is my duty now to report to you the outcomes of that meeting.

First of all, the meeting unanimously endorsed the Manila Declaration. For those of you who are unfamiliar with it, this Declaration was proposed at the GEOSEA Union meeting in Manila in 1995. The over-riding spirit behind it is to foster greater cooperation amongst member countries and to enhance individual capabilities.

The meeting also agreed to the concept of a permanent secretariat for GEOSEA, as it was felt that it is necessary to establish continuity of communication between member countries. This secretariat will be a focal point for inquiries, coordination of congresses and dissemination of information. It is my singular pleasure to announce that Malaysia has been selected as this permanent secretariat. We are honoured by this decision and we regard it as a great privilege to be able to serve the membership in the way that will take the Union from strength to strength.

I am delighted to announce that the meeting has chosen Ikatan Ahli Geologi Indonesia to host the GEOSEA 2001 Congress which will be held in Bandung. Please join me in thanking them for agreeing to undertake the task.

Like me, I am sure you look forward to this first meeting of the new millennium.

My duty ends here, and before I leave the rostrum allow me to take this opportunity to wish all of you a safe journey home.

I would now like to hand over the Union flag to the President of Ikatan Ahli Geologi Indonesia, Mr. Yanto Sumantri.

GEOSEA '98 Photos Caption to photos

1. Y.B. Dato Seri Lim being greeted on arrival.
2. A light moment at tea.
- 3-4. At the registration desk.
5. GSM President Ibrahim Komoo with the Welcoming Address.
6. YAB Dato Seri Lim with the Opening Address.
- 7-18. The big turnout at the Opening Ceremony.
- 19-21. YAB Dato Seri Lim visiting the booths.
22. Busy, busy at the Society's booth.
23. Visitors to the booths' area.
24. A demonstration at the Landmark booth.
- 25-26. Prof. Tjia with his Training Course.
27. B.K. Tan with his Keynote Paper.
28. Mr. Katz presenting his Keynote Paper.
29. A.R. Berger with his Keynote Paper.
30. I. Metcalfe on the Palaeo-Tethys.
31. J. Milsom on the Banda Sea.
32. Session Chairman S. Hada getting things going.
33. Geoscience Education Panelists.
34. F. Fuller on palaeomagnetism.
35. E. Platzman with her presentation.
36. Carla Dimalanta with her joint paper.
- 37-39. Lunch time.
40. Agus Guntoro on the Banggal-Sula microcontinent.
41. E. Honza on the Lupar Fault Zone.
42. Hamzah Mohamed with his paper.
43. Pornsawat Wathanakul on Geoscience Education in Thailand.
44. Chen Tingyu presenting his paper.
45. Emmy Suparka on Geoscience Education in Indonesia.
46. C.Y. Lee with his paper.
47. C.P. Lee on science and faith.
48. A.D. Wirakusumah chairing the Engineering Geology session.
49. J.K. Raj on stability of slope cuts.
50. Umar Hamzah on shallow seismic reflection.
51. Abdul Rashid Abd. Aziz with his joint paper.
52. Abdul Ghani Rafek on refraction seismics.
53. A.K. Askury on the travelling microscope.
54. Tan Boon Kong with his presentation.
55. R.T.C. Ancog on Geoscience Education in the Philippines.
56. Ahmad Tajuddin with his paper.
57. S. Bunopas with his presentation.
58. S. Singharajwarapan on the Nan River suture.
59. C. Chonglakmani on the Triassic of Thailand.
60. Zaiton Harun on the Bok Bak.
61. H.D. Tjia with his presentation.
62. Sun-Ling Chung on the Indosinian orogeny.
63. G.P. Yumul Jr. with his presentation.
64. Manomay Vilaihongs on Geoscience Education in Laos.
- 65-67. Cocktail — Hosted by Western Atlas.
68. Wang Yipeng on the Tibet Plateau.
69. G.L. Kirillova on the sedimentary basins of SE Russia.
70. T. Sakai with his paper.
71. H. Fontaine chairing his session.
72. Baba Musta on geochemical behaviour of heavy metals.
73. Felix Tongkul on Paleogene sedimentary rocks.
74. R. Murphy with his Keynote Paper.
75. Chuan Yin on AVO study
76. J.R. Gaither on the Mekong Basin.
77. Ong Duen Woei with his joint paper.
78. Abdul Hadi with his paper.
79. Ismail Che Mat Zin listening to a question.
80. F. Matsuda on computer simulation.
81. Tran Van Tri chairing his session.
82. P. Kohpina on heavy mineral placers.
83. J. Ringis with his presentation.
84. R. Wust on peat accumulation.
85. G.H. Teh on gold deposits in Peninsular Malaysia.
86. B. Ratanasthien with her paper.
87. S. Intasopa on corundums of S.E. Asia.
88. T. Nuchanong on gold in Thailand.
89. Khin Zaw with his paper.
90. Fateh Chand with his presentation.
91. Mohd. Hatta on groundwater resources.
92. Md. Shahid Ayub on isotope hydrology.
93. Mohd. Anuar Md. Razali on hot springs.
94. Jamaludin Othman with his paper.
95. Marilah Sarman on tourism geology.
96. B. Sulistijo with his presentation.
97. C. Chamid with her comments.
98. V. Pisutha-Arnond on corsilzirpite.
99. Phan-Trong Trinh on ruby in the Red River.
100. Majeed Faizal on mass movements.
101. S.B. Harper with his paper.
102. S. Muhrizal with his joint paper.
103. Lye Yue Choong on the Raya Yong Field.
104. Meh Jabeen Zainuddin on the D35.
105. B. Ouzani with his paper.
106. P.M. Lloyd on chasing channel sands.
107. P. Crevello on reservoir definition.
108. M.A. McCaffrey on Malay Basin oils.
109. Andang Bachtiar on the Bajau area.
110. P. George with his joint paper.
111. M. Johansson on the Miocene Plateau Formation.
112. A. Mansor with his presentation.
113. Y. Sumantri with his Keynote Paper.
114. T.T. Khoo on ceramic sherds.
115. Abd. Rahim Samsuddin with his paper.
116. R. Pena with his presentation.
117. J.J. Jaegar on rodents of Thailand.
118. Ibrahim Amnan with a joint paper.
119. M. Fujikawa on cephalopods from Loei.
120. Basir Jasin on Jurassic radiolaria.
121. Wan Fuad on REE patterns.
122. Mohd Shafeea on Permian brachiopods.
123. R.H. Findlay with his presentation.
124. V.H. Jensen with his paper.
125. A. Uromiely on landslide hazard zonation.
126. Mario Aurelio with his paper.
127. Yao Daquan with his presentation.
- 128-135. Interested crowd at the Poster Session.
- 136-137. IGCP Meeting.
138. Hamzah Mohamad with his address at Closing Ceremony.
139. Y. Sumantri — next GEOSEA host Chairman.
140. Ibrahim Komoo handing over the GEOSEA flag to Y. Sumantri.
- 141-142. The good turnout at the Closing Ceremony.
- 143-144. GEOSEA Secretariat Meeting.
145. A group photo — the Thai delegation.
146. The Philippine delegation.
147. Finally, the Indonesian delegation, the next hosts.

GEOSEA '98

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NINTH REGIONAL CONGRESS ON GEOLOGY, MINERAL AND ENERGY
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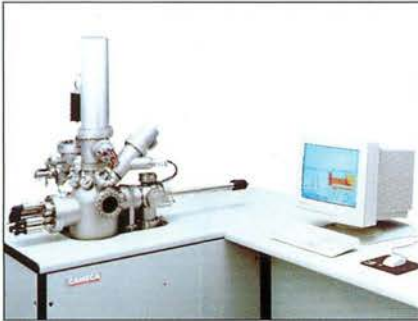
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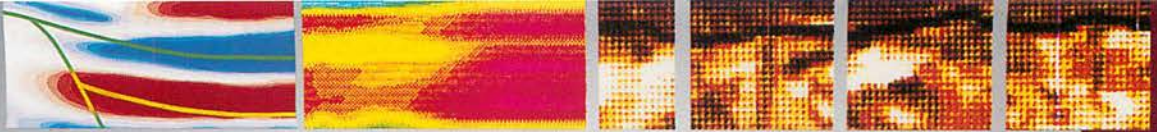
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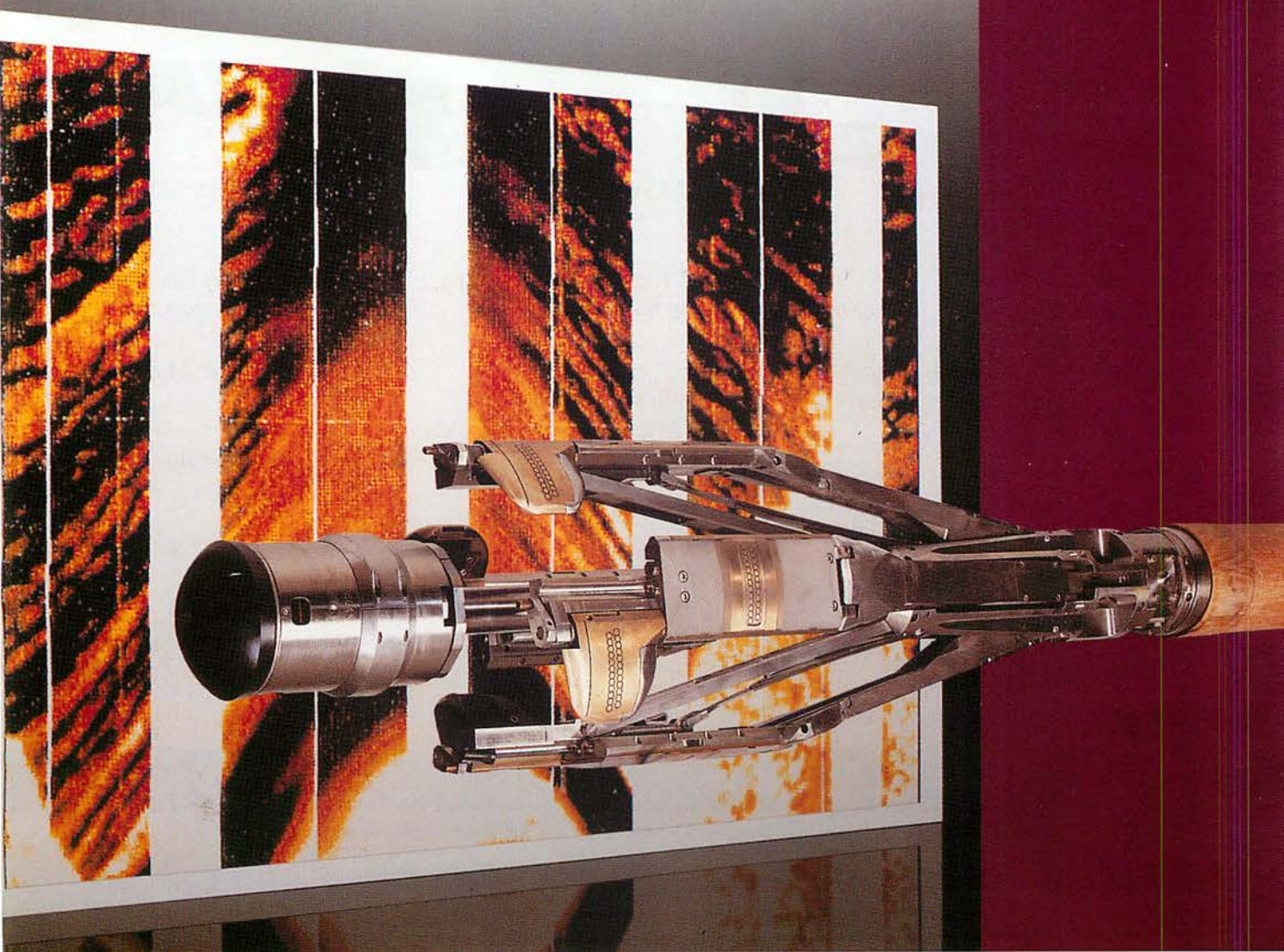
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Common Rocks of Malaysia

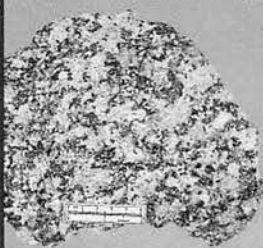
A full colour poster illustrating 28 common rocks of Malaysia. With concise description of the features and characteristics of each rock type including common textures of igneous, sedimentary and metamorphic rocks.

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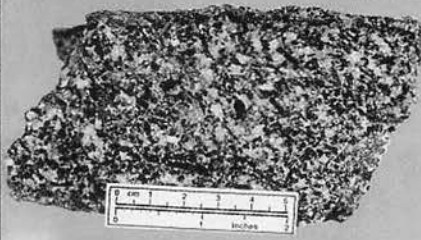
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COMMON ROCKS



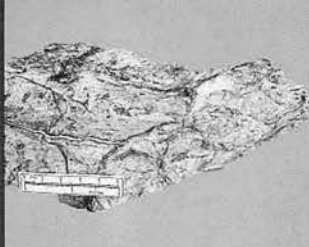
Granite (Tampin, Negri Sembilan)



5. Diorite (Kg. Kemahang, Kelantan)



6. Basalt (Segamat, Johor)



Serpentinite (Raub, Pahang)



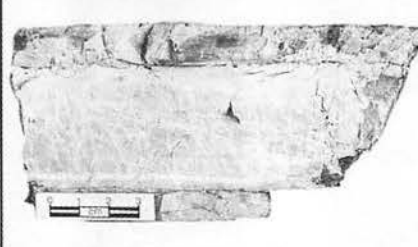
12. Pegmatite (Bukit Mor, Johor)



13. Conglomerate (Pulau Redang, Terengganu)



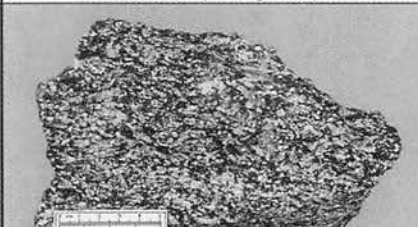
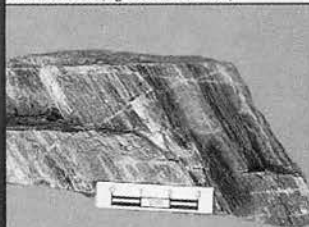
Mudstone (Kg. Laloh, Kelantan)



19. Chert (Nenering, Kedah)



20. Coal (Batu Arang, Selangor)



Cheques, Money Orders or Bank Drafts must accompany all orders. Orders will be invoiced for postage and bank charges. Orders should be addressed to:

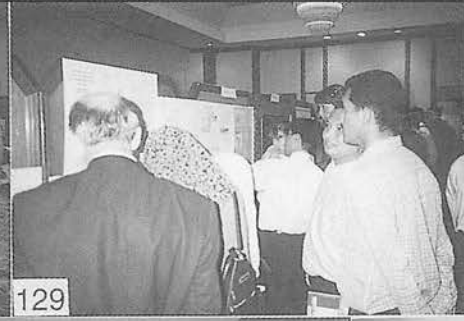
ORDERS

The Hon. Assistant Secretary
 GEOLOGICAL SOCIETY OF MALAYSIA
 c/o Dept. of Geology, University of Malaya
 50603 Kuala Lumpur, MALAYSIA

GEOSEA '98



GEOSEA '98



GEOSEA '98

Ninth Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia — Programme
17–19 August 1998, Shangri-La Hotel, Kuala Lumpur

Monday 17 August 1998

Sabah Room

OPENING CEREMONY

- 09:30 : **Welcoming Address by Ibrahim Komoo**
President, Geological Society of Malaysia
- 09:40 : **Opening Address by Y.B. Dato' Seri Dr. Lim Keng Yaik**
Minister of Primary Industries Malaysia

10:00–10:30 : **Tea Break**

Plenary Session

Chairman: Ibrahim Komoo (*President, Geological Society of Malaysia*)

- 10:30–11:00 : **B.K. Tan**
Paper 1 Geosciences research and development needs in Southeast Asia
- 11:00–11:40 : **M.B. Katz**
Paper 2 Demand and supply for geoscientists in Southeast Asia for the 21st century
- 11:40–12:20 : **A.R. Berger**
Paper 3 Environmental well-being — the contribution of geoscience

12:20–14:00 : **Lunch Break**
Host: Schlumberger (M) Sdn. Bhd.

Sabah Room

Regional Tectonics

Chairman: S. Hada (*Kobe University, Japan*)

- 14:00–14:20 : **I. Metcalfe**
Paper 1 The Palaeo-Tethys in East Asia
- 14:20–14:40 : **M. Fuller et al.**
Paper 2 Paleomagnetism of Borneo and surrounding regions
- 14:40–15:00 : **E. Platzman**
Paper 3 Large scale constraints on the kinematics of tectonics escape using paleomagnetic analysis

15:40–16:00 : **Tea Break**

Chairmen: A.J. Barber (*Royal Holloway & New College, London*)
M. Fuller (*University of Hawaii*)

- 16:00–16:20 : **K. Wakita**
Paper 6 Mesozoic mélange formations in Indonesia

- 16:20–16:40 : **G.P. Yumul**
Paper 7 Geology and geochemistry of southern Zambales Ophiolite Complex, Luzon, Philippines: accretion of an arc terrane

- 16:40–17:00 : **A. Guntoro**
Paper 8 The effect of collision of the Banggai-Sula microcontinent to the tectonic development in Central Indonesian region

- 17:00–17:20 : **J. Milsom**
Paper 9 The Banda Sea: continental collision at the eastern end of Tethys

- 17:20–17:40 : **E. Honza et al.**
Paper 10 The Lupar Fault Zone in Sarawak and its relation to the opening of the South China Sea

- 17:40–18:00 : **U. Hartono et al.**
Paper 11 Geochemistry and K/Ar results of the Mesozoic-Cenozoic plutonic and volcanic rocks from the Meratus Range, South Kalimantan

- 18:00–18:20 : **F.Tongkul**
Paper 12 Regional geological correlation of Paleogene sedimentary rocks between Sabah and Sarawak, Malaysia

Kedah Room

Geoscience Education

Chairman: V. Pisutha Arnon (*Chulalongkorn University*)

- 14:00–14:20 : **Hamzah Mohamad**
Paper 1 Geoscience curriculums in higher learning institutions in Malaysia: can they survive the challenges of the 21st century?
- 14:20–14:40 : **Pornsawat Wathanakul**
Paper 2 Geoscience education in the years 2000 and beyond: direction of higher education in Thailand
- 14:40–15:00 : **Emmy Suparka**
Paper 3 Geoscience education in Indonesia facing the 21st century: curriculums and challenges
- 15:00–15:20 : **R.T.C. Ancog**
Paper 4 Geoscience education in the Philippines: Challenges and issues
- 15:20–15:40 : **Wan Tianfeng & Chen Tingyu**
Paper 5 Development, present situation and prospects of geoscience education in China

15:40–16:00 : **Tea Break**

Chairman: E. Suparka (*Institut Teknologi Bandung*)

- 16:00–16:20 : **Manomay Vilaihongs**
Paper 6 Geoscience Education in Laos
- 16:20–16:40 : **C.Y. Lee**
Paper 7 Training geophysicists for industry: a Malaysian perspective
- 16:40–17:00 : **Ahmad Tajuddin Ibrahim et al.**
Paper 8 Aims, activities and results of the Malaysian Geoscience Promotion Group, Geological Society of Malaysia
- 17:00–17:20 : **Lee Chai Peng**
Paper 9 Helping Malaysian Islamic and Christian geoscience students resolve issues of science and faith (evolution and creation)
- 17:20 : **PANEL DISCUSSION**

Panelists:

M.B. Katz
R. Pena
Denis Tan
P.Wathanakul
Yip Foo Weng

Perak Room

Engineering Geology

Chairman: A.D. Wirakusumah (*Volcanological Survey Indonesia*)

- 14:00–14:40 : **J.K. Raj**
Keynote 1 The stability of slope cuts in humid tropical areas
- 14:40–15:00 : **Samsudin Taib**
Paper 1 Some applications of seismic refraction survey for site investigation work in Malaysia
- 15:00–15:20 : **Umar Hamzah et al.**
Paper 2 Application of shallow seismic reflection in geoenvironment and geoenvironment mapping
- 15:20–15:40 : **Abdul Ghani Rafek**
Paper 3 Refraction seismics over karstic terrain: a case study from P. Langkawi, Malaysia

15:40–16:00 : **Tea Break**

Chairmen: Saim Suratman (*Geological Survey Malaysia*)

Abdul Ghani Rafek (*National University Malaysia*)

- 16:00–16:20 : **S.S. Abdul Nassir & C.Y. Lee**
Paper 4 The use of geoelectrical imaging surveys for the delineation of different subsurface geological and man-made features
- 16:20–16:40 : **Abdul Rahim Samsudin et al.**
Paper 5 The use of electrical and seismic methods for imaging shallow subsurface structure of limestone at Batu Caves, Kuala Lumpur, Malaysia
- 16:40–17:00 : **Nasiman Sapari & Abdul Rashid Abdul Aziz**
Paper 6 Interpretation of pumping tests in fractured crystalline rocks
- 17:00–17:20 : **A.K. Askury et al.**
Paper 7 Travelling microscope: an alternative tool for determining the shrinkage limit of clay soils
- 17:20–17:40 : **Tan Boon Kong & Anizan Isahak**
Paper 8 Physico-chemical properties of basalt soils from Kuantan (Pahang) and Segamat (Johor), Peninsular Malaysia
- 17:40–18:00 : **Tan Boon Kong**
Paper 9 Assessing the adsorption capabilities of clay soils via the batch equilibrium test
- 18:00–18:20 : **B. Sulistijo et al.**
Paper 10 Cut and stull system in weak rock, Cikidang gold mine, Indonesia

Tuesday 18 August 1998

Sabah Room

Regional Tectonics

Chairman: G. Yumul (*University of the Philippines*)

- 08:00–08:20 : **S. Bunopas et al.**
Paper 13 SE Asia was rifted parts of the Early Paleozoic NW Australia Gondwana
- 08:20–08:40 : **S. Singharajwarapan**
Paper 14 Provenance and tectonic setting of deposition of metagreywackes in the Nan River Suture, Northern Thailand
- 08:40–09:00 : **J. Tulyatid**
Paper 15 Tectonic development of Central Thailand: new evidence from airborne geophysical data
- 09:00–09:20 : **Punya Charusiri et al.**
Paper 16 Thailand — new sutures and new terranes: a new geological synthesis
- 09:20–09:40 : **C. Chonglakmani**
Paper 17 The Triassic system of Thailand: implication on geotectonic evolution of Southeast Asia
- 09:40–10:00 : **K. Hisada et al.**
Paper 18 New suture zone deduced from detrital chromian spinels: Loei suture zone in Thailand

10:00–10:20 : **Tea Break**

10:20–11:00 : **POSTER SESSION (Selangor Room)**

Chairman: Ren Jishun (*Chinese Academy of Geological Sciences, Beijing*)

- 11:00–11:20 : **Zaiton Harun**
Paper 19 Implications of the Bok Bak movements on the structure and lithostratigraphy of the Pokok Sena area, Kedah, Malaysia
- 11:20–11:40 : **H.D. Tjia**
Paper 20 Origin and structural development of the Malay Basin, Sunda Shelf
- 11:40–12:00 : **Sun-Ling Chung et al.**
Paper 21 The Indosinian orogeny and closure of eastern Paleo-Tethys: amalgamation between Indochina and South China blocks in the early Triassic
- 12:00–12:20 : **Chen Tingyu & Chen Huilan**
Paper 22 Magmatism of South Asia and East Antarctica during the Gondwana dispersion and Asian Accretion
- 12:20–12:40 : **G.P. Yumul Jr et al.**
Paper 23 Arc volcanism in Central Luzon, Philippines: subducted slab or lower crust melts?

13:00–14:00 : **Lunch Break**

Host: Veritas DGC (M) Sdn. Bhd.

Selangor Room

Poster Session

- Poster 1 : **T. Miki**
Accumulation and diagenesis of Tertiary coals in some marginal area of the Asian Continent
- Poster 2 : **B. Ratanasthien et al.**
Preparation of Thai coals for water and waste water treatment
- Poster 3 : **P. Kuttikul et al.**
Electromagnetic-gravity surveys: a combination for successful gypsum exploration
- Poster 4 : **E.B. Yeap**
The prospects of primary tin and gold deposits in Malaysia
- Poster 5 : **G.H. Teh et al.**
Characterisation of limestone hills of the Kinta Valley — their geochemistry and possible uses
- Poster 6 : **C. Utha-aroon et al.**
Industrial potential of wollastonite from Lopburi, Central Thailand
- Poster 7 : **Mastura Abdul Malik & H.D. Tjia**
Wrench-faulting in Malay and Penyu Basins
- Poster 8 : **Wan Hasiah A. et al.**
Petroleum generating potential of selected sediments from the Beliat Formation of the Brunei-Muara District, Negara Brunei Darussalam
- Poster 9 : **P. Asnachinda et al.**
Keng Tung geothermal field, eastern Shan State, Myanmar
- Poster 10 : **Azman Abdul Ghani et al.**
Geochemistry of dolerite dykes from the Perhentian and Redang islands, Terengganu, Peninsular Malaysia
- Poster 11 : **Samsudin Taib & Maslee Abd Latif**
Gravity and magnetic survey north of Kuantan, Pahang, Malaysia
- Poster 12 : **Basir Jasin & Uyop Said**
Some Late Triassic-Early Cretaceous radiolarian faunas from the Pedawan Formation, Sarawak
- Poster 13 : **S. Das & M. Mohanti**
Diagenesis in Holocene tufas, Orissa State, India
- Poster 14 : **S. Intasopa et al.**
A comparative study on corundums from Southeast Asia: their application to origin determination
- Poster 15 : **K.L. Queano et al.**
Stratigraphy of Mati-Northern Pujada Peninsula, Davao Oriental, Philippines: its implications to the tectonic evolution of Southeastern Philippines

- Poster 16 : **Wannakao, L. et al.**
The prediction of engineering properties of soils by geophysical exploration method: laboratory ultrasonic and field seismic refraction test at Khon Kaen, Thailand
- Poster 17 : **Mazlan Madon**
An overview of the tectonic settings of Tertiary sedimentary basins of Malaysia
- Poster 18 : **Prinya Putthapiban**
The half-ring granite complex at the Ban That Pluton, Loei Province
- Poster 19 : **Y. Chaimanee & J.J. Jaeger**
Plio-Pleistocene rodents of Thailand and their utility for biochronology and paleoenvironments
- Poster 20 : **V.H. Jensen**
Seismic microzonation in Australia

Kedah Room

Mineral Resources

Chairman: Khin Zaw (*University of Tasmania*)

- 08:00–08:40 : **W.K. Fletcher**
Keynote
Some advances in understanding and application of stream sediment geochemistry to mineral exploration in Southeast Asia
- 08:40–09:00 : **Hamzah Mohamad**
Paper 1
The potential of tin mines' tailing sand as an alternative source of silica: preliminary findings
- 09:00–09:20 : **Tran Van Tri**
Paper 2
Geological settings and mineral resources of Vietnam
- 09:20–09:40 : **C. Utha-aroon & M.El Tabakh**
Paper 3
Upper Carboniferous sulphate-bearing sequence in Loei, Northeast Thailand

10:00–10:20 : **Tea Break**

10:20–11:00 : **POSTER SESSION (Selangor Room)**

Chairman: Manomay Vilaihongs (*Dept. of Geology and Mines, Laos*)

- 11:00–11:20 : **V. Pisutha-Arnond et al.**
Paper 4
Corsilzirspite, a corundum-sillimanite-zircon-hercynite rock: new evidence on the origin of Kanchanaburi sapphire, Thailand
- 11:20–11:40 : **Phan-Trong Trinh et al.**
Paper 5
Formation of ruby in the Red River metamorphic zone

- 11:40–12:00 : **T.T. Win et al.**
Paper 6
Preliminary study on the trace element geochemistry of corundums from Southeast Asia

- 12:00–12:20 : **P.Wathanakul et al.**
Paper 7
Characteristics of diamonds, Southern Thailand

- 12:20–12:40 : **S. Nakapadungrat & N. Seetun**
Paper 8
The lamprophyres(?) of Takua Pa-Phangnga area, Southern Thailand

13:00–14:00 : **Lunch Break**

Host: Veritas DGC (M) Sdn. Bhd.

Perak Room

Engineering Geology

Chairman: J.K. Raj (*University of Malaya*)

- 08:00–08:40 : **A. Djumarma Wirakusumah & R. Bacharuddin**
Keynote 2
Volcanic hazard mapping in Indonesia
- 08:40–09:00 : **Abdul Ghani Rafek et al.**
Paper 11
Engineering geology of the second tunnel, Genting Sempah, Malaysia
- 09:00–09:20 : **Ibrahim Komoo**
Paper 12
Landslides in Sabah
- 09:20–09:40 : **Majeed Faisal et al.**
Paper 13
Study of mass movements along Kundasang Road, Sabah

10:00–10:20 : **Tea Break**

10:20–11:00 : **POSTER SESSION (Selangor Room)**

Environmental Geology

Chairman: Fateh Chand (*c/o Geological Survey Malaysia*)

- 11:00–11:40 : **A.R. Berger**
Keynote 1
Reporting on changing environment: the role of geoinicators
- 11:40–12:00 : **S.B. Harper**
Paper 1
Lithologic and landuse controls on debris flow susceptibility in Southern Thailand
- 12:00–12:20 : **S. Muhrizal et al.**
Paper 2
Release of metals during oxidation of pyrite from marine sediments in Malaysia
- 12:20–12:40 : **Baba Musta et al.**
Paper 3
Geochemical behaviour of heavy metals in Pinosuk gravel soil from an agricultural area, Kundasang, Sabah

13:00–14:00 : **Lunch Break**

Host: Veritas DGC (M) Sdn. Bhd.

Sabah Room

Petroleum & Energy Resources

Chairmen: **R.A. Becker** (*XM, EPMI*)

Songpope Polachan (*CEO, MTJA*)

14:00–14:40 : **R. Murphy**

Keynote Thirty -six years geologizing Southeast Asia — a perspective

14:40–15:00 : **Chuan Yin et al.**

Paper 1 Basin-scale AVO study in the Malay and Penyu Basins

15:00–15:20 : **J.R. Gaither et al.**

Paper 2 Structure and stratigraphy, Mekong Basin Blocks 01 and 02, offshore Vietnam

15:20–15:40 : **D.E. Nice & Ang Duen Woei**

Paper 3 Right lateral strike slip in the Malay Basin: observations from 3D seismic

15:40–16:00 : **Tea Break**

16:00–16:20 : **H.I. Thio & P.E. Heer**

Paper 4 South Furious Field, the evolution of an interpretation

16:20–16:40 : **Abdul Hadi A. Rahman**

Paper 5 Burial history and diagenetic modifications in the Upper Cycle V (Late Miocene) reservoir sandstone of Baram field, Offshore Sarawak, East Malaysia

16:40–17:00 : **Ismail Che Mat Zin**

Paper 6 Tertiary tectonic model of Northwest Borneo

17:00–17:20 : **M. Macaulay**

Paper 7 Delineation of reservoir sand quality by integrating leading edge technology well log data and calibrating to core data

17:20–17:40 : **F. Matsuda et al.**

Paper 8 A computer simulation model facies-3D for the reconstruction of the carbonate sedimentary process

17:40–18:00 : **Andang Bachtiar et al.**

Paper 9 Shallow reservoir delineation in Bajau area, East Kalimantan, Indonesia

Kedah Room

Mineral Resources

Chairman: **Tran Van Tri** (*Dept. of Geology and Mineral Resources, Hanoi*)

14:00–14:20 : **P. Kohpina & R. Vongpromak**

Paper 9 Non-marine heavy mineral placers in the Gulf of Thailand

14:20–14:40 : **J. Ringis**

Paper 10 Correlation of offshore Quaternary sediment sequences in Southeast Asia

14:40–15:00 : **B. Ratanasthien et al.**

Paper 11 Potential weathering characteristics of Mae Moh lignite and power plant waste, Lampang, Thailand

15:00–15:20 : **R. Wust et al.**

Paper 12 Holocene peat accumulation in a tropical intermontane mire system, Tasek Bera, West Malaysia: implication for coal formation

15:20–15:40 : **N. Suwarna**

Paper 13 Jurassic coal in Western Australia and its depositional environment

15:40–16:00 : **Tea Break**

Chairman: **J. Ringis** (*Fugro Survey, Perth*)

16:00–16:20 : **S. Intasopa et al.**

Paper 14 A comparative study on corundums from Southeast Asia: their application to origin determination

16:20–16:40 : **G.H. Teh et al.**

Paper 15 EPMA characterisation and geochemistry of gold deposits of Peninsular Malaysia — genetic implications

16:40–17:00 : **T. Nuchanong**

Paper 16 Gold: potential and development in Thailand

17:00–17:20 : **A. Basuki et al.**

Paper 17 Gold deposit in Cikidang area, West Java, Indonesia

17:20–17:40 : **Khin Zaw et al.**

Paper 18 The importance of ore fluid chemistry on studies of ore genesis: examples from Australian and Southeast Asian deposits

17:40–18:00 : **Y. Noya et al.**

Paper 19 A study of fluid inclusions at the Cikotok Gold Mine, West Java, Indonesia

Perak Room

Environmental Geology

Chairman: **A.R. Berger** (*COGEOENVIRONMENT*)

14:00–14:40 : **Fateh Chand**

Keynote 2 Environmental geology in urban development

14:40–15:00 : **A.K. Mohd. Hatta & B. Abdul Rashid**

Paper 5 Groundwater resources in Johor, Malaysia: resource, potential and information management

15:00–15:20 : **Md. Shahid Ayub & Daud Mohamad**

Paper 6 Isotope hydrological study of Pulau Langkawi, Malaysia

15:20–15:40 : **S. Notoiswyo & S.B. Kusumayudha**

Paper 7 Hydrogeologic model of the Gunungsewu karstic area, Central Java, Indonesia

15:40–16:00 : **Tea Break**

Chairman: Mior Sallehuddin Mior Jadid (*Geological Survey Malaysia*)

16:00–16:20 : **Jamaludin Othman**
Paper 8 Application of geophysical techniques in engineering and environmental investigations

16:20–16:40 : **Mohd. Anuar Md. Razali & Mohd Rais Ramli**
Paper 9 Hot spring investigations using the transient electromagnetic technique (TEM) in Peninsular Malaysia

16:40–17:00 : **Mohd Tadza Abdul Rahman et al.**
Paper 10 The use of environmental isotope caesium-137 as a tracer for soil erosion study

17:00–17:20 : **Marilah Sarman et al.**
Paper 11 Conservation and tourism geology: diversification of geoscience information

17:20–17:40 : **S.B. Kusumayudha et al.**
Paper 12 Distribution of the Gunungsewu karstic aquifers based on fractal analysis

17:40–18:00 : **B. Sulistijo & C. Chamid**
Paper 13 Environmental impact of a sandmine in West Java, Indonesia

18:00–18:20 : **Hidartan & R. Chandra**
Paper 14 Kud Mekar Jaya as a model of earth scientists in support of growing village economics

Wednesday 19 August 1998

Sabah Room

Petroleum & Energy Resources

Chairmen: David Mackertich (*XM, Amerada Hess*)
Bill Schaefer Jr. (*GM, Santa FE Energy*)

08:00–08:20 : **Lye Yue Choong & Zuraida Mat Isa**
Paper 10 Seismic inversion in Raya Yong Field development

08:20–08:40 : **Meh Jabeen Zainuddin et al.**
Paper 11 Successful application of AVO in a field development — the D35 story

08:40–09:00 : **T. Dunbar et al.**
Paper 12 Determining the proper migration technique and velocity model for a prospect in the North Sea

09:00–09:20 : **Ouzani, B. & Wan Hasiah A.**
Paper 13 Generation and expulsion of liquid hydrocarbons from Sarawak coals: correlation between petrographic features and physical properties

09:20–09:40 : **P.M. Lloyd et al.**
Paper 14 Chasing channel sands in Southeast Asia

10:00–10:20 : **Tea Break**

10:20–10:40 : **D. Poole et al.**
Paper 16 The use of AVO gradient cube analysis in optimizing development well planning — an example from the Tapis Field, Malay Basin

10:40–11:00 : **J.J. Wicker**
Paper 17 Baram Field — the 3D marine re-processing challenge

11:00–11:20 : **Zulkarnain A. Anas et al.**
Paper 18 Vp-Vs relationship in the Malay Basin

11:20–11:40 : **D. Rimmer**
Paper 19 Brown Bassett 3-D seismic survey: solving a complex statics problem

11:40–12:00 : **Idrus Mohd Shuhud & Mohd Firdaus Abd Halim**
Paper 20 Specialised seismic studies in the Eastern Tembungo Field

12:00–12:20 : **N. Casson et al.**
Paper 21 Modern morphology-ancient analogue: insights into deep water sedimentation on the active tectonic margin of West Sabah

12:20–12:40 : **M. Johansson & D.A.V. Stow**
Paper 22 Evidence to support near-steady turbulent flows in sandy alluvial systems: the Miocene Plateau Formation, Bako National Park, Sarawak

12:40–13:00 : **A. Mansor et al.**
Paper 23 Hydrocarbon prospectivity of the Straits of Melaka

13:00–14:00 : **Lunch Break**Host: *Geological Society of Malaysia*

Kedah Room

General Geology

Chairman: H. Fontaine (*CCOP, Bangkok*)

08:00–08:40 : **B. Dwiyanto and Y. Sumantri**
Keynote Development of geology in Indonesia

08:40–09:00 : **T.T. Khoo**
Paper 1 Use of ceramic sherds for stratigraphic and process interpretations of recent coastal deposits in Malaysia

09:00–09:20 : **Abdul Rahim Samsudin and Umar Hamzah**
Paper 2 Geophysical measurements for archaeological investigations: case study in Malaysia

09:20–09:40 : **Zaiton Harun et al.**
Paper 3 A new evidence of a higher Quaternary sea level in Langkawi, Peninsular Malaysia

09:40–10:00 : **Rolando Pena**
Paper 4 Towards a Southeast Asian Network for Geologic Information System

10:00–10:20 : **Tea Break**

Chairmen: **Y. Sumantri** (*PERTAMINA Exploration & Production*)
R. Pena (*Bureau of Mines and Geoscience, Philippines*)

- 10:20–10:40 : **E.J. Marquez et al.**
 Paper 5 Deep-sea foraminiferal distribution of the central and eastern portions of the South China Sea
- 10:40–11:00 : **Y. Chaimanee & J.J. Jaeger**
 Paper 6 Plio-Pleistocene rodents of Thailand and their utility for biochronology and paleoenvironments
- 11:00–11:20 : **Mouloud Benammi et al.**
 Paper 7 Paleontology and magnetostratigraphy of the Eocene Krabi basin (Southern Thailand)
- 11:20–11:40 : **H. Fontaine et al.**
 Paper 8 Important discovery of late Early Permian limestone in southern Terengganu, Peninsular Malaysia
- 11:40–12:00 : **M. Fujikawa et al.**
 Paper 9 Middle Carboniferous cephalopods from Loei area, northern Thailand
- 12:00–12:20 : **Basir Jasin & Uyop Said**
 Paper 10 Significance of Early Jurassic radiolarian from West Sarawak, Malaysia
- 12:20–12:40 : **M. Shafeea Leman**
 Paper 11 Permian brachiopod as an alternative source for biostratigraphic correlation in Malaysia and adjacent Southeast Asian Region
- 12:40–13:00 : **H. Fontaine et al.**
 Paper 12 The Carboniferous of east Thailand: new information from the microfossils

13:00–14:00 : **Lunch Break**

Host: Geological Society of Malaysia

Selangor Room

IGCP-383

- Paper 1 : **R.H. Findlay**
 Introduction to IGCP-383
- Paper 2 : **Phan-Trong Trinh**
 Inverse method for the determination of stress tensor from geological and earthquake data
- Paper 3 : **R.H. Findlay et al.**
 Geochemistry and stratigraphy of the Finisterre Mountains, Papua New Guinea: what means the Finisterre Terrane?

- Paper 4 : **J. Milsom**
 New gravity data and neotectonics in the Finisterre Mountains of Papua New Guinea
- Paper 5 : **R.H. Findlay**
 Palaeostress in the Ramu-Markham Obduction Zone
- Paper 6 : **J. Arumba**
 Palaeostress, seismicity and plate motion, Port Moresby and adjacent regions, Papua New Guinea
- Paper 7 : **Punya Charusiri et al.**
 Thailand — new sutures and new terranes: a new geological synthesis
- Paper 8 : **Phan-Trong Trinh**
 Remote sensing and GIS for early warning of geological hazard: application in Vietnam
- Paper 9 : **V.H. Jensen**
 The Lake Edgar Fault Scarp, SW Tasmania
- Paper 10 : **A. Uromiehy et al.**
 Landslide hazard zonation by use of fuzzy set, a case study of Khorshrostan area, Iran
- Paper 11 : **S. Kosuwan et al.**
 Active tectonics of the Mae Chan fault Northern Thailand
- Paper 12 : **M.A. Aurelio**
 Displacement rates and block rotation in and around the Philippines
- Paper 13 : **Y.P. Wang**
 The active tectonics of Tibet Plateau
- Paper 14 : **Yao Dagan**
 Sinistral displacement along the northern extension of the Tancheng-Lujiang fault zone and compression in northern border zone of the Sino-Korean Platform

Perak Room

IGCP-350

- Paper 1 : **H. Okada**
 Achievements of IGCP 350 — Cretaceous Environmental Change in East and South Asia: summary
- Paper 2 : **K. Takahashi & H. Hirano**
 Oceanic anoxic event in early Cretaceous — with special reference to the middle Albian OAET1c
- Paper 3 : **T. Sakai et al.**
 Sedimentation and tectonics of the Jurassic and Cretaceous structural basins in SW Japan

Paper 4 : **Kirillova G.L.**
Misozoic-Cenozoic sedimentary basins of southeastern Russia

Paper 5 : **Kazuo Kiminami**
Geochemical relationships between the Sanbagawa psammitic schists (Oboke unit) and the Cretaceous Shimanto sandstones in Shikoku, Southwest Japan

Paper 6 : **A. Meesook**
Jurassic-Cretaceous environments: a preliminary investigation

Sabah Room

Petroleum & Energy Resources

Chairman: Denis Tan (*Manager, Geological Review, SSBI/SSPC*)

14:20–14:40 : **P. Crevello**
Paper 24 Do neural networks improve reservoir definition?

14:40–15:00 : **H. Panggabean & R. Heryanto**
Paper 25 Sedimentology and provenance of the Paleogene sandstones in West and Southeast Kalimantan: a comparison study and the role of the sandstone as reservoir rocks for oil and gas

15:00–15:20 : **Robert Wong**
Paper 26 Interpretation of 1997 regional lines in the NW Malay Basin

15:20–15:40 : **M.A. McCaffrey et al.**
Paper 27 Geochemical characterization of Malay Basin oils: some insight into the effective petroleum systems

Kedah Room

General Geology

Chairman: Phisit Dheeradilok (*Dept. of Mineral Resources, Thailand*)

14:00–14:20 : **S. Bunopas et al.**
Paper 13 The early Quaternary extraterrestrial collision with a whole comet in the Australasian tektite field: apparent evidences from Thailand and East Asia

14:20–14:40 : **S. Bhongaraya & N. Thiramongkol**
Paper 14 Geomorphology of the Ping and Wang River Basin, Amphoe Sam Ngao and Ban Tak area, Changwat Tak

14:40–15:00 : **J.A.L. Barretto et al.**
Paper 15 Magnetic and gravity variations along the Southeast Bohol Ophiolite Complex (SEBOC), Central Philippines

15:00–15:20 : **Wan Fuad Wan Hassan & Mohd. Suhaimi Hamzah**
Paper 16 Rare earth element patterns in some granitic rocks of Peninsular Malaysia

15:20–15:40 : **Ibrahim Abdullah et al.**
Paper 17 Depositional basin of the Tembeling Group: an eastward tilted graben model

15:40–16:00 : **S.C. Srivastava & M. Mohanti**
Paper 18 Diagenesis in Paleogene carbonates of Narayan Sarovar region, Kutch (Gujarat) India

Sabah Room

CLOSING CEREMONY

16:00 : **Address by Organising Chairman, Hamzah Mohamad**

16:10 : **Closing Remarks by President Geological Society of Malaysia, Ibrahim Komoo**

16:20 : **Address by Representative of next GEOSEA host**

16:30–17:00 : **Tea Break**

BERITA-BERITA PERSATUAN News of the Society

KEAHLIAN (Membership)

The following applications for membership were approved:

Full Members

- | | |
|--|---|
| 1. David G.R. Goold
100 Chesapeake Boulevard, P.O. Box 10,
Elkton, MD, 21922, USA. | 2. David John Robinson Bowling
Cambrian Consultants Ltd., Unit 5A, Level
5, Menara Chan, 138 Jalan Ampang, 50450
Kuala Lumpur. |
|--|---|

Student Members

- | | |
|---|--|
| 1. Alexander Graham Anak Chukan
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi. | 10. Zuraimi Ahmad
Jabatan Geologi, Universiti Malaya, 50603
Kuala Lumpur. |
| 2. Aben bin Mantali
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi. | 11. Che Norhisham Che Daud
Jabatan Geologi, Universiti Malaya, 50603
Kuala Lumpur. |
| 3. Cyprian Marsillius Tiwol
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi. | 12. Yusnoor Arbaingin
Jabatan Geologi, Universiti Malaya, 50603
Kuala Lumpur. |
| 4. Norhaidah Maral
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi. | 13. Jaineh Lingi
Jabatan Geologi, Universiti Malaya, 50603
Kuala Lumpur. |
| 5. Azlan Manjali @ Ian
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi. | 14. Mursyidah Abdul Hamid
Jabatan Geologi, Universiti Malaya, 50603
Kuala Lumpur. |
| 6. Zamila binti Abdul Rahman
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi. | 15. Hairul Azhar Ahmad Anval
Jabatan Geologi, Universiti Malaya, 50603
Kuala Lumpur. |
| 7. Lee Beng Huat
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi. | 16. Yajesh A/L Ramachendram
Jabatan Geologi, Universiti Malaya, 50603
Kuala Lumpur. |
| 8. Phang Wui Toon
Jabatan Geologi, Universiti Malaya, 50603
Kuala Lumpur. | 17. Md Ishah Rahman
Jabatan Geologi, Universiti Malaya, 50603
Kuala Lumpur. |
| 9. Zahifulazwan Zakaria
Jabatan Geologi, Universiti Malaya, 50603
Kuala Lumpur. | 18. Thony AK Maratin Saba
Jabatan Geologi, Universiti Malaya, 50603
Kuala Lumpur. |

- | | |
|---|--|
| <p>19. Amy Egberths
Jabatan Geologi, Universiti Malaya, 50603
Kuala Lumpur.</p> <p>20. Ng Pei Kuan
Jabatan Geologi, Universiti Malaya, 50603
Kuala Lumpur.</p> <p>21. Wan Zariah Aini Wan Hamat
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi.</p> <p>22. Ti Ooi Chin
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi.</p> <p>23. Chan Liang Shing
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi.</p> <p>24. Yim Poh Wan
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi.</p> | <p>25. Cheah Kean Keong
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi.</p> <p>26. Khairul Anam Musa
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi.</p> <p>27. Murtadha Fathul Ariffin
Jabatan Geologi, Universiti Kebangsaan
Malaysia, 43600 Bangi.</p> <p>28. Cheong Yaw Peng
Program Geologi, Universiti Malaysia
Sabah, Kampus Jalan Tuaran, 88999 Kota
Kinabalu.</p> <p>29. Isharudin Md Isa
Jabatan Sains Tanah, Fakulti Pertanian,
Universiti Putra Malaysia, Serdang.</p> |
|---|--|

Associate Member

- Lawrence Kin Ping Chew
Corporated International Consultants,
P.O. Box 20052, Luyang 88757, Kota
Kinabalu.

GSM

PETUKARAN ALAMAT (Change of Address)

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

- Adi Suprpto
P.T. Eksindo Pratama, Bungur Grand
Centre B-6, Jl. Ciputat Raya 4-6,
Kebayoranlama, Jakarta 12240, Indonesia.

GSM

PERTAMBAHAN BAHARU PERPUSTAKAAN (New Library Additions)

The Society has received the following publications:

1. AAPG Bulletin, vol. 82/6, 82/5A & 5B, 1998.
2. Mineralogia Polonica, vol. 28, no. 1, 1997.
3. Bulletin du Centre de Richerches elf Exploration Production, vol. 21, no. 1, 1997.
4. Episodes, vol. 21, no. 2, 1998.
5. Scripta Geologica, nos. 114, 115 (1997); 112, 113 (1996).
6. Journal of the Natural History Museum & Institute, Chiba, vol. 5, no. 1, 1998.
7. Natural History Research, vol. 5, no. 1, 1998.
8. Natural History Research, special issue, no. 5, 1998.
9. National Science Museum, Bulletin: vol. 23, nos. 3 & 4, 1997; vol. 24, nos. 1-2, 1998.
10. Proceedings of the International conference on geology, geotechnology & mineral resources of Indochina, 22-25, Nov. 1995, Khon Kaen, Thailand.
11. Proceedings of the International Conference on stratigraphy & tectonic evolution of Southeast Asia and the South Pacific and the associated meetings of IGCP 359 & IGCP 383, vols. I & II, 1997.
12. Geoscience Journal, vol. 2, no. 2, 1998.
13. Geological Survey of Japan, vol. 49, nos. 1, 2/3, 1998.
14. U.S. Geological Survey: Bulletin 1997: nos. 2094-G, 2150-B; 1998: nos. 2147.
15. U.S. Geological Survey: Circular: 1998: nos. 930-0, 1152, 1145.
16. U.S. Geological Survey: Prof. Paper: 1998: nos. 1593, 1550-B, 1588; 1997: no. 1582.

SOCIETY'S BATIK SHIRT

Computer-designed and handprinted with the latest technology of handprinting from the East Coast, the Society's batik shirt is of soft, rayon material and comes in a cool, soothing, grey colour.

The Society's logo is craftily concealed in the background so that besides the Society's functions you can even wear your batik shirt anywhere, anytime!

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For further inquiries:

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Fax.: (603) 7563900

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made to "Geological Society of Malaysia" for the purchase [* Please delete where applicable].

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BERITA-BERITA LAIN Other News

Local News

Petronas results better

Petroleum Nasional Bhd. (Petronas) has chalked up a 27.7% jump in group pre-tax profit to RM15.82bil for year ended March 31 from RM12.39bil last year. This was on the back of a 21.2% increase in group revenue to RM35.1bil from RM28.9bil in 1997.

Petronas president and chief executive officer Tan Sri Mohamed Hassan Marican said when announcing the group results at a press conference in Kuala Lumpur yesterday that the better performance was mainly attributable to the higher US dollar against the ringgit.

"We are in a dollar-denominated business and the foreign exchange situation has translated into a better ringgit bottomline for us," he added.

However, in US dollar terms, the Petronas group net profits dropped by 6.8% to US\$2.74bil from US\$2.94bil in 1997 while group revenue was 17.4% lower at US\$9.63bil.

"Lower prices of crude oil and petroleum products have mainly contributed to the lower US dollar earnings," Hassan said.

He said while demand for energy, including crude oil, petroleum products and petrochemicals, had been hampered by the economic slowdown, Petronas was also exposed to the volatility of oil prices and the dollar-ringgit exchange rate.

During the year, Malaysian crude oil prices averaged at US\$18.72 per barrel compared to US\$22.29 in 1997 — a decline of 16%, while the average prices of petroleum products was down 12.9% to US\$20.26.

Hassan said exports continued to be a major contributor to group revenue, amounting to RM24.36bil (1997: RM19.77bil), or 69.6% of the total, compared to 69.4% in 1997.

"There was a significant increase in Petronas' export and trading of international crude, resulting in a 28.7% increase in overall crude

sales volume to 192.5 million barrels in 1998."

Hassan said that export of liquefied natural gas (LNG) also rose by 10.3% to 14.99 million tonnes from 13.59 million tonnes while sales gas (methane) volume rose to 415.11 million MMBTU (million British thermal unit).

Sales of petrochemicals grew from 1.92 million tonnes to 1.98 million tonnes but that of refined petroleum products fell to 89.93 million barrels from 94.27 million barrels.

Hassan said higher crude oil exports by Petronas subsidiaries operating internationally and the incorporation of Engen Ltd's full year results in the group accounts resulted in the 83% increase in contribution of its global business to RM7.34bil in 1998.

Contribution from international ventures now accounted for 20.9% of group revenue, he said, adding that the target was 30% by 2005.

On crude oil production, he said Petronas production rose 9.6% to 196.2 million barrels from 179 million barrels in 1997, of which 125.3 million barrels were exported and 53.4 million barrels processed at its Malacca and Terengganu refineries.

Production of natural gas rose by 9.3% to 1,685 billion standard cubic feet, with some 65% sold by Petronas and the remaining by its production sharing contracts (PSC) contractors.

Hassan said although attempts were made by major producers to cut supply to prop up crude prices, so far, its success had yet to be seen.

"Malaysia is only a very small player in the international market with some 400,000 barrels exported per day and we do not have plans to cut back on production. In fact, to generate higher export revenue, Petronas had last October raised crude production by 50,000 barrels per day (bpd) and current production is capped at 650,000 bpd."

Shell and Occidental sign large-scale asset swap deal

Shell Malaysia Ltd. yesterday announced it has signed an asset swap deal with Occidental Petroleum Corporation of the United States, involving their global oil and gas exploration and production portfolios.

The deal, which is one of the largest cross-border asset swaps, will increase Shell's oil and gas reserves by some 60 million barrels of oil equivalent.

Shell will also commit a further RM1 billion in investments in Malaysia for the next five years.

The complex deal will see Occidental acquiring Shell's wholly-owned subsidiary Pecten Yemen Masila in Yemen.

It will also acquire the stock of Compania Shell de Colombia Inc., one of Shell's exploration and production subsidiaries in Colombia.

In return, Shell will receive 100 per cent ownership of Occidental's upstream subsidiary in the Philippines.

The subsidiary holds a 50 per cent interest in the SC-38 concession offshore, including the Camago/Malampaya gas-to-power project.

Shell will also receive all of Occidental Petroleum (Malaysia) Ltd and 90 per cent of the stock in Occidental LNG (Malaysia) Ltd.

Occidental will make a cash payment to Shell to balance the difference in the overall transaction value.

Sarawak Shell Bhd. managing director Lim How Kuang said the deal could potentially lead to a further investment of up to RM1 billion, in addition to some RM12 billion of investment and expenditure planned in the next five years.

The deal is expected to be concluded within 45 days after all the necessary administrative and regulatory requirements have been completed.

Occidental Petroleum Malaysia's subsidiary, Occidental Oil and Gas (Malaysia) has a 37.5 per cent interest in SK8 block offshore Sarawak which contains six gas discoveries with an estimated 3.8 trillion cubic feet of gas, together with scope for further exploration.

The partners for SK8 are Nippon with 37.5 per cent and Petronas Carigali with 25 per cent.

Shell, through its upstream subsidiary Sarawak Shell, is currently the largest upstream investor in the State.

"This transaction will enable Shell to increase the value of its portfolio in Sarawak."

In the Philippines, the Camago/Malampaya project is the largest and most significant private investment in the country's economy to date.

It is the first large scale development of indigenous gas resources in the country and will reduce its reliance on imported fuels by 20 to 30 per cent.

NST, 25.7.1998

Shell to pump in RM12bil

Sarawak Shell Bhd. (SSB) and Sarawak Shell Petroleum Co. Ltd. (SSPC) have committed a whopping RM7.2bil in capital investment and RM4.8bil in operating expenditures over the next five years.

Of the RM7.2bil to fund exploration activities, RM4.8bil would be spent in Sarawak and RM2.4bil in Sabah, said SSB/SSPC managing director Lim Haw Kuang.

He said operating expenditures for Sarawak and Sabah would be RM3.8bil and RM1bil respectively.

"The (proposed) investments demonstrate Shell's confidence in Malaysia and its commitment to develop oil and gas reserves for growth and long-term profitability," he added at

the annual Shell Kenyalang Press Awards presentation ceremony at Merdeka Palace here last night.

This year, Lim said SSB/SSPC was expected to spend RM2.2bil on exploration and development projects and RM1bil in operating costs in the two states.

"Following the signing of three offshore acreages under the production sharing contracts (PSCs) with the national oil company Petronas last year, SSB/SSPC is now pursuing a demanding schedule, including the drilling of 10 exploration wells — six in Sarawak and four in Sabah."

"The drilling of these exploration wells will be conducted in the three new PSC blocks, SK-

BERITA-BERITA LAIN Other News

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He said the group's balance sheet position remained strong with a 19.8% increase in total assets to RM81.69bil while group fixed assets

rose 15.3% to RM34.26bil. Group shareholders funds rose by 24.5% from RM27.32bil to RM34bil in 1998.

Star, 8.7.1998

More underground water sources found

Johor has identified several sources of underground water which have potential for exploitation, State Public Works and Utilities Committee chairman Datuk Zainalabidin Mohamed Zin said.

Speaking to reporters after the weekly State Executive Council meeting today, he said a recent study commissioned by the State Government showed that there were several rich underground water sources in the west and east coast of Johor.

"These water sources stretch from Muar right up to Pontian and also to Endau," he said.

The study, titled "The Study on Comprehensive Water Resources Planning and Development in the State of Johor", which began in 1991 was completed recently by a private consultant.

The Health and Geology Departments, in separate reports issued earlier, had also found that 26 sources of underground water had been commercialised in Johor.

NST, 9.7.1998

Tin miner that has ventured into other businesses

Rahman Hydraulic Tin Bhd. (RHT), which started as a tin mining company way back in 1907, has since expanded into other businesses.

Since its inception, the company has maintained tin mining as one of its core businesses despite the "hard times" faced by the industry in the late eighties and early nineties. RHT's mining operations are now carried out over 700 ha in Klian Intan, north Perak.

Beside tin mining, it is also into plantation activities, mainly in rubber and oil palm production, manufacturing of latex gloves and property development.

Rubber comes from its Pinang Tunggal estate in Sungai Petani and it has a latex glove manufacturing facility in Batu Caves. RHT's oil palm estate is also located in its Sungai Petani estate.

The company is anticipating higher contributions to the group's earnings for the current year from its mining and plantation activities. The latter activities involve the supply

of rubber wood and oil palm.

The depreciation of the ringgit means that the company's tin output will bring in more ringgit since it is sold in US dollars.

The company fell into the red last year when it registered a group pre-tax loss of RM24.84mil as against a profit of RM7.21mil the previous year.

The loss was attributed to lower earnings from the property division due to the economic downturn and lower tin production.

RHT was listed on the KLSE main board in 1973. It has seven subsidiaries, including Healthcare Gloves Sdn. Bhd. and Rahman Hydraulic Development Sdn. Bhd.

Late last year, RHT's plans to go into the electrical and electronics business were dashed when property-based company Kuala Lumpur Industries Holdings Bhd. aborted its plans to sell its stake in Malaysia Electric Corp Bhd. to RHT.

Star, 9.7.1998

Petaling Tin to surrender mining leases

Petaling Tin Bhd. said it has been asked to surrender its mining leases by the Kuala Langat land and district office and the mining land lessor, Kumpulan Perangsang Selangor Bhd., to pave the way for the setting up of a wetlands sanctuary project.

In a statement, the company said it has ceased its core business of tin mining and related activities with the imminent surrender of the leases. Petaling Tin said the company would lose its main source of revenue and income with the surrender of the leases.

A retrenchment exercise for its mine workers is being carried out. The company has three mining leases, all of them in Selangor. Two of them will expire in the year 2004 and the third in 2014.

It said it would negotiate with the relevant parties for compensation for the surrender of the mining leases.

Petaling Tin is also currently considering new sources of revenue and income and will make an announcement in due course.

Star, 23.7.1998

Triton selling half its stake in gas project firm

Dallas-based Triton Energy Ltd. is selling half of its stake in a subsidiary that holds its 50% interest in the Malaysia-Thailand natural gas project to Atlantic Richfield Co (Arco) to ease its pressing financial needs.

Under an agreement reached last week, Arco will pay Triton US\$657 mil for the stake. Of this amount, a US\$150 mil upfront payment will be made by Arco on closure of the deal.

Triton is developing Block A-18 of the Malaysia-Thailand joint development area (JDA) together with Petronas Carigali Sdn. Bhd., with each party holding a 50% equity interest. The Block A-18 area has an estimated combined gross resource base of about 300 billion cubic metres of gas. Exploration in the area is supervised by the Malaysia-Thailand joint authority, a joint venture of the two countries which have overlapping claims in the Gulf of Thailand.

The Block A-18 project is also Triton's key project in Asia where seven major natural gas fields have been discovered and which offers a solid contribution to Triton's resource base.

"We are looking forward to working with Arco, which has well-established and extensive project management expertise which, in turn, should help enhance the value of the overall project," Triton's interim chief executive officer Robert B. Holland said.

He said the Arco transaction was "extremely attractive" to Triton and the best proposal to emerge from its review of strategic alternatives.

"It helps reduce our debt and significantly improves our future cash flow outlook, while reducing the company's risks in this major project," Holland said.

Petronas officials when contacted said the stake sale by Triton would not have any impact on the development of the project.

Triton said Arco would finance up to US\$377 mil of its current 50% share of Block A-18 expenditure and all costs recoverable related to the first phase of field development.

The deal with Arco will enable Triton to recover its investment in the project which is in excess of US\$100mil.

Triton and Petronas Carigali have committed a total investment of over US\$600mil for the development of Block A-18, with each pumping in over US\$300mil.

The sale to Arco ends months of speculation that Triton would sell off its two main assets — its 50% of Block A-18 and a 12% stake in Colombia's giant Cusiana and Cupiagua fields.

According to an *Asian Wall Street Journal* report early this week, Triton, once a hot stock, had said several months ago that it would try to sell all or part of its assets amid slumping energy prices and a shortage of cash for its projects. However, although numerous suitors looked at the company's books, none came forward with an acceptable price.

"Instead, the company said it will sell only half of its interest in its Malaysia-Thai natural gas project to Arco," the report said.

Star, 25.7.1998

Shell and Occidental sign large-scale asset swap deal

Shell Malaysia Ltd. yesterday announced it has signed an asset swap deal with Occidental Petroleum Corporation of the United States, involving their global oil and gas exploration and production portfolios.

The deal, which is one of the largest cross-border asset swaps, will increase Shell's oil and gas reserves by some 60 million barrels of oil equivalent.

Shell will also commit a further RM1 billion in investments in Malaysia for the next five years.

The complex deal will see Occidental acquiring Shell's wholly-owned subsidiary Pecten Yemen Masila in Yemen.

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The subsidiary holds a 50 per cent interest in the SC-38 concession offshore, including the Camago/Malampaya gas-to-power project.

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NST, 25.7.1998

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He said operating expenditures for Sarawak and Sabah would be RM3.8bil and RM1bil respectively.

"The (proposed) investments demonstrate Shell's confidence in Malaysia and its commitment to develop oil and gas reserves for growth and long-term profitability," he added at

the annual Shell Kenyalang Press Awards presentation ceremony at Merdeka Palace here last night.

This year, Lim said SSB/SSPC was expected to spend RM2.2bil on exploration and development projects and RM1bil in operating costs in the two states.

"Following the signing of three offshore acreages under the production sharing contracts (PSCs) with the national oil company Petronas last year, SSB/SSPC is now pursuing a demanding schedule, including the drilling of 10 exploration wells — six in Sarawak and four in Sabah."

"The drilling of these exploration wells will be conducted in the three new PSC blocks, SK-

307 in Sarawak waters, SB-J and Block G in Sabah waters.”

Lim said the exploration activities would include the deployment of pioneering deep water drilling techniques and high temperature/high pressure well development technology. *“Development plans are also being vigorously pursued for the fields which have been discovered but are not yet developed.”*

“This will involve the application of ‘fast track’ concepts including ‘development while exploring’ with the aim of minimising the time taken to bring the fields on-stream.”

Lim also announced that Shell had acquired the interests of an American-based oil company Occidental at SK8 block in the central Luconia

province, offshore Sarawak, including the exploration and production portfolios, following a complex international assets swap deal recently.

He said this deal could lead to a further investment of up to RM1bil by Shell.

“Production from SSB/SSPC for 1998 alone will generate some 707,000 barrels of oil equivalent per day (mboe/d) of which 65 mboe/d come from Sabah waters while 642 mboe/d from fields in Sarawak waters.”

“This means generating US\$3.6bil of revenue (based on an exchange rate of RM3.5 to US\$1 and an oil price of US\$16 per barrels,” added Lim.

Star, 26.7.1998

Shell strikes oil and gas deal with Occidental

The Royal Dutch Shell group has announced an international oil and gas deal with US-based Occidental involving the swapping of assets in their respective global oil and gas exploration and production portfolios.

The complex deal is said to be one of the world's largest cross-border exploration and production asset swaps.

In Malaysia, Shell will receive all of the Occidental interests in Occidental Oil and Gas (M) LLC, which holds a 37.5% interest in Block SK8 in Central Luconia Province offshore Bintulu, Sarawak, and all of the Occidental shares in Occidental LNG (M) Ltd. (OLML).

Shell said in a statement issued in London the deal also involved Occidental acquiring Shell's assets and businesses in Yemen, Pecten Yemen Masila and the stock of Compania Shell de Colombia Inc., one of Shell's exploration and production subsidiaries in Colombia.

In return, Shell would receive 100% ownership of Occidental's upstream subsidiaries in the Philippines, holding a 50% interest in the SC-38 concession offshore the Philippines, which includes the Camago/Malampaya gas to power project.

Occidental would also make cash payments to Shell to balance the difference in the overall

transaction.

The deal would increase Shell's oil/gas reserves by some 60 million barrels of oil equivalent.

In a separate statement, Sarawak Shell Bhd. managing director Lim Haw Kuang said the oil and gas deal with Occidental reinforced Shell's commitment to a long-term presence in Malaysia.

In addition to some RM12bil of investment and expenditure which Shell Malaysia had planned for the next five years, this deal could potentially lead to a further investment of up to RM1bil.

Occidental's SK8 Block off Bintulu contains six gas discoveries with an estimated 3.8 trillion cu ft of gas together with scope for further exploration.

The SK8 gas will be delivered to the Malaysia Liquefied Natural Gas (MLNG) Tiga joint venture, in which OLML and Shell each holds a 10% interest.

The statement said the transaction would enable Shell to increase the value of its portfolio in Sarawak to shareholders and Malaysian Government through the optimisation of field developments and follow-on-future investments, including the MLNG Tiga project.

Star, 27.7.1998

Shell to spend RM12b in 5 years

Sarawak Shell Berhad/Sabah Shell Petroleum Co Ltd, the exploration and production sector of Shell Malaysia, will spend RM12 billion on capital investment and operation expenditure in Sarawak and Sabah over the next five years.

"Of the amount, RM4.8 billion will be spent in Sarawak on exploration activities and RM2.4 billion in Sabah while the amount for the operating expenditure stands at RM1 billion in Sabah and RM3.8 billion in Sarawak," its managing director Lim Haw Kuang said last night.

Speaking at the annual Shell Kenyalang Press Awards, he said the investment demonstrated Shell's confidence in Malaysia and its commitment to develop oil and gas reserves for growth and long-term profitability.

He said this year alone SSB/SSPC was expected to spend RM2.2 billion on exploration and development projects, and operating costs.

Lim said SSB/SSPC was now pursuing a demanding schedule, including the drilling of 10 exploration wells — six in Sarawak and four in Sabah.

NST, 27.7.1998

Petronas signs production sharing deals

Petronas yesterday signed two production sharing contracts with US company Santa Fe Energy Resources Inc. and Sarawak Shell Bhd.

The PSC with Santa Fe — one of the largest independent oil companies in the US — is for Block PM308 which covers an area of 10,800 se kilometres — within the Penyu Basin, located off the Malaysian coast north of Pulau Tioman.

With Sarawak Shell, the PSC is for the exploration, development and production of hydrocarbons in SK308 and E6, F14 and F28 petroleum fields, offshore Bintulu, Sarawak.

Sarawak Shell and Petronas' wholly-owned subsidiary Petronas Carigali will have equal equity participation in the contract area, and Sarawak Shell will be the operator of the block.

A minimum investment of US\$25 million (RM102.5 million) will be committed to the block.

Both companies will explore for petroleum resources in Block SK308 and develop the three fields already discovered to supply natural gas to meet the requirements of phases two and three of the third liquefied natural gas plant in Bintulu.

Sarawak Shell said in a statement yesterday that the PSC could potentially lead to an additional investment of up to RM2 billion, and the success of the development could lead to another RM1 billion investment.

Santa Fe Energy, meanwhile, will operate block PM308 and have a 80 per cent interest while Petronas Carigali will hold the remaining stake.

A minimum investment of US\$22.1 million will be committed to the block, with three exploratory wells being drilled and comprehensive geological and geophysical studies being conducted.

The exploration contract is for five years, with the period for oil production being 15 years and gas production 20 years.

Santa Fe Energy is the second American independent oil concern to sign a PSC with Petronas this year, after Amerada Hess Corporation signed two PSCs for two exploration blocks offshore Terengganu and Sarawak in February.

The PSC with Santa Fe Energy is also the ninth PSC to be signed under the Revenue-Over-Cost concept introduced by Petronas in 1997 to encourage investments in the exploration activities.

The concept allows PSC contractors, like Santa Fe Energy, a better opportunity to recover their costs, especially for smaller and high-cost fields.

After the signing ceremony at Petronas Twin Towers in Kuala Lumpur, Santa Fe Energy president and chief operating officer Hugh Boyt said Southeast Asia had become a core area for its activities in recent years.

With expectations that half of its production will come from outside the US by the year 2000, Boyt said about 30 per cent will come from Southeast Asia.

After deciding in the late 1980s to expand its

business out of the US, Santa Fe Energy has since obtained five producing oil fields in Indonesia with two new discoveries there in the process of being developed.

"We also recently announced a new field discovery with our first operated exploration well in offshore China. That well tested over 10,000 barrels per day," said Boyt.

He added that the company was also the winning bidder for Block B7/38 offshore Thailand and scheduled to sign for that block in September.

"In addition to Southeast Asia, Santa Fe Energy has operations in three countries of West

Africa and two countries in South America."

Asked if the company found the gas production to be significant, Boyt said the existing logistics and infrastructure are not fully available for gas today.

"Our focus is on oil production. We are not ready to wait 10 to 15 years for the gas infrastructure."

Santa Fe Energy, based at Houston in Texas, was set up during the last century by the Santa Fe Railroad and its first oil discovery was made in California in 1897.

NST, 30.7.1998

MMC to keep to core of mining and infrastructure development

Malaysian Mining Corporation Bhd. (MMC) will stick to mining and infrastructure development as its core regardless of the economic uncertainties.

Group chief executive Tan Sri Ibrahim Menudin said MMC's business were for the long term and that it had sufficient reserves to ensure a smooth running of its operations.

"We made profits from the operations last year and have more than RM500mil sitting in the bank earning interest," he said after the company's AGM in Kuala Lumpur yesterday.

He said the figure did not take into consideration the RM1bil (at current market price) if the company were to sell its stake in the North American-based Homestake Mining Co.

For the financial year to Jan 31, 1998, MMC recorded an operating profit of over RM100mil but a devaluation of RM250mil of its holding in Plutonic Resources Ltd and Ashton Mining Ltd. brought the final figure to a negative territory of RM160mil.

This contrasts with RM91.9mil profit it made in 1997.

The devaluation was due to the deteriorating gold prices and adverse diamond market conditions exacerbated in the second half of 1997 by the sharp depreciation of East Asian currencies.

Ibrahim said the current year would see its bottom line returning to the black, without disclosing any forecast figures.

On the company's mining operations, he said a number of exploration works had been carried out to determine the feasibility of each mining field.

The company is currently involved in five exploration works at the Merapoh Prospect in Pahang, the Tavai Cobalt-Nickel Iron Laterite in Sabah, the Lao People's Democratic Republic Gold and Base Metal Project in Laos, the Cempaka-Danau Seran Alluvial Diamond Project in Kalimantan, and the Taldybulak Leftbank Gold Project in Kyrgyzstan.

Ibrahim said the most promising among the fields was the Cempaka-Danau diamond project in Kalimantan.

Star, 31.7.1998

Work at Tanjung Pelepas port ahead of schedule

Construction of Johor's second port in Tanjung Pelepas is progressing slightly ahead of schedule with the first two berths to be completed by December next year.

The remaining four berths will be completed by February 2000, and the all six berths will offer 2.16 km of linear quayside with full ancillary facilities and the latest equipment.

Transport Minister Datuk Seri Dr. Ling Liong Sik, who visited the port site today, said the Government was monitoring its work progress.

"It is seen as an important infrastructure to enable exporters and importers to fully utilise our local ports."

"I am satisfied with the progress. I am told that it is a little bit ahead of time."

The Tanjung Pelepas port is being developed by Pelabuhan Tanjung Pelapas Sdn. Bhd., a wholly-owned subsidiary of Seaport Terminal (Johor) Sdn. Bhd.

Strategically-located near the south-western tip of Peninsular Malaysia and about 45 km from Johor Baru, it is poised to become a world-class container port.

When completed by February 2000, it will have a capacity of 3.8 million TEUs (twenty-foot equivalent units), with space for further expansion.

Dr. Ling said the equipment for the first two berths had been ordered and would arrive on time.

A RM100 million contract has also been awarded by the Government for the construction of access road to the port, scheduled to be ready next May.

The planned rail link, meanwhile, will be built *"when we can afford it"*, Dr. Ling said.

"This port will have an integrated information technology system to link up the players like Customs, hauliers, shippers, freight forwarders, exporters and importers."

NST, 5.8.1998

Drilling of first deepwater well by Sabah Shell

Sabah Shell Petroleum Company Limited (SSPC) will drill Malaysia's first deepwater exploration well some 100 kilometres offshore from Kota Kinabalu in October.

SSPC managing director Lim Haw Kuang said the exploration well would be drilled 735 metres deep, which is almost twice the height of the Petronas Twin Towers in Kuala Lumpur.

He said the location for the well was chosen using advanced geophysical techniques including satellite imaging and seismic processing.

Lim also said that to boost short-term production and to secure long-term growth, the company would invest some RM12 billion in Sabah and Sarawak in both the exploration and

production sectors over the next five years.

Of the amount, RM3.4 billion would be invested in Sabah.

"Apart from that, the company's recent high-technology project to develop the Kinabalu oil field in offshore Sabah is proving to be a success," he said.

Lim said production facilities at the Kinabalu oil field would soon switch to fully remote, unmanned operations using the latest in computer assisted operations and high-speed telecommunication, turning the oil field into the first fully remote operated oil platform in the region.

NST, 10.8.1998

Kedah Cement looking to merge

Kedah Cement Holdings Bhd. is looking to merge with a local cement manufacturer to emerge stronger in view of the current economic slowdown.

Kedah Cement managing director Datuk Dr. Khalid Ngah said due to the dwindling local cement market, he believed that there was a need for the industry to consolidate.

"Being No. 2 in the country, it would be good to team up with other local companies to command

a bigger market share," he said after the company's AGM in Kuala Lumpur yesterday.

Debt-ridden Kedah Cement had been the target of many foreign cement manufacturers and a local player, YTL Corp. Bhd., due to its strategically-located 3.3 million-tonne facility in Langkawi.

Khalid said the group had not decided on the bids made by the foreign cement producers.

It is reported that foreign offers for Kedah

Cement was as high as RM2bil.

On the likelihood of Kedah Cement's major shareholders accepting the bid, Khalid said: *"It is up to the shareholders to decide. If the price is right, I would imagine so."*

The major shareholders of Kedah Cement are Hicom Holdings Bhd. with 36% equity and Bolton Bhd. with 29%.

On the company's operations, Khalid said that despite the weaker demand, the plant in Langkawi was still operating close to full capacity of 2.5 million tonnes a year, of which 1.4 million tonnes were exported.

"In fact, we are currently loading a 36,000-tonne cement vessel to Nigeria, the biggest ever single cement shipment by the local industry," he

said.

Meanwhile, in a press release, chairman Tan Sri Mohd Saleh Sulong said the company expected RM105mil in export earnings in the next year.

The first shipment was to Singapore, followed by Bangladesh, Egypt, Seychelles Islands, Maldives and Sri Lanka.

Up to July, the group had exported a total of 273,734 tonnes of clinkers and cement worth RM29.6mil.

For the financial to March 31, Kedah Cement posted a 46% drop in group pre-tax profit to RM65.6mil although group turnover rose 11% to RM622.5mil.

Star, 22.8.1998

Construction of Sungai Penchala Link put off

The Cabinet has decided to defer indefinitely the construction of the Sungai Penchala link, a part of the Sprint Highway, Works Minister Datuk Seri S. Samy Vellu said today.

Samy Vellu said the Cabinet decided to defer the project after taking into consideration factors such as the reclamation of land and the highway's design.

The RM1.3 billion Sprint Expressway which is expected to be ready by the year 2000, will have three links of 26 km of six-lane dual-carriageway, including a 700-metre long tunnel. The three links are the Duta-Kerinci Link, Penchala Link and Damansara-Semantan Link.

"There are many reasons why we came to this decision. At the moment, we are studying

alternative plans for the realignment of the Penchala Link project."

Speaking to reporters after launching the "Touch 'n Go" card, Samy Vellu said the Cabinet had given the go-ahead for the construction of the Damansara and Kerinci Link.

"The construction of the Kerinci and Damansara Link will begin in three months time now that the projects have received financing offers from the bank," he added.

He said a bank was prepared to lend more than RM800 million to finance the highway project but he did not name the bank concerned.

He added that it was necessary for work on these two projects to continue as they were important infrastructure schemes.

NST, 27.8.1998

Samy: 180 PWD projects delayed

The Works Ministry has identified about 180 government projects which have been delayed due to various problems.

Minister Datuk Seri S. Samy Vellu said the projects, which included roads, highways and government buildings, were carried out by the Public Works Department.

He said that among the reasons for the delay was failure of the contractors to adhere to work schedules besides delay in payments.

"For instance, the contractors claim that they are unable to maintain their cash flow due to the late payment by the Government."

"We will ask the PWD to assess the projects as soon as possible so that the contractors will not face problems to apply for loans from financial institutions in view of the economic slowdown." Speaking to reporters after visiting the Tanjung Pelepas port site yesterday, Samy Vellu said the ministry had to set up an Implementation and

Co-ordination Committee early this month in view of the problem.

He said the committee would investigate every contract and work out comprehensive and beneficial plans to overcome the problem.

He said the ministry would build the RM208mil two-phase road project linking Gelang Patah to the port, scheduled to be completed by the year 2000.

"The first phase will be a 5.7 km dual carriageway which will link Gelang Patah to the

Second Link while the second phase will have a 2.4 km-long two-lane single carriageway," he said.

The second phase would also have motorcycle lanes.

Samy Vellu said the Government had allocated RM2.6bil mainly for the port, government buildings and highway projects which would contributed to the country's economy.

Star, 28.8.1998

PRELIMINARY ANNOUNCEMENT

7th Asia-Pacific Conference on Electron Microscopy*"Perspective Imaging"*

26–30 JUNE 2000

SINGAPORE INTERNATIONAL CONVENTION & EXHIBITION CENTRE
SUNTEC CITY*Under the auspices of*Microscopy Society (Singapore)
National University of SingaporeThe International Federation of Societies for Electron Microscopy (IFSEM)
The Committee of Asia-Pacific Societies for Electron Microscopy (CAPSEM)**INVITATION**

The Organising Committee and I would like to extend a very warm invitation to all friends and colleagues in microscopy to welcome the 21st Century together at the 7th APEM in Singapore. The science will be food for many thoughts intercalated with exciting social events and delicious cuisine on a tropical island, 2° north of the equator. What more can one ask for? So please join us at the 7th APEM and make this event one to remember!

CONFERENCE VENUE

Singapore International Convention & Exhibition Centre, SUNTEC CITY.

ACCOMMODATION

Student hostels to 5-star hotels are available. Prices from S\$15 to S\$350 per night.

EXHIBITION

The Who's who in microscopy arena will be participating at this conference.

HIGHLIGHT (TO DATE)

- 5th NUS-PHILIPS Electron Optics Symposium (22 June 2000)
- Micrograph competition (optical, confocal and electron)

SCIENTIFIC PROGRAMMES (TO DATE)

1. Cryotechniques for microscopy
2. Imaging molecular dynamics of living cells
3. 3-D reconstruction of macromolecules
4. Crystallography
5. Electron topography microscopy
6. New advances in light microscopy
7. Image analyses & processing

8. Electron microscopy of DNA
9. Immunohistochemistry
10. X-ray analysis
11. Application of Green Fluorescent Protein (GFP) fluorescent microscopy
12. Electron microscopy of materials
13. Microstructure of advanced materials
14. Microstructure-property relationships in materials
15. New microscopes (SIMS, STM, AFM, etc.)
16. Sustainability through electron microscopy in environmental studies
17. Interpretation of analysis techniques for environmental studies
18. Failure analysis with electron microscopes
19. High resolution microscopy
20. Critical dimension measurement
21. Potential contrast microscopy
22. Contamination-free and non-destructive methods in microscopy

PRE-CONFERENCE WORKSHOPS (22 TO 24 JUNE 2000)

To be held at EM Unit, National University of Singapore.

CONFERENCE SECRETARIAT:

7th APEM Organising Committee
c/o Electron Microscopy Unit
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Hope page: <http://www.med.nus.edu.sg/micsoc/7apem>

KALENDAR (CALENDAR)

1998

August 30 – September 3

V.M. GOLDSCHMIDT CONFERENCE (8th Annual of The Geochemical Society), Toulouse, France. (Contact: E-mail: goldconf@lucid.upstlse.fr; WWW: <http://www.obs-mip.fr/omp/umr5563/goldconf98.html>)

August 30 – September 4

CLAY MINERALOGY AND PETROLOGY (International Conference and Workshop of IGCP Project No. 405), Brno, Czech Republic. (Contact: Petr Sulovsky, Dept. of Mineralogy, Petrology and Geochemistry, Faculty of Science, Masaryk University, Kotlarska 2, CZ 611 37 Brno, Czech Republic. Fax: 420 541211214; E-mail: clays@sci.muni.cz)

September

SEDIMENTARY ROCKS (International Symposium), Taipei, Taiwan, China. (Contact: Dr. Ou Chin Der, Director General, Taiwan Area National Expressway Engineering Bureau, Ministry of Transportation and Communications, Taipei Taiwan, China. Tel: +886 2 5156777; Fax: +886 2 5041281)

September 1–12

ANATOMY AND TEXTURES OF ORE-BEARING GRANITOIDS OF SIKHOTEALIN (PRIMORYE REGION, RUSSIA) AND RELATED MINERALIZATION (Joint Field Conference of IAGOD, IGCP-373, SGA, and Russian Academy of Sciences), Vladivostok, Russia. (Contact: Dr. Galina Gonevchuk, Far East Geological Institute of FEB of Russian Academy of Sciences, 159, Prospect 100-letya, Vladivostok, 690022, Russia. Tel: 7 4232 318 750; Fax: 7 4232 31 7847; E-mail: fegi@online.marine.su; WWW: <http://www.immr.tu-clausthal.de/lager/announcement1.html>)

September 5–9

ANTARCTIC GLACIOLOGY, Lanzhou, China. (Contact: Secretary General of ISAG-6, Laboratory of Ice Core and Cold Regions Environment, Lanzhou Institute of Glaciology and Geocryology, CAS, Lanzhou 730000, China. Fax: 86 931 8885241; E-mail: icecore@ns.lzb.ac.cn)

September 5–14

INTERNATIONAL "THE GEOLOGY OF TODAY FOR TOMORROW" (Conference on radioactive waste disposal, protection of drinking water resources, integrated stratigraphy and sequence analysis. GIS in geology — on the occasion of the 150th anniversary of the Hungarian Geological Society), Budapest, Hungary. (Contact: Hungarian Geological Society, P.O. Box 433, H-1371 Budapest. Tel: (361) 251 0889; Fax: (361) 156 1215; E-mail: csaszar@mafi.hu)

September 6–11

EARTHQUAKE ENGINEERING (International Conference), Paris, France. (Contact: French Association for Earthquake Engineering, 4 Avenue du Recteur Poincare, 75782 Paris Cedex 16, France. WWW: <http://dfc2.enpc.fr/ecee11>)

September 6–16

DEPOSIT AND GEOENVIRONMENTAL MODELS FOR RESOURCE EXPLOITATION AND ENVIRONMENTAL SECURITY (International Conference of NATO Advanced Study Institute), Matrahaza, Hungary. (Contact: Dr. A.G. Fabbri, Intern. Inst. for Aerospace Survey & Earth Sciences (ITC). Hengelosestr 99, P.O. Box 6, 7500 AA Enschede. The Netherlands. Fax: 31-53-487-4336; E-mail: fabbri@itc.nl)

September 7–9

SEDIMENT TRANSPORT AND DEPOSITION BY PARTICULATE GRAVITY CURRENTS (Conference), Leeds, UK. (Contact: Ben Kneller, Earth Sciences Department, University of Leeds, Leeds, LS2 9JT, UK. Tel: +44 113 233 6625; Fax: +44 113 233 5259; E-mail: ben@earth.leeds.ac.uk; WWW: <http://earth.leeds.ac.uk/turbidites/conference/html>)

September 7–10

DRINKING WATER CONTAMINATION (International Conference of International Association of Hydrological Sciences), Santiago, Chile. (Contact: Eric G. Reichard, U.S. Geological Survey, 5735 Kearny Villa Road, Ste. O. San Diego, California 92123, USA. Tel: 1 619 637 6834; Fax: 1 619 637 9201; E-mail: egreich@usgs.gov)

September 7-11

EARLY WARNING SYSTEMS FOR THE REDUCTION OF NATURAL DISASTERS (Conference), Potsdam, Germany. (Contact: E-mail: ewc98@gfz-potsdam.de)

September 7-14

INTERNATIONAL INHIGEO HISTORY OF GEOLOGY CONGRESS "From Folds to Nappes to Plates" "The History of Ideas About Glaciation", Neuchâtel, Switzerland. (Contact: Prof. Jean-Paul Schaer, Université de Neuchâtel, Institut de Géologie, Emile-Argand 11, 2007 Neuchâtel, Switzerland. Fax: 4132 7182601; E-mail: sabine.robert@geol.unine.ch)

September 8-10

COASTAL ENVIRONMENT 98 — ENVIRONMENTAL PROBLEMS IN COASTAL REGIONS (Conference), Cancun, Mexico. (Contact: Liz Kerr, Conference Secretariat, COASTAL ENVIRONMENT 98, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, SO40 7AA, UK. Tel: 44 (0) 1703 293223; Fax: 44 (0) 1703 292853; E-mail: liz@wessex.ac.uk; <http://www.wesses.ac.uk>)

September 9-11

REMOTE SENSING (Annual Conference, Natural Resource Institute and University of Greenwich), Kent, UK. (Contact: RSS98, School of Earth and Environmental Sciences, University of Greenwich, Medway Towns Campus, Chatham Maritime, Kent ME4 4AW, UK. Tel: 44 0181 3319803; Fax: 44 0181 3319805; E-mail: rss98@gre.ac.uk)

September 10-20

IGCP PROJECT 367 (FINAL MEETING) AND INQUA SHORELINES AND NEOTECTONICS COMMISSIONS, Corinth and Samos, Greece. (Contact: Stathis Stiros, Inst. of Geology and Mineral Exploration, 70 Mesoghion St., Athens 11527, Greece. Tel: 30 1 771 5522; Fax: 30 1 775 2211; E-mail: stiros@prometheus.hol.gr or Paolo Antonio Pirazzoli, CNRS, URA 141-Lab de Géographie Physique, 1 Pl. Aristide Briand, 92190 Meudon-Bellevue, France. Tel: 33 1 4507 5558; Fax: 33 1 4507 5830; E-mail: pirazzol@cnrs-bellevue.fr)

September 11-14

ASSOCIATION OF EARTH SCIENCE EDITORS (32nd Annual), Council of Biology

Editors, and Association of European Science Editors (Joint Meeting), Washington, DC, USA. (Contact: Arly Allen, Sheridan Electronic Systems, Suite 832, 400 E. Pratt St., Baltimore, MD 21202, USA. Fax: +1 410 347 1641; E-mail: aallen@ses.sheridan.com)

September 13-15

PETROLEUM GEOLOGY AND HYDROCARBON POTENTIAL (Conference), Neptune/Constanta, Romania. (Contact: Dr. Akif A. Narimanov, Azerbaijan Society of Petroleum Geologists. Tel: 0099412 92 3511; Fax: 0099412 92 3297; E-mail: Akifnar@Socar.baku.az)

September 13-17

ENVIRONMENTAL AND ENGINEERING GEOPHYSICS (4th International Conference), Barcelona, Spain. To receive the First Announcement sent E-mail request. (Contact: Lluís Rivero, Ass't of Applied Geophysics, Faculty of Geology, University of Barcelona, Barcelona 08071, Spain. Tel: 34-3-402.14.30; Fax: 34-3-402.13.40; E-mail: rivero@natura.geo.ub.es.)

September 14-17

MODERN EXPLORATION AND IMPROVED OIL AND GAS RECOVERY METHODS (2nd International Conference), Kraków, Poland. (Contact: DEXTER Congress and Symposium Bureau, Wroclawska 37A, 30-011 Kraków, Poland. Tel: 48 12 340 808; Fax: 48 12 336313; E-mail: kongresy@dexter.krakow.pl)

September 21-23

EPICONTINENTAL TRIASSIC (Symposium), Halle, Germany. (Contact: Gerhard Beutler, Institut für Geologische Wissenschaften und Geiseltalmuseum, Domstr. 5, D-06108 Halle/Oaale, Germany. Fax: 49 0 345 55 27 178)

September 21-25

INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY (8th International Congress), Vancouver, Canada. (Contact: Kim Meidal, Secretariat, 8th Congress IAEG, c/o BC Hydro, 6911 Southpoint Dr., Burnaby, BC V3N 4X8, Canada. Tel: 1 604 528 2421; Fax: 1 604 528 2558; E-mail: kim.meidal@bchydro.bc.ca; WWW: <http://www.bchydro.bc.ca/bchydro/IAEG/IAEG98.html>)

September 21-25

GROUNDWATER QUALITY (International Conference), Tübingen, Germany. (Contact: Conference Secretariat GQ '98, c/o Lehrstuhl für Angewandte Geologie, Sigwart-strasse 10, D-72076 Tübingen, Germany. Tel: 49 7071 2974692; Fax: 49 7071 5059; E-mail: mike.herbert@uni-tuebingen.de)

September 26-27

EVOLUTION OF STRUCTURES IN DEFORMING ROCKS, Canmore, Alberta, Canada. (Contact: Shoufa Lin, c/o Geological Survey of Canada, 601 Booth St., Ottawa, Ontario K1A 0E8, Canada. Fax: 1 613 995 7997; E-mail: slin@gsc.nrcan.gc.ca; WWW: <http://www.nrcan.gc.ca/ess/cgd/ctg98/>)

September 27 - October 2

GAMBLING WITH GROUND WATER: PHYSICAL, CHEMICAL AND BIOLOGICAL ASPECTS OF AQUIFER-STREAM INTERRELATIONS (28th Congress of the International Association of Hydrogeologists), Las Vegas, Nevada, USA. (Contact: John Van Brahana, IAH Las Vegas, USGS, 118 Ozark Hall, University of Arkansas, Fayetteville AR 72701, U.S.A. Tel: +1 501 575 2570; Fax: +1 501 575 3846; E-mail: jbrahana@jungle.uark.edu)

September 29-30

IMPROVING THE EXPLORATION PROCESS BY LEARNING FROM THE PAST, Haugesund, Norway. (Contact: Norwegian Petroleum Society, P.O. Box 1897 Vika, N-0124 Oslo, Norway; Fax: 47 22 55 46 30; E-mail: karin.haugness@npf.no)

September 30 - October 3

SOCIETY OF VERTEBRATE PALEONTOLOGY (Annual Meeting), Salt Lake City, Utah, USA. (Contact: SVP, 401 N. Michigan Ave., Chicago, IL 60611-4267, USA. Tel: 1 312 321 3708)

October 5-7

FIFTH INTERNATIONAL CONFERENCE ON REMOTE SENSING FOR MARINE AND COASTAL ENVIRONMENTS, San Diego Princess Convention Center, San Diego, California, USA. Organized by ERIM with sponsors that include NASA, NOAA/NESDIS, U.S. DOE Nevada Operations Office and Remote Sensing Lab., GER Corporation, RadarSat

International, and National Wetlands Research Center. (Contact: ERIM Marine Conferences, Box 134001, Ann Arbor MI 48113-4001 USA. Tel: +1 313 994 1200, ext. 3234; Fax: +1 313 994 5123; E-mail wallman@erim.org)

October 5-9

INTERNATIONAL ASSOCIATION FOR MATHEMATICAL GEOLOGY (Annual Conference), Ischia Island, Naples, Italy. (Contact: Conference Secretariat, IAMG '98, c/o Antonella Buccianti, Dipartimento di Scienze della Terra, Università di Firenze, Via La Pira 4, 50121 - Firenze, Italy. Tel: +39 55 275 7496; Fax: +39 55 284 571; E-mail: buccianti@cesit1.unifi.it)

October 6-9

GERMAN GEOLOGICAL SOCIETY (150th Annual Meeting), Berlin, Germany. (Contact: Johannes Schroeder, Inst. für Angewandte Geowissenschaften II, Ernst-Reuter-Platz 1, D-10587 Berlin, Germany. Tel: 49 30 314 23650; Fax: 49 30 314 21107; E-mail: Geo-Berlin-98@tu-berlin.de)

October 7-9

COMPUTER SIMULATION IN RISK ANALYSIS AND HAZARD MITIGATION (International Conference), Valencia, Spain. (Contact: Paula Doughty-Young, RISK ANALYSIS '98 Conference Secretariat, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton SO40 7AA, UK. Fax: +44 1703 292 853; E-mail: paula@wessex.ac.uk)

October 19-21

WILLISTON BASIN SYMPOSIUM (8th International), Regina, Saskatchewan, Canada. (Contact: Dr. Dough Paterson, Saskatchewan Geological Society, P.O. Box 234, Regina, Saskatchewan, Canada S4P 2Z6. Tel: +1 306 787 2625; Fax: +1 306 787 4608; E-mail: dpaterson@gov.sk.ca; WWW: <http://www.gov.sk.ca/enermine/about/semnew.htm>)

October 26-29

GEOLOGICAL SOCIETY OF AMERICA ANNUAL MEETING, Toronto, Ontario, Canada. (Contact: GSA Meetings Department, P.O. Box 9140, Boulder CO, 80301 USA. Tel: +1 303 447 2020; Fax: +1 303 447 1133; E-mail: meetings@geosociety.org; WWW: <http://www.geosociety.org/meetings/index.htm>)

October 26-29

SOCIETY OF ECONOMIC GEOLOGISTS (Annual Meeting, with GSA), Toronto, Canada)

October/November

PHYSICAL, CHEMICAL AND BIOLOGICAL ASPECTS OF AQUIFER-STREAM SEDIMENT INTERRELATIONS (28th IAH Congress) (Contact: Dr. J. Rosenschein, USGS MS 414, National Center, Reston Va 22092, USA; Fax: 703 648 5722)

November 8-11

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (International Conference and Exhibition), Rio de Janeiro, Brazil. (Contact: AAPG Conventions Department, P.O. Box 979, 1444 S Boulder Ave., Tulsa, OK 74101-0979, USA. Tel: +1 918 560 2679; Fax: +1 918 560 2684)

November 16-20

THIRTEEN SOUTHEAST ASIAN GEOTECHNICAL CONFERENCE (Conference), Taipei, Republic of China. (Contact: Dr. John Chien-Chung Li, Secretary General/SEAGC 13, c/o Public Construction Commission, Executive Yuan, Fl. 9, No. 4, Chung Hsiao West Road, Sec. 1, Taipei, Taiwan, Republic of China. Tel: 886-2-388-4962; Fax: 886-2-388-4959; E-mail: seagc13@mail.pcc.gov.tw)

December 1-3

ORIGIN OF THE EARTH AND MOON (International Conference of the Geochemical Society), Monterey, California, USA. (Contact: LeBecca Simmons, Lunar and Planetary Institute, 3600 Bay Area Boulevard, Houston TX 77058-1113, USA. Tel: 1 281 486 2158; Fax: 1 281 486 2160; E-mail: simmons@lpi.jsc.nasa.gov)

December 2-3

SEAPEX SILVER JUBILEE EXPLORATION CONFERENCE, Suntec City Exhibition Center, Singapore. (Contact: Mr. T.C. Chew, Southeast Asia Petroleum Exploration Society, P.O. Box 423 Tanglin Post Office, Singapore 812. Tel: (65) 338-9108; <http://web.singnet.com.sg/~seapex>)

December 6-10

AMERICAN GEOPHYSICAL UNION (Annual Fall Meeting), San Francisco, California, USA. (Contact: AGU Meetings Department, 1998 Fall Meeting 2000 Florida Avenue NW, Washington, DC 20009, USA. Tel: +1 202 462

6900 (in Washington, D.C. area and outside North America), or +1 800 966 2481 (toll-free in North America); Fax: +1 202 328 0566; E-mail: meetinginfo@kosmos.agu.org; WWW: <http://www.agu.org>)

1999**February 1-5**

SHALLOW TETHYS (International Symposium), Chiang Mai, Thailand. (Contact: Shallow Tethys 5 Symposium Secretary, Dept. of Geological Sciences, Chiang Mai University, Chiang Mai 50200, Thailand. Fax: 66 53 89 2261)

March 1-3

THIRTEENTH INTERNATIONAL CONFERENCE AND WORKSHOPS ON APPLIED GEOLOGIC REMOTE SENSING: Practical Solutions for Real-World Problems. Hotel Vancouver, Vancouver, British Columbia, Canada. Organized by ERIM with sponsors that include NASA, U.S. DOE Nevada Operations Office and Remote Sensing Lab, and USGS. (Contact: ERIM Geologic Conferences, Box 134001, Ann Arbor, MI 48113-4001 USA. Tel: +1 313 994 1200, ext. 3234; Fax: +1 313 994 5123; E-mail: wallman@erim.org)

March 1-4

SOCIETY FOR MINING, METALLURGY, AND EXPLORATION (Annual Meeting), Denver, Colorado, USA. (Contact: SME, 8307 Shaffer Parkway, P.O. Box 625002, Littleton, CO 80162-5002, USA. Tel: 1 303 973 9550; E-mail: smenet@aol.com)

March 9-11

INTERNATIONAL CONFERENCE ON PANGAEA AND THE PALEOZOIC-MESOZOIC TRANSITION, Wuhan, Hubei, China. (Contact: Dr. Tong Jinan, Faculty of Earth Science, China University of Geosciences, Wuhan, Hubei 430074, China. Tel: +86-27-7482031; Fax: +86-27-7801763; E-mail: jntong@dns.cug.edu.cn)

April 11-14

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (Annual Meeting), San Antonio, Texas, USA. (Contact: AAPG Conventions Department, P.O. Box 979, 1444 S. Boulder Ave., Tulsa, OK 74101-0979, USA. Tel: +1 918 560 2679; Fax: +1 918 560 2684; E-mail: dkeim@aapg.org)

May 26-28

GEOLOGICAL ASSOCIATION OF CANADA-MINERALOGICAL ASSOCIATION OF CANADA, JOINT ANNUAL MEETING, Sudbury, Ontario. (Contact: Dr. P. Copper, Dept. of Earth Sciences, Laurentian University, Sudbury, Ontario P3E 2C6, Canada. Tel: (705) 657-1151 ext. 2267; Fax: (705) 675-4898; E-mail: gacmac99@nickel.laurentian.ca)

June

FOURTH INTERNATIONAL AIRBORNE REMOTE SENSING CONFERENCE AND EXHIBITION, Ottawa, Ontario, Canada. Organized by ERIM. (Contact: ERIM Airborne Conferences, Box 134001, Ann Arbor, MI 48113-4001 USA. Tel: +1 313 994 1200, ext. 3234; Fax: +1 313 994 5123; E-mail: wallman@erim.org)

June 7-11

EUROPEAN ASSOCIATION OF GEOSCIENTISTS AND ENGINEERS (EAGE), 61st Conference), Helsinki, Finland.

July 19-30

INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS, Birmingham, UK. (Contact: IUGG99, School of Earth Sciences, University of Birmingham, Edghaston, Birmingham B15 2TT, UK. Fax: 44 121 414 4942; E-mail: IUGG99@bham.ac.uk)

August 3-12

INTERNATIONAL UNION FOR QUATERNARY RESEARCH (INQUA) (15th Congress), "The Environmental Background to Hominid Evolution in Africa", Durban, South Africa. (Contact: Dr. D. Margaret Avery, INQUA XV CONGRESS, P.O. Box 61, South Africa Museum, Capetown 8000, South Africa. Tel: +27 21 243 330; Fax: +27 21 246 716; E-mail: mavery@samuseum.ac.za; WWW: <http://inqua.geoscience.org.za>)

August 4-12

AFRICA, CRADLE OF HUMANKIND DURING THE QUATERNARY (XV INQUA Congress), Durban, South Africa. (Contact: Prof. T.C. Partridge, Climatology Research Center, University of Witwatersrand, 13 Cluny Rd., Forest Town, Johannesburg 2193, South Africa. Tel: +27 11 646 3324; Fax: +27 11 486 1689; E-mail: 141tcp@cosmos.wits.ac.za)

August 14-25

CARBONIFEROUS-PERMIAN (XIV International Congress), Calgary, Alberta, Canada. (Contact: Dr. Charles Henderson, Associate Professor, Department of Geology and Geophysics, The University of Calgary, N.W. Calgary, Alberta, Canada T2N 1N4. Tel: 403 220 6170; Fax: 403 285 0074; E-mail: henderson@geo.ucalgary.ca)

August 22-25

SOCIETY FOR GEOLOGY APPLIED TO MINERAL DEPOSITS (SGA) (5th Biennial Meeting), "Mineral Deposits: Processes to Processing," London, UK. Imperial College Natural History Museum. (Contact: Dr. Chris Stanley, Department of Mineralogy, Natural History Museum, Cromwell Road, London, SW7 5BD, UK. Tel: +44 171 938 9361; Fax: +44 171 938 9268; E-mail: cjs@nhm.ac.uk)

September

THE CONTINENTAL PERMIAN OF THE SOUTHERN ALPS AND SARDINIA (ITALY): Regional reports and general correlations (International Field Conference), Brescia, Italy. (Contact: Prof. G. Cassinis, Dipartimento di Scienze della Terra, Università di Pavia, Via Ferrata, 1, I-27100 Pavia, Italy. Tel: 39 382 505834; Fax: 39 382 505890; E-mail: cassinis@ipv36.unipv.it)

September

INTERNATIONAL ASSOCIATION OF HYDROGEOLOGISTS (29th Congress), Bratislava, Slovakia. (Contact: Prof. L. Melioris, Comenius University, Mylinska Dolina, 84215 Bratislava, Slovakia. Tel/Fax: +42 7 725 446; E-mail: podzvody@fns.uniba.sk)

September

INTERNATIONAL SOCIETY OF ROCK MECHANICS (9th International Congress), Paris, France. (Contact: Dr. S. Gentier, Secrétaire Général du CFMR, BRGM/DR/GGP, Avenue Claude Guillemin, B.P. 6009, F-45060 Orléans Cedex 2, France. Tel: +33 2 38 64 38 77; Fax: +33 2 38 64 30 62)

September 12-15

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October 25-28

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October 30 - November 4

SOIL SCIENCE SOCIETY OF AMERICA (Annual Meeting), Salt Lake City, Utah, USA. (Contact: SSSA, 677 So. Segoe Rd., Madison, WI 53711, USA. Tel: 1 608 273 8090; Fax: 1 608 273 2021; E-mail: rbarnes@agronomy.org)

2000**March 6-9**

SOCIETY FOR MINING, METALLURGY, AND EXPLORATION (Annual Meeting), Salt Lake City, Utah, USA. (Contact: SME, 8307 Shaffer Parkway, P.O. Box 625002, Littleton, CO 80162-5002, USA. Tel: 1 303 973 9550; E-mail: smenet@aol.com)

August 6-17

31ST INTERNATIONAL GEOLOGICAL CONGRESS, Rio de Janeiro, Brazil. Theme of the Congress: Geology and Sustainable Development: Challenges for the Third Millennium. (Contact: Prof. Hernani Chaves, President of the Preparatory Commission for the 31st IGC, Ave. Pasteur, 404, Urca: Cep 22290-204, Rio de Janeiro, Brazil. Tel: +55 21 295 5337; Fax: +55 21 542 3647; E-mail: Hernani@uerj.br)

October

INTERNATIONAL MILLENIUM CONGRESS ON GEOENGINEERING, Melbourne, Australia. (More information soon)

November 13-16

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Reno, Nevada, USA. (Contact: GSA Meetings Dept., P.O. Box 9140, Boulder, CO 80301-9140, USA. Tel: +1 303 447 2020; Fax: +1 303 447 1133; E-mail: meetings@geosociety.org; WWW: <http://www.geosociety.org/meetings/index.htm>)

2001**June 3-6**

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (Annual Meeting), Denver, Colorado, USA. (Contact: AAPG Conventions Department, P.O. Box 979, 1444 S. Boulder Ave., Tulsa, OK 74101-0979, USA. Tel: +1 918 560 2679; Fax: +1 918 560 2684; E-mail: dkeim@aapg.org)

November 5-8

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Boston, Massachusetts, USA. (Contact: GSA Meetings Dept., P.O. Box 9140, Boulder, CO 80301-9140, USA; Tel: +1 303 447 2020; Fax: +1 303 447 1133; E-mail: meetings@geosociety.org; WWW: <http://www.geosociety.org/meetings/index.htm>)

2002**March 10-13**

AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS (Annual Meeting), Houston, Texas, USA. (Contact: AAPG Conventions Department, P.O. Box 979, 1444 S. Boulder Ave., Tulsa, OK 74101-0979, USA. Tel: +1 918 560 2679; Fax: +1 918 560 2684; E-mail: dkeim@aapg.org)

October 28-31

GEOLOGICAL SOCIETY OF AMERICA (Annual Meeting), Denver, Colorado, USA. (Contact: GSA Meetings Dept., P.O. Box 9140, Boulder, CO 80301-9140, USA; Tel: +1 303 447 2020; Fax: +1 303 447 1133; E-mail: meetings@geosociety.org; WWW: <http://www.geosociety.org/meetings/index.htm>)

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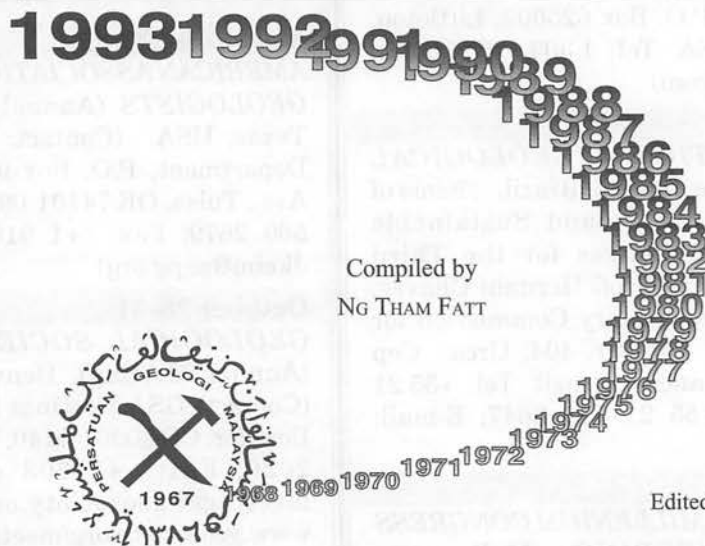
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