

# PERSATUAN GEOLOGI MALAYSIA

# WARTA GEOLOGI

## NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MALAYSIA

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GEOLOGICAL SOCIETY  
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# PERSATUAN GEOLOGI MALAYSIA

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The Society was founded in 1967 with the aim of promoting the advancement of earth sciences particularly in Malaysia and the Southeast Asian region.

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

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# CATATAN GEOLOGI

## Geological Notes

### Clay minerals in the weathering profile of a graphitic-quartz-muscovite schist in the Kajang area, Selangor

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**Abstract:** X-ray diffractograms show randomly interstratified illite-montmorillonite and kaolinite to be the clay minerals present in the upper morphological horizons of the weathering profile, whilst illite and kaolinite are the clay minerals present in the lower morphological horizons. Increasing amounts of randomly interstratified illite-montmorillonite and kaolinite up the weathering profile, and a corresponding decrease of illite, reflect increasing effects of weathering processes; disaggregation and disintegration of muscovites and sericites within the original bedrock material initially resulting in illite, followed by development of randomly interstratified illite-montmorillonite and kaolinite through leaching of the illites.

#### INTRODUCTION

There is a lack of published literature on the clay minerals of weathering profiles over quartz-mica schist bedrock in Malaysia, except for Yeow (1975), Siti Zauyah (1986) and Raj (1993a; 1993b). Yeow (1975) studied two well drained profiles; one over a quartz-phengite schist and the other over a graphitic-muscovite-quartz schist. In the profile over the quartz-phengite schist, Yeow (1975) concluded that kaolinite formed where rapid leaching of potassium and iron from the phengite occurred, though where the rate of removal of these ions was slow, a mixed layer phengite-montmorillonite was formed. In the profile over the graphitic muscovite-quartz schist, Yeow (1975) concluded that muscovite altered to kaolinite and halloysite, though the rate of decomposition was slow. Siti Zauyah (1986) investigated a well-drained weathering profile over a graphitic quartz-sericite schist and concluded that sericite altered to kaolinite. Raj (1993a; 1993b) studied weathering profiles over quartz-muscovite schists and concluded that disaggregation and disintegration of muscovites and sericites initially resulted in illite; leaching

of the illite leading to formation of randomly interstratified illite-montmorillonite and kaolinite.

In studying the characterisation (for engineering geological purposes) of a weathering profile over a graphitic-quartz-muscovite schist bedrock, samples were collected at various depths and their clay fractions investigated by X-ray diffraction. Results of these studies are presented in this paper which also discusses the origins of the clay minerals identified to be present in the weathering profile.

#### SAMPLING SITE — GEOLOGICAL SETTING

The selected weathering profile is exposed at a slope cut, excavated in 1974, located on the eastern side of the Kuala Lumpur-Seremban Highway at km 25.6 (Fig. 1). The Highway here cuts across the col between two low hills and trends in a general N-S direction across a low-lying, undulating terrain. The slope cut was of an approximately symmetrical shape with a length of some 100 m along its base and a maximum vertical height of 10 m at its centre.



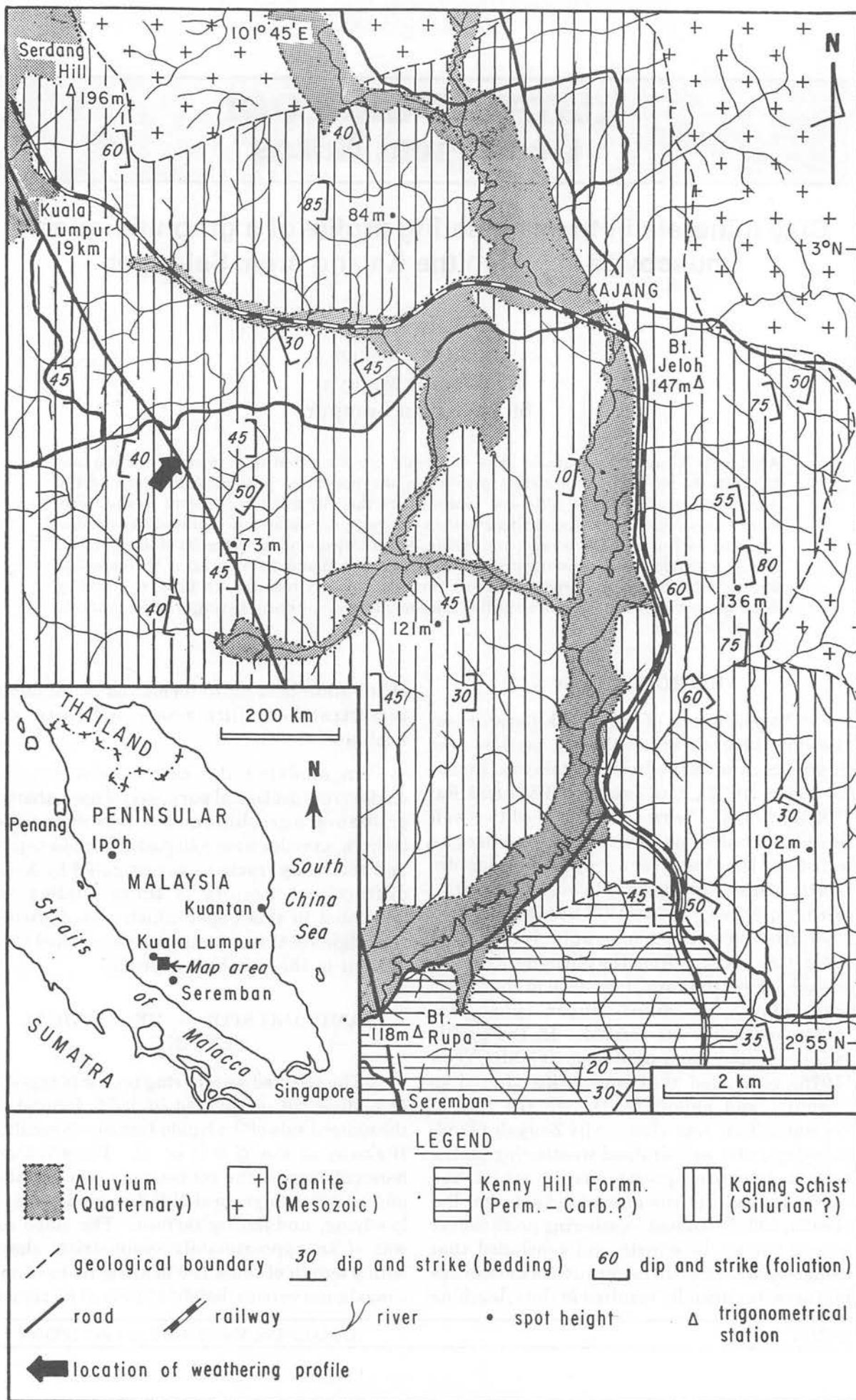


Figure 1. Geological sketch map of the Kajang area (after Yin, 1976).

The cut, which had an overall slope angle of 45°, was benched with the benches of 2.50 m and 3.75 m vertical height and face angles of 55° separated by horizontal berms of 1.56 m and 1.88 m wide.

At this cut is exposed a weathering profile developed over an original bedrock mass that comprised dark grey to black graphitic-quartz-muscovite schists inter-layered with thin bands and lenses of orange to buff coloured, quartz-muscovite schists. These schists, which contain many thin quartz veins and pods, form part of the Kajang Schist, which has been reported to be strongly folded with variable strikes and dips, and is of a probable Lower Carboniferous to Permian age (Yin, 1976).

The exposed weathering profile can be subdivided into a number of morphological horizons, each of which is characterised by the lateral similarity of morphological features (Fig. 2). Completely unweathered bedrock material, however, is not exposed, though the weathered material indistinctly to distinctly preserves all the textural and structural features of the original bedrock mass. The relict foliation, though variable, generally strikes N-S with a westward dip of 40°. Several sets of indistinct to distinct, closely spaced relict joint planes are also seen and are often developed perpendicular to the relict foliation.

In thin-sections, the less weathered graphitic-quartz-muscovite schists are seen to consist of thin layers (some 0.5 mm thick) of fine grained quartz crystals in parallel alignment with thicker layers (of up to 5 mm thick) of aligned graphite, sericite, muscovite and clay minerals. The quartz-muscovite schists also show a similar appearance in thin-section, except for the absence, or presence in minor amounts, of graphite in the thicker layers. In the thin-sections, secondary iron oxide stains and grains are often seen, while thin quartz veins are sometimes seen developed perpendicular to the foliation.

#### METHODS OF SAMPLING AND X-RAY DIFFRACTION

Samples of the earth materials exposed at the weathering profile were collected at

various depths (Fig. 3) using thin walled, cylindrical brass rings of 7.6 cm internal diameter. These samples were then air dried and separated into smaller fractions using a sample splitter. Fractions of samples to be used for the X-ray diffraction were then ground with a porcelain mortar and pestle and placed into 30 ml test tubes which were filled with distilled water and three drops of concentrated ammonia solution added. The test tubes were vigorously shaken for two minutes and allowed to stand overnight before the suspension in the top 1 cm was collected with a glass dropper and spread onto glass slides to air dry.

Following air drying, the glass slides were scanned from 5° to 28° 2 $\theta$  at a goniometer speed of 1°/min using Copper K $\alpha$  radiation in order to obtain diffractograms of the clay fractions under untreated conditions. Two drops of 6% glycerol in ethyl alcohol were then dropped onto the slides, and after air-drying, they were scanned from 5° to 15° 2 $\theta$  to obtain diffractograms under glycolated conditions. The slides were then heated in an oven for one hour at 500°C, and after cooling in a desiccator, scanned from 5° to 15° 2 $\theta$  to obtain diffractograms under conditions of heating to 500°C.

#### RESULTS

The resulting X-ray diffractograms (Fig. 4) show several reflections that indicate the presence of a number of clay minerals. These reflections are of variable intensities and show that there is some vertical variation in the types, and amounts, of the different clay minerals present within the weathering profile.

In clay fractions of the middle and lower morphological horizons IIB and IIC (Samples 7 to 10), the narrow and slightly asymmetrical reflections on the untreated diffractograms at 8.75°, 17.75° and 26.7°, 2 $\theta$  (corresponding to d-spacings of 10.1, 5.0, and 3.34, Angstroms) indicate the presence of illite; confirmation being the absence of shifts of the 8.75° 2 $\theta$  reflection on glycolation and on heating to 500°C (Fig. 4). It is to be noted that the term 'illite' is here used in the sense proposed by Grim, Bray and Bradley (1937) i.e. as being a general name for mica-like clay minerals. The narrow and

Vertical Depth	Morphological Horizon	Morphological Horizon	Description
0 m	IB <sub>1</sub>	IB <sub>1</sub>	Reddish yellow, friable sandy clay with many gravel sized lateritic concretions; boundary wavy, gradual.
	IB <sub>2</sub>	IB <sub>2</sub>	Reddish yellow, firm clayey sand with some gravel sized lateritic concretions; boundary irregular, diffuse.
	IB <sub>3</sub>	IB <sub>3</sub>	Yellowish red, firm clayey sand with some gravel sized lateritic concretions and lateritized corestones; boundary irregular, diffuse.
	IC <sub>1</sub>	IC <sub>1</sub>	Yellowish red and reddish yellow, mottled, stiff clayey sand with some lateritized corestones and vein quartz clasts; boundary irregular, diffuse.
	IC <sub>2</sub>	IC <sub>2</sub>	Yellowish red, firm silt with white mottles, distinct relict quartz veins, some lateritized corestones and indistinct relict foliation; boundary broken, diffuse.
5 m	IIA	IIA	Thick bands of yellowish red to purple and white, firm silt with indistinct relict foliation alternating with thin bands of light grey to yellow, firm silt with distinct relict foliation and quartz veins, indistinct relict joint planes and a few lateritized corestones; boundary broken, diffuse.
	IIB	IIB	Thick bands of light grey to yellow, firm silt with distinct relict foliation alternating with thin bands of yellowish red to purple and white, firm silt with indistinct relict foliation; distinct relict quartz veins and joint planes; boundary broken, diffuse.
10 m	IIC	IIC	Thick bands of dark grey and yellow, firm silt alternating with thin bands of light grey to yellow, firm silt with distinct relict foliation, quartz veins and joint planes.

Figure 2. Schematic sketch and field description of morphological horizons within the weathering profile over the graphitic quartz-muscovite schist.

symmetrical reflections on the untreated diffractograms at  $12.25^\circ$  and  $24.8^\circ 2\theta$  (corresponding to d-spacings of 7.2 and 3.58 Angstroms) indicate the presence of kaolinite; confirmation being the absence of shift of the  $12.25^\circ 2\theta$  reflection on glycolation and its disappearance on heating to  $500^\circ\text{C}$ .

In clay fractions of the top-most morphological (or pedological) horizons  $\text{IB}_1$ ,  $\text{IB}_2$  and  $\text{IC}_1$  (Samples 1 to 3), the narrow and symmetrical reflections on the untreated diffractograms at  $12.25^\circ$  and  $24.8^\circ 2\theta$  (corresponding to d-spacings of 7.20 and 3.58 Angstroms) indicate the presence of kaolinite; confirmation being the absence of shift of the  $12.25^\circ 2\theta$  reflection on glycolation and its disappearance on heating to  $500^\circ\text{C}$ . Broad

reflections on the untreated diffractograms between  $7^\circ$  and  $8.5^\circ 2\theta$ , and around  $17.8^\circ 2\theta$  (corresponding to d-spacings of between 12.6 and 10.4, and about 5.0 Angstroms, respectively) are not characteristic of individual discrete clay minerals and indicate the presence of an interstratified (or mixed-layered) clay mineral. In view of the fact that the broad reflections between  $7^\circ$  and  $8.5^\circ 2\theta$  shift to around  $8.5^\circ 2\theta$  on heating to  $500^\circ\text{C}$ , it is considered that this clay mineral is an interstratified illite-montmorillonite (Moore and Reynolds, 1989). The absence of other reflections at lower  $2\theta$  angles on the untreated diffractograms furthermore, shows that the inter-stratification is of a random nature. Comparisons with calculated diffraction patterns in Reynolds (1980), and Moore and Reynolds (1989), indicate

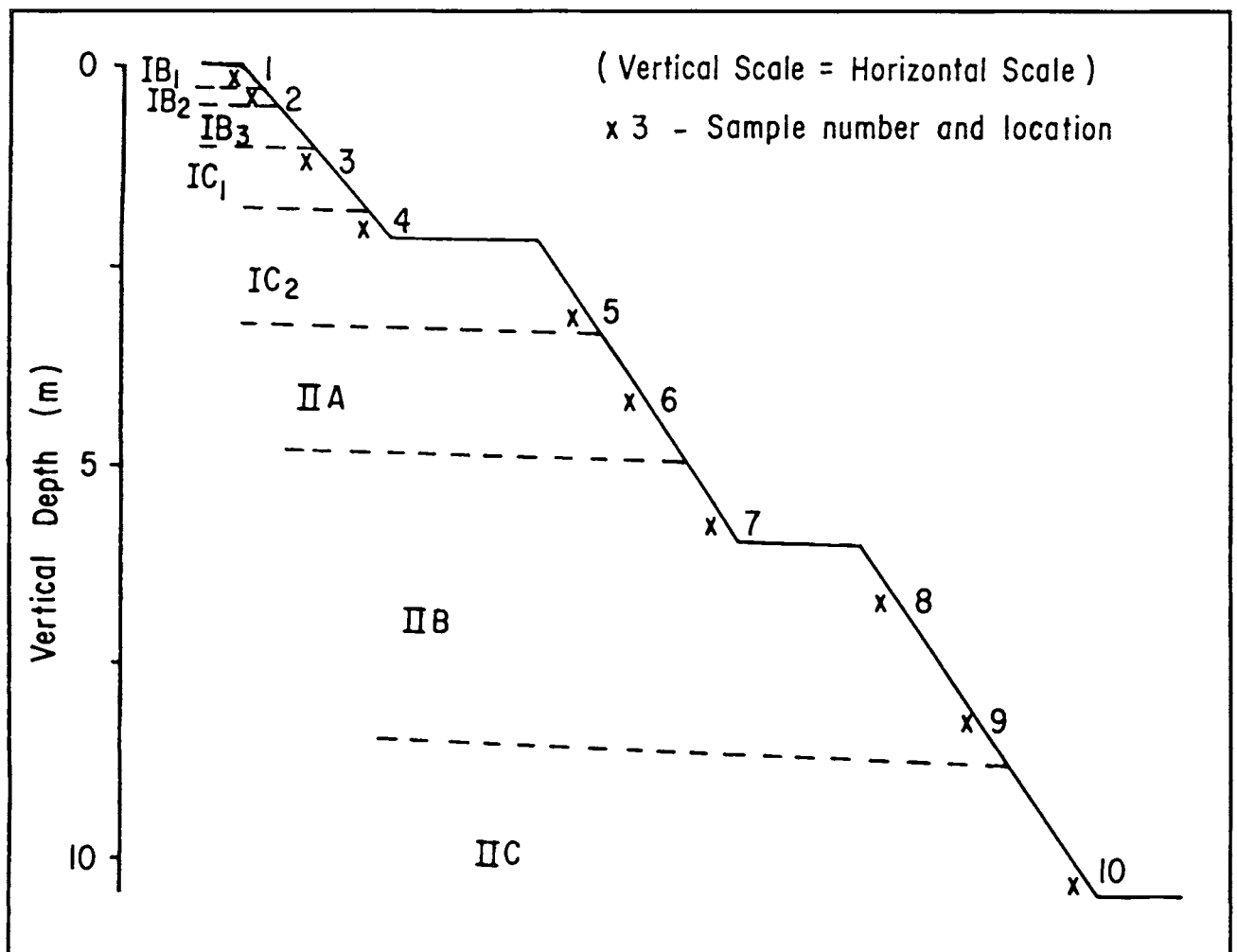


Figure 3. Sample locations and lateral extensions of morphological horizons within the weathering profile over the graphitic-quartz-muscovite schist.

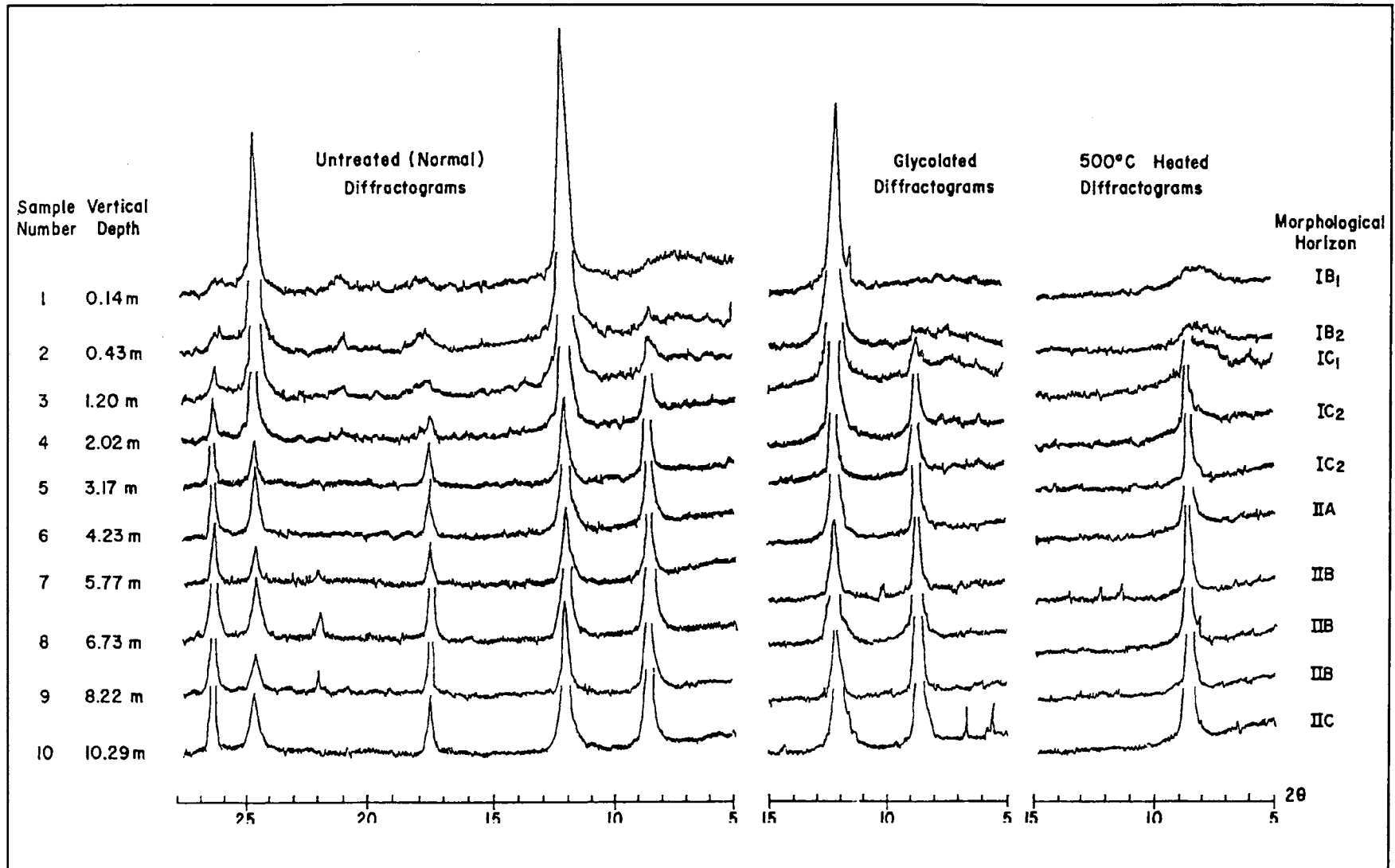


Figure 4. X-ray diffractogram of the clay fraction of samples from the weathering profile over the graphitic-quartz-muscovite schist.



that the interstratified montmorillonite layers form at most some 10% of the randomly interstratified clay mineral. In the clay fraction of morphological horizon IC<sub>1</sub> (Sample 3), however, the content of the interstratified montmorillonite layers is much lower as the illite shows a distinct reflection on both the untreated and glycolated diffractograms (Fig. 4).

In clay fractions of the intermediate morphological horizons IC<sub>2</sub> and IIA (Samples 4 to 6), the narrow and symmetrical reflections on the untreated diffractograms at 12.25° and 24.8° 2θ (corresponding to d-spacings of 7.2 and 3.58 Angstroms) indicate the presence of kaolinite; confirmation being the absence of shift of the 12.25° 2θ reflection on glycolation and its disappearance on heating to 500°C. The asymmetrical and narrow reflections on the untreated diffractograms at 8.75°, 17.75° and 26.7° 2θ (corresponding to d-spacings of 10.1, 5.0 and 3.34, Angstroms, respectively), indicate the presence of illite; confirmation being the absence of shift of the 8.75° 2θ reflection on glycolation and on heating to 500°C.

## DISCUSSION

From the results, it can be seen that there is a vertical variation in clay mineralogy within the weathering profile. In the lower part of the weathering profile (in morphological horizons IIB and IIC), illite and kaolinite are the clay minerals present, whilst in the top-most part (in pedological horizons IB<sub>1</sub>, IB<sub>2</sub> and IC<sub>1</sub>), kaolinite and randomly interstratified illite-montmorillonite are the clay minerals present. At intermediate depths within the weathering profile, in horizons IC<sub>2</sub> and IIA, kaolinite and illite are again the clay minerals present.

The occurrence of illite in the lower morphological horizons is unexpected in view of the mineral composition of the quartz-muscovite schist bedrock material for the disaggregation and disintegration of muscovites and sericites within the bedrock material will lead to the clay sized material identified as illite on the diffractograms. A similar origin can also be considered for the illites found in the intermediate morphological horizons IC<sub>2</sub> and IIA.

The occurrence of the randomly interstratified illite-montmorillonite in the upper morphological horizons IB<sub>1</sub>, IB<sub>2</sub> and IC<sub>1</sub> is also in a sense unexpected, for several authors, including Grim (1953), Droste and Tharin (1958), Millot (1970), and MacEwan and Ruiz-Amil (1975) have pointed out that leaching of cations (particularly K<sup>+</sup>) from illite structures, and the entrance of water, gives rise to randomly interstratified illite-montmorillonite. Increasing effects of these processes within the weathering profile are also seen in the diffractograms (Fig. 4) with the gradual broadening and asymmetry of the 8.75° 2θ reflections up the profile.

The occurrence of kaolinite within the weathering profile is a somewhat unexpected one in view of the mineral composition of the graphitic-quartz-muscovite schist bedrock material. Increasing amounts of kaolinite up the weathering profile, and a corresponding decrease of illite, however, suggest that the kaolinite has developed as a result of weathering, probably through the leaching of illite. Such an origin for kaolinite has in fact been proposed by several other authors including Loughnan (1969), Weaver and Pollard (1973), Yeow (1975), Siti (1986) and Raj (1993a; 1993b).

## CONCLUSION

It is concluded that randomly interstratified illite-montmorillonite and kaolinite are the clay minerals present in the upper morphological horizons of the weathering profile, whilst illite and kaolinite are the clay minerals present in the lower morphological horizons. It is also concluded that increasing amounts of kaolinite and randomly interstratified illite-montmorillonite up the weathering profile, and a corresponding decrease of illite, reflect increasing effects of weathering processes; disaggregation and disintegration of the original bedrock material initially resulting in illite, followed by development of randomly interstratified illite-montmorillonite and kaolinite through leaching of the illites.

## ACKNOWLEDGEMENTS

This study forms part of a research project on the geotechnical properties of earth materials

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# CATATAN GEOLOGI

## Geological Notes

### Some engineering geology characteristics of the Kenny Hill Formation, Kuala Lumpur

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#### INTRODUCTION

Engineering geology is the study of the geological factors that influence the design and construction of engineering projects. The engineering geology of the Kenny Hill Formation at Kuala Lumpur was examined by the writer (Lim, 1985) and some of its characteristics are presented here. In the study, the descriptions and classification of the earth materials of the Kenny Hill Formation was based on the system proposed by the International Association of Engineering Geologists (IAEG, 1981). The main divisions of the earth materials are into residual soils, weathered rocks and fresh rock.

#### KENNY HILL FORMATION

The Kenny Hill Formation occurs over a large part of Kuala Lumpur and south of it. It was mapped by Yin (1976). The Kenny Hill Formation is a sequence of interbedded sedimentary rocks that had experienced some metamorphism by the granite that intruded into it. It occurs as a sequence of quartzite, phyllite and shale.

#### WEATHERING PROFILE OF THE FORMATION

The weathering profile of the formation extends to approximately 40 m below surface and variations in its thickness occur throughout. The weathering profile of the formation was also described by Ibrahim Komoo (1989).

The soil materials of the Kenny Hill Formation is derived from the intense weathering of the original rocks. The Kenny Hill formation occurs as an interbedded sequence and has moderate dips. Because of these factors the weathering profile and changes of the soil characteristics with depth show variations. Furthermore the resistance of the different layers towards weathering is different. The shale layer is more resistant to weathering whereas the quartzite breaks down more easily into silt.

In hilly areas where the activity of erosion is high, the layer of the residual soils are thin. Whereas in the lowlands the layer of the residual soils are thicker. Occasionally, in the lowlands the soil materials of the Kenny Hill Formation is covered by alluvium especially when it is near the river.

Figure 1 shows a subsurface profile of the Kenny Hill Formation at Jalan Shaw, Kuala Lumpur. The profile was prepared based on my interpretations of borehole data courtesy of JKR (1981). In general, it shows that the residual soils are composed chiefly of clay. The weathered soil materials are chiefly sandy silt. In the lower section of the profile, there occurs weathered rock materials which consists of shale, phyllite and quartzite.

The colour of the residual soils is yellowish brown but the weathered materials are of various colours.

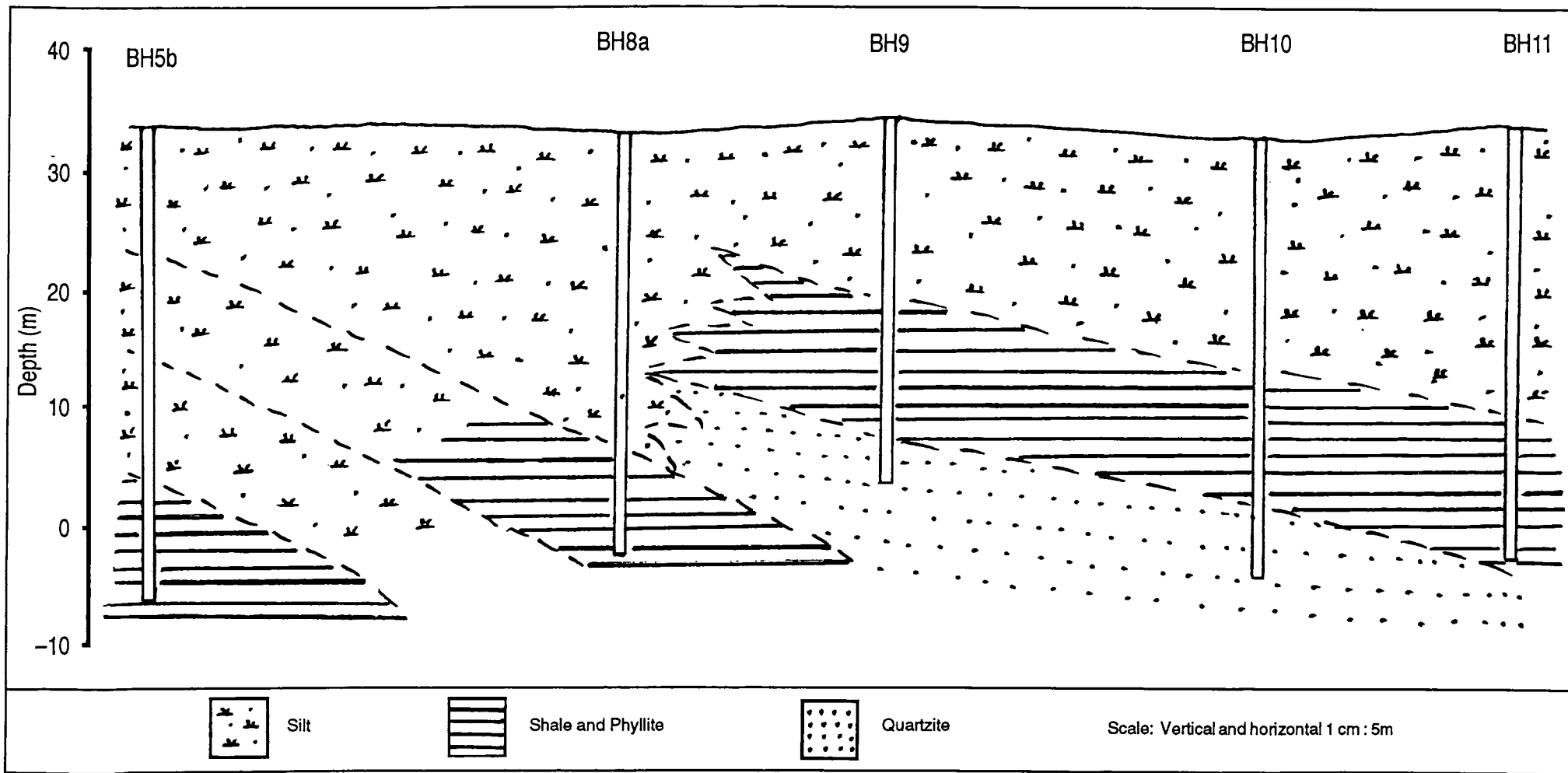


Figure 1. Shows the subsurface profile of the Kenny Hill Formation at Jalan Shaw, Kuala Lumpur.

**Table 1:** Point load strength and water content results of three samples from the Kenny Hill Formation.

Sample No.	Rock Type	Weathering Grade	Water Content	Point Load Strength Index, $I_{550}$ , MPa	Correlated Uniaxial Compressive Strength $I_{550} \times 25$ , MPa
PL3	Quartzite	III	2.88	0.33	8.1
PL4	Quartzite, Shale and Phyllite	III	2.78	0.63	15.7
PL8	Quartzite	III	3.65	0.57	14.3
Average			3.10	0.51	12.7

### POINT LOAD STRENGTH

The rock materials of the Kenny Hill formation was also examined for their water content and point load strength index. The point load strength was described by Broch and Franklin (1972). Three samples from the Kenny Hill formation was examined and results presented in Table 1. The three samples were from different surface locations within the formation and comprised weathered rock materials of Grade III that is moderately weathered. The average water content is 3.10%. The average value of the point load index is 0.51 MPa and the average value of the correlated uniaxial compressive strength is 12.7 MPa. This point load strength index is only indicative of the strength of the moderately weathered rock materials of the formation.

### CONCLUSION

The profile of the Kenny Hill Formation just below the surface comprised residual soils, weathered soil materials and weathered rock materials in engineering geologic terms. However because of the interbedded nature of the formation and having moderate dips, the

characteristics of the soil and rock materials together with their strength show much variations.

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# Souvenirs For Sale

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

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

# PERTEMUAN PERSATUAN Meetings of the Society

## Ceramah Teknik (Technical Talk)

### **Late Cretaceous environmental change**

ANDY GALE

#### **Abstrak (Abstract)**

The Cretaceous world differed significantly from our own in the lack of polar ice-caps, the very high global sea-levels which resulted in the flooding of many continents, the major palaeogeographic features such as presence of the Tethyan Ocean. The oceans were more prone to anoxia, and widespread organic-rich deposits formed in the shelves and in the ocean basins. I will examine the sedimentary record of this Cretaceous greenhouse world, and speculate as to why so much chalk formed on a global scale.

### **Mudrocks and their diagenesis**

JENNY HUGGETT

#### **Abstrak (Abstract)**

Due to their fine grain size, and apparent uniformity mudrocks have attracted little attention from petrologists until quite recently. Consequently, most of what is known about their diagenesis is derived from X-ray diffraction studies of the clays and other minerals present. With modern electron optical techniques (back-scattered SEM and high resolution field emission SEM) it is both possible and simple to study the petrography of fine grained rocks. The diversity of mudrock textures and diagenesis will be described, using examples mostly from the UK and the North Sea. The mechanisms and relative timing of mudrock diagenetic reactions will be briefly discussed and contrasted with diagenetic processes in sandstone.

#### **Report (Laporan)**

Members who turned up at the Geology Department, University of Malaya on the afternoon of 13th January 1995 were treated to 2 excellent talks by Andy Gale of the Department of Palaeontology, The Natural History Museum of London and Jenny Huggett of Imperial College, London. Both discussed the results of their current researches and the talks were well illustrated with good outdoor slides and photomicrographs. Both are in Malaysia, seeing the country and collecting samples and data and are guests of Dr. Lee Chai Peng, Department of Geology Universiti Malaya.

G.H. Teh



ANDY GALE AND JENNY HUGGETT  
WITH C.P. LEE

GSM

**Seminar by staff of Geology Department, University of Malaya**  
**Captions to Photos**

1. Wan Hasiah starting off the Seminar.
2. Azhar Hj. Hussin happy with his presentation.
3. K.R. Chakraborty on granites.
4. J.K. Raj on EIA studies.
- 5-7. Tea break.
8. E.B. Yeap on the Highland Towers collapse.
9. T.T. Khoo receiving a memento from the Session Chairman, Ahmad Tajuddin.
10. Mohd. Ali Hasan with his presentation.
- 11-14. The various audiences.

# Seminar by staff of Geology Department, University of Malaya



## Seminar by staff of Geology Department, University of Malaya

This seminar by staff members of the Geology Department, University of Malaya, a collaboration with the Society, was held over 3 Monday afternoons. The papers presented include:

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### 16 January 1995

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1. Depositional palaeoenvironment characterization — An organic geochemical approach (a case study from Spitsbergen)  
*Wan Hasiah Abdullah*
2. The on-shore North Sarawak Basin: Stratigraphy, basin evolution and economic potential  
*Azhar Hj Hussin*
3. Tectonomagmatic evolution of the Main Range granite of Peninsular Malaysia  
*K.R. Chakraborty*

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### 23 January 1995

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4. Geology in environmental impact assessment studies  
*J.K. Raj*
5. Collapse of the Block A, Highland Towers, Ulu Kelang: The geological, geotechnical and geomorphological factors and the probable cause/s of the collapse  
*E.B. Yeap*

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### 13 February 1995

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6. The Hua San (Qinling, China) and Peninsular Malaysia orogens: A comparison  
*T.T. Khoo*
7. Hot springs and mineral water development — A Malaysian scenario  
*Mohd Ali Hasan*

The various papers drew considerable interest from members, however, the paper by Dr. Yeap on the collapse of Block A of Highland Towers attracted the best crowd of about 60.

Tea breaks for the 3 afternoons were provided by the Society. The Society appreciates the input by Dr. E.B. Yeap in coordinating the above Seminar and making it a success.

G.H. Teh



## Seminar by staff of Geology Department, University of Malaya — Abstracts of Papers

### Depositional palaeoenvironment characterization — An organic geochemical approach (a case study from Spitsbergen)

**Wan Hasiah Abdullah**  
Department of Geology, University of Malaya

Depositional palaeoenvironment characterization based on organic geochemical parameters formed part of an organic facies evaluation carried out on Carboniferous to Tertiary sedimentary sequences of Spitsbergen. In this study, the organic facies is defined by the biomarker distribution, distinctive kerogen assemblages, TOC content and pyrolysis data. Among the Carboniferous sediments, coals of peat-swamp type environment and lacustrine environment can be differentiated based on their distinct organic facies. The Permian limestones, deposited within a shallow marine environment are shown to be strongly influenced by terrestrially-derived organic matter. The Triassic and Jurassic sediments, deposited within a marine setting of shallow to deep shelf environment also indicate organic facies characteristics dominated by terrestrial markers. Coals and carbargilites of the Tertiary and Cretaceous samples studied were mainly deposited within peat-swamp environments of a deltaic setting. Coal-facies analysis performed on these coals/carbargilites has been able to differentiate between forest-swamps of upper delta plain setting and limnotelmatic or limnic depositional environments of lower delta plain setting.

Distinctive terrestrial markers include the presence of coaly particles, very high TOC content, low HI values, high pristane/phytane and Tm/Ts ratios, high concentration of C<sub>24</sub> tetracyclic terpane, and pyrolysis-GC traces dominated by phenolic and aromatic compounds. Marine and lacustrine markers share some common organic facies characteristics such as high "aquatic ratio", high concentration of tricyclic terpanes, abundant n-alkanes with low-mid range members, relatively lower pristane/phytane and Tm/Ts ratios compared to coaly sediments and Py-GCs dominated by n-alkane/alkene doublets. Distinction between lacustrine and marine facies could be made, however, by the algal assemblage present (*Botryococcus* in lacustrine, *Tasmanites* in marine) and by the higher organic richness and hydrogen indices in the lacustrine facies.

### The onshore North Sarawak Basin: Stratigraphy, basin evolution and economic potential

**Azhar Haji Hussin**  
Department of Geology, University of Malaya

The onshore North Sarawak Basin (NSB) comprises of three thick unconformity-bounded lithostratigraphic units, each with its own sedimentological characteristics and structural style and history. The depocenters of these units successively shifted northwards. A trend towards a simpler structural style is also observed in the same direction.

The oldest unit is the intensely folded Late Cretaceous-Middle Eocene shale-turbidite sandstone sequences forming the Rajang Group, now exposed as the arcuate Rajang Mountain range. Inliers of this Group outcrop to the north of the Rajang range in the Mulu-Temala Anticlinorium. Paleontological and sedimentological evidence suggest deposition occurred in a relatively deep marine setting. Basin inversion with concomittent folding and thrusting affected this unit in the Late(?) Eocene. Subsequent erosion of this unit allowed it to be the basement for the younger sequence.

The second unit is the Middle Tertiary succession which represents the infill of an alluvial valley and shelf initiated in Late Eocene times. Along the southern margin of this basin, massive shedding off the Rajang hinterland resulted in a relatively short phase of alluvial deposition followed by an extensive deltaic sedimentation and progradation. Thick proximal deltaic facies showing repetitive coarsening upwards, coal bearing sequence were formed, while the finer fractions were redistributed as muddy components on the shelf and near-shore sediments.

The earliest marine incursion occurred along this margin and subsequently spread southwards by Late Oligocene times. This basin is characterised by the development of broad shelf with tracts of shelf sands, carbonate shoals and reefs. The earliest carbonate bodies were developed unconformably on areas of up-lifted basement while the younger Miocene carbonates were formed on topographic highs composed of sand shoals and islands.

Sedimentation of the middle Tertiary succession were terminated in late Miocene by the onset of regional tectonic events that caused the inversion of the eastern and southern margins of the basin. A new depocenter created in the north saw the influx of coarser clastics of the Lambir, Beliat and Miri Formations. These thick sand-prone formations were deposited in coastal environments. The Lambir Formation represent the initiation of the Baram delta deposition. Northwards migration of the Baram delta led to the deposition of the Miri formation which were then unlifted in the Pliocene(?).

## **Tectonomagmatic evolution of the Main Range Granite of Peninsular Malaysia**

**K.R. Chakraborty**

**Department of Geology, University of Malaya, 59100 Kuala Lumpur**

The voluminous Triassic Main Range Granite (MRG) is a spectacular and a fundamentally important geologic feature. Its tectonomagmatic evolution is a contentious issue, and must be understood before the problems related to the geological evolution of the region can properly be resolved.

The MRG is a composite batholith emplaced into lower green schist facies environment. It is in general mildly peraluminous; and it has petrographic, geochemical and isotopic characteristics of S-type granites. The crystallization of the MRG occurred at relatively low pressure (< 4 Kb) from water undersaturated melts (< 4% H<sub>2</sub>O). Pl-Q-Bi-Kf or Pl-Bi-Q-Kf are common paragenetic sequence. The MRG includes many textural varieties due primarily to variations in growth rates, physical conditions and H<sub>2</sub>O-activity. Effects of fluid relocation, deformation of crystal-melt mush, subsolidus alterations and recrystallization, and post-crystallization deformation. Influx of water caused partial re-melting of already crystallized hot and relatively dry granite and gave rise to primary composite textured granites (two-phase granite).

The MRG comprises several chemical suites which have evolved along broadly parallel paths from different batches of magmas representing different crustal melt fractions. The

suites have evolved to varying degrees through crystallization-differentiation. Mixing of magmas at various stages of evolution has occurred to a certain extent. Restite-controlled differentiation or large scale assimilation did not play any significant role in the evolution of the MRG magmas.

There is no regular spatial variation in the chemical characteristics of the suites; and compositionally similar suites are found to occur in geographically separated areas. Also the parental magmas of the least evolved suites do not reveal any significant chemical differences. Evidently the source rocks involved in the crustal anatexis processes were compositionally very similar. The source rocks were relatively  $K_2O$  poor and weakly to moderately peraluminous. Psammopelitic or immature quartzofeldspathic sediments are likely candidates.

The thermotectonic models of the MRG are poorly constrained. Currently available geological and geophysical evidence does not support the idea that crustal anatexis was caused by collisional thickening. The absence of coeval basic magmatism also precludes the possibility of significant heat supply from the mantle. High heat production and heat retention in radioelement enriched old basement have probably played an important role in inducing crustal anatexis in intra-plate tectonic environment.

## **Geology in environmental impact assessments**

**J.K. Raj**

**Jabatan Geologi, Universiti Malaya**

The earth provides the basic physical environment for man and as geology involves the study of the earth, it is appropriate that geological inputs also be considered in environmental impact assessments. Development projects have a profound influence on the physical environment and influence not only the external and internal geological processes operating on and in the earth, but also the surface and subsurface earth materials where the projects are located. The extent of influence is, however, dependent upon the nature and scope of the project, though it is important that the impacts be recognized so that suitable remedial and/or mitigating measures be proposed. Impacts on the physical environment that need to be considered from a geological point of view, include those of regional importance, as induced earthquakes, ones of areal importance as groundwater regimes, and ones of site importance, as the surface and sub-surface materials. In the course these impacts will be discussed in terms of the Malaysian context.

**(Without Prejudice)**

### **The collapse of the Block A of the Highland Towers, Ampang Jaya — the geological, geomorphological and geotechnical factors and the probable cause of the collapse**

**Yeap Ee Beng**

**Department of Geology, University of Malaya**

1. Rumbling noise for 3 to 5 minutes was heard by most witnesses. Trees, soil, rubble walls started to fall from half way up the slope behind Block A to the lower levels. The landslide debris came to rest and were piled up 2 to 3 storeys high over the space occupied by two car parks and a badminton court immediately behind Block A (actual distance between the badminton court to the building is about 3 metres).
2. A horrendous sound was heard by a number of eye-witnesses when the landslide material fell and slide onto the car parks. This horrendous sound is described as the sound of crushing of

metal.

3. The noise then stopped. An eerie silence of 20 seconds or more then followed. This was likened to the calm before the storm.
4. The rubble wall towards the left front of the Block A collapsed (photo evidence) and earth fell onto the road on the left front corner of the Block A (one of the entrance roads leading to the Highland Towers). Another witness also notice that earth fell on the cars parked on the access road on the left of the Block A leading to the car park.
5. Eye-witnesses had said that parts of the badminton court between the Block A and the landslide debris which had piled up began to crack and moved forward.
6. A crack appeared on the ground in front of the building and it runs parallel to the front two quadrants of Block A.
7. The road by the left of the Block A which leads to the car park had given way and cars parked on this part of the access road appeared to have sunk.
8. Block A or parts of it (actually the front left corner) was observed to have moved forward 5 to 10 ft.
9. In the building, eye-witness felt several jerks in various directions and then the building began to vibrate. The ceilings of some of the condo units fell through and the floor gave way as the vibration became more intense.
10. From outside, glass windows and walls appeared to have shattered. The shattered glasses and some bricks were flung out from the higher floors.
11. The building apparently arched forward and fell followed by a loud whooshing noise.
12. A thick cloud of dust enveloped the collapse building.

The geological, geotechnical and geomorphological factors pertaining to the Block A of the Highland Towers shall be discussed. The deduced sequence of events leading to the collapse of Block A shall be presented. The probable cause/s will be left for the audience to judge.

## **Pembangunan air panas dan air galian di Malaysia — antara persepsi dan realiti**

**Mohamad Ali Hasan**

**Jabatan Geologi, Universiti Malaya, 59100 Kuala Lumpur**

Air panas dan air galian merupakan sumber luahan air tanah yang unik dan tersendiri. Walaupun sambutan awam terhadap kedua-dua sumber air tanah ini agak menggalakkan, namun kedua-dua sumber ini masih belum (jauh) dibangunkan sepenuhnya di Malaysia. Ini mungkin disebabkan persepsi dan tafsiran pihak pemaju serta pengguna yang berlainan dan pelbagaian.

Untuk pembangunan air panas misalnya, walaupun terdapat banyak kawasan air panas telah dimajukan supaya pelawat dapat memanfaatkan nilai-nilai perubatan dan rekreasi, namun pembangun bersepadu sumber ini masih jauh daripada memuaskan. Walaupun terdapat infrastruktur asas (yang dibina pada peringkat ala kadar sahaja), namun tidak banyak tempat yang dimajukan itu mempunyai kemudahan yang cukup untuk pelawat/pelancong merasa kenikmatan berendam dan berehat di dalam kolam-kolam air panas semula jadi ini. Adalah didapati, boleh dikatakan setiap negeri mempunyai kawasan air panasnya sendiri dan pembangunan di sekitar kawasan ini berbeza-beza dari satu kawasan ke satu kawasan.

Pembentangan bahagian pertama memaparkan antara lain: (a) takrifan dan ciri-ciri air panas (b) di mana terdapatnya sumber air panas ini di Malaysia (c) bagaimanakah sumber air panas ini telah digunakan selama ini? (d) kemajuan dan cabaran-cabaran pembangunan air panas di Malaysia (e) Perbandingan pembangunan air panas di luar negara Malaysia (Jepun & negeri Thai) (f) kesimpulan dan beberapa syor ke arah pembangunan bersepadu air panas di Malaysia.

Bagi air galian pula, negara Malaysia ini mempunyai potensi baik untuk melancarkan jenama air galian tulen buatan Malaysia. Dijangkakan hampir semua negeri di Malaysia mempunyai potensi menghasilkan air galian tulen yang setanding dengan keluaran air galian luar negara. Sehingga kini lebih 120 jenama air galian yang diimpot serta dihasilkan dalam negara terdapat di pasaran Malaysia. Walau bagaimanapun, kajian beberapa air galian 'buatan Malaysia' dan kononnya jenama luar negara tidak menyakinkan ketulenannya dan boleh diragui disebabkan antara lain ketidakpastian punca sumber air galian tersebut diperolehi.

Selaras dengan kehendak pemaju-pemaju tempatan untuk menghasilkan air galian tulen 'buatan Malaysia' yang boleh diyakini serta sebagai menyakinkan pelancong-pelancong luar negara, pembentangan bahagian kedua pula akan menyentuh perkara-perkara berikut:-

- a) Definisi dan ciri-ciri air galian serta persepsi masyarakat terhadap air galian di Malaysia.
- b) Pembangunan terkini tentang air galian di Malaysia.
- c) Beberapa komen terhadap air galian 'buatan Malaysia' dewasa ini.
- d) Penilaian terhadap kawasan-kawasan punca air galian buatan Malaysia (Bagaimana dihasilkan sekarang)?
- e) Perbandingan penghasilan air galian di negara Peranchis.
- f) Kesimpulan dan beberapa syor ke arah memastikan penghasilan air galian 'buatan Malaysia' yang lebih diyakini.

Adalah diharapkan dengan pembentangan pengalaman secara terus dan penelitian penulis terhadap pembangunan sumber air panas di Jepun dan di negara Thai serta pembangunan sumber air galian di negeri Peranchis, pembangunan air panas dan air galian di Malaysia lebih bermakna serta dapat diyakini sepenuhnya. Pihak-pihak tertentu juga diharapkan akan mengambil langkah-langkah sewajarnya bukan sahaja untuk menjaga nama baik industri air galian dan air panas tetapi juga untuk menjaga imeg Malaysia di arena antarabangsa.

## Forum on "Soil & Rock Properties"

19th January 1995, Universiti Malaya, Kuala Lumpur — Report

The Forum on "Soil & Rock Properties" was the 6th in the series of such forums organised by the Working group on Engineering Geology & Hydrogeology.

This Forum received good response in terms of paper submissions, with eight papers from geologists and engineers from the Universities, public and private sectors. Topics covered include properties of granite, granitic and basaltic soils, the Kenny Hill formation and shales. One paper dealt with coastal deposits around a landfill site. The list of papers, as contained in the proceedings, is shown below.

### LIST OF PAPERS

- Paper 1** : Ng Tham Fatt (UM)  
Empirical correlation of physical and mechanical properties of granitic rock materials
- Paper 2** : Lee Eng Choy, Jasper R. Cook & Azman Abdul Samad (IKRAM)  
Fabric and collapse behaviour of a weathered granitic soil-rock profile.
- Paper 3** : Ibrahim Komoo (UKM)  
Weathering as an important factor in assessing engineering properties of rock materials.



- Paper 4** : Tan Boon Kong (UKM)  
Physico-chemical properties of granitic versus basaltic soils of Kuantan, Pahang.
- Paper 5** : James Wong T.F., Muhinder Singh\*, Rusli Abdullah & Dharam Singh (CSL & PLRT\*)  
Some engineering properties of weathered Kenny Hill formation in Kuala Lumpur.
- Paper 6** : Paul Hewitt, Wong Koon Yuin & Gue See Sew\* (Woodward-Clyde & Geo-Environment\*)  
Properties of Kenny Hill formation for piled raft foundation design, Kuala Lumpur.
- Paper 7** : Ooi Lean Hock (CASE)  
A review of engineering properties of non-durable shales.
- Paper 8** : Shaharin I. & Nasiman S. (UPM)  
Geophysical and hydrogeological properties of soil underlying and surrounding municipal landfill sited on coastal and lowland areas in the northern part of Peninsular Malaysia.

The Forum was well attended, with about 100 registered participants. A substantial portion of the participants comprise engineers or friends from IEM. Ample time was allocated for questions from the floor, and sure enough, the audience was very active in the discussion sessions.

Once again, we thank all speakers and co-authors for taking time to write and present their papers. My personal thanks to the helpers: Tham Fatt, Joy, Anna and Guan Hoe for their help in running the Forum and preparation of the Proceedings. Last but not least thanks to the Head of Geology Department, Universiti Malaya, for use of the venue.

\* Limited copies of the Proceedings of the Forum are available for sale at a nominal price of RM20 (Twenty Ringgit only). Please contact Anna for your personal copy.

Tan Boon Kong  
Chairman  
Working Group on Engineering  
Geology & Hydrogeology

### Forum on "Soil & Rock Properties" Captions to Photos

1. At the registration desk. *"Don't panic, just sign"*.
2. The Chairman trying his hand at selling the Proceedings.
3. Ng Tham Fatt on granitic rock materials.
4. Lee Eng Choy with his presentation.
- 5-6. A serious looking audience.
7. Ibrahim Komoo on the importance of weathering.
- 8-9. The other half of the audience — just as serious.
10. *"The price is still the same even at tea-break"*.
- 11-13. Tea time and discussion time.
14. Rusli Abdullah on the Kenny Hill formation.
15. Dharam Singh emphasizing the engineering properties of the same formation.
16. Paul Hewitt on pile raft foundation design.
17. L.H. Ooi sounding a warning on non-durable shales.

# Forum on "Soil & Rock Properties"





PERSATUAN GEOLOGI MALAYSIA  
Geological Society of Malaysia

# Persidangan Tahunan Geologi '95

*Annual Geological  
Conference '95*

27hb & 28hb Mei 1995

Malacca Village  
Park Plaza Resort, Melaka

Pemberitahuan  
Pertama  
Januari 1995

## BORANG PENDAFTARAN

PERSATUAN GEOLOGI MALAYSIA  
Geological Society of Malaysia

**PERSIDANGAN TAHUNAN GEOLOGI '95**  
**Annual Geological Conference '95**  
**27-28 Mei 1995**

Nama: Prof/Dr/Mr/Ms \_\_\_\_\_

Jawatan: \_\_\_\_\_

Organisasi/Syarikat: \_\_\_\_\_

Alamat: \_\_\_\_\_  
\_\_\_\_\_  
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Sila kembalikan borang ini **sebelum 31 Mac, 1995.**



# Forum on "Soil & Rock Properties"



# 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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## BERITA-BERITA PERSATUAN News of the Society

### Results of Council Election and GSM Council 1995/96

An election was held to fill the posts of PRESIDENT and 4 COUNCILLORS (2-years) for the 1995/96 Council. There were 2 candidates for PRESIDENT and 6 for the 4 COUNCILLORS posts.

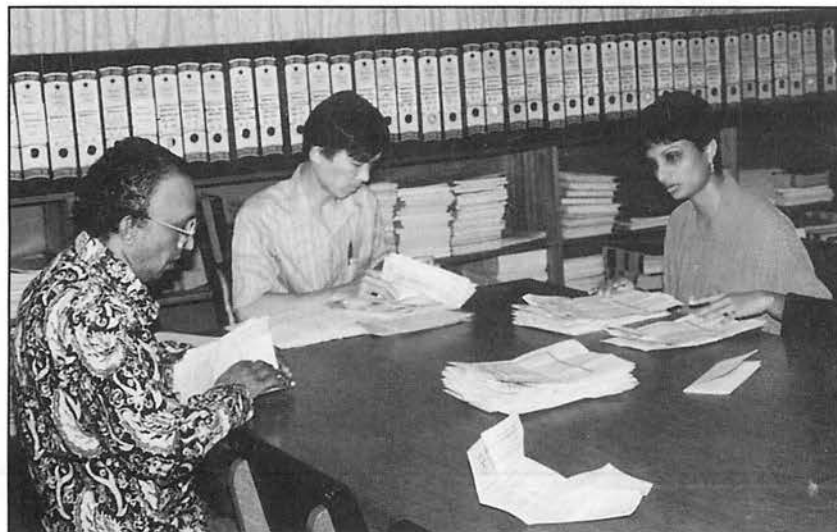
When the ballot box was opened for counting by the Election Officer, Ng Tham Fatt and his 2 scrutineers, S. Sandrasagaram and J.J. Pereira, on the 3rd January 1995, a total of 137 ballots were received. The results of the count showed the following candidates were successful.

PRESIDENT	: Khalid Ngah	
COUNCILLORS	: Khoo Khay Khean	Hoh Swee Chee
(2-years)	Ibrahim Abdullah	Mohd Shafeea Leman

The Geological Society of Malaysia Council for 1995/96 is thus as follows:

PRESIDENT	: Khalid Ngah
VICE PRESIDENT	: Ibrahim Komoo
SECRETARY	: Ahmad Tajuddin Ibrahim
ASSIST. SECRETARY	: Nik Ramli Nik Hassan
TREASURER	: Lee Chai Peng
EDITOR	: Teh Guan Hoe
IMMEDIATE PAST PRESIDENT	: Fateh Chand
COUNCILLORS 1995-1997	: Khoo Khay Khean Hoh Swee Chee Ibrahim Abdullah Mohd Shafeea Leman
1995-1996	: Abd. Ghani Mohd Rafek Abdul Rahim Samsudin Effendy Cheng Abdullah Tan Boon Kong

G.H. Teh



Election Officer, Ng Tham Fatt  
and his Scoutineers at work.



PERSATUAN GEOLOGI MALAYSIA  
Geological Society of Malaysia

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 Batu Igneus & Permineralan  
 Sedimentologi & Stratigrafi

- Saya berminat mengikuti acara keluarga

Sila kembalikan borang ini **sebelum 31 Mac, 1995.**

# PERSATUAN GEOLOGI MALAYSIA Geological Society of Malaysia

## PERSIDANGAN TAHUNAN GEOLOGI '95 Annual Geological Conference '95

### OBJEKTIF

Persatuan Geologi Malaysia sedang merancang untuk mengadakan Persidangan Tahunan Geologi 1995 pada 27 & 28 Mei, 1995 di Malacca Village, Park Plaza Resort, Melaka. Persidangan ini merupakan siri ke-10, Persidangan Tahunan Geologi yang telah dianjurkan oleh Persatuan Geologi Malaysia.

Persidangan yang lepas telah menyediakan forum pertukaran maklumat sains dan teknik di kalangan peserta dari sektor swasta, institusi penyelidikan dan universiti. Kertas yang dibentangkan turut menyumbang kepada pemahaman yang lebih baik tentang aspek geologi Malaysia khususnya, dan Asia Tenggara amnya. Persidangan tahun ini tentunya dapat memberikan peluang interaksi dan sumbangan maklumat geologi di kalangan peserta.

### KERTASKERJA

Memandangkan jumlah dan kualiti kertaskerja yang semakin meningkat di persidangan lepas, kami yakin sambutan yang lebih menggalakkan akan diberikan pada persidangan kali ini. Oleh itu, kami berbangga sekiranya tuan dapat meneruskan sumbangan kertaskerja seperti yang dilakukan di tahun-tahun lepas.

Persidangan kali ini telah mengenalpasti beberapa tema perbincangan supaya ia lebih relevan kepada pembangunan negara. Berikut merupakan tema yang dicadangkan:

- Bahan Bumi Industri (Industrial Earth Material)
- Geosains Sekitaran & Kejuruteraan (Environmental & Engineering Geosciences)
- Sedimentologi & Sumber Tenaga (Sedimentology & Energy Resources)

- Struktur, Tektonik & Magmatisme (Structural, Tectonic & Magmatism)

Bakal peserta yang berminat membentangkan kertaskerja sila mengambil perhatian tarikh-tarikh penting berikut:

Februari 28, 1995	Penyerahan Tajuk Kertaskerja
Mac 31, 1995	Penyerahan Abstrak Panjang
April 15, 1995	Pengumuman Penerimaan Kertaskerja
April 30, 1995	Penyerahan Kertas Penuh*

\*Kertas penuh yang diterima sebelum/pada April 30, 1995 akan diedarkan semasa persidangan, dan akan dipertimbangkan terus untuk penerbitan siri Buletin Persatuan.

### BAHASA PERSIDANGAN

Bakal peserta boleh menyediakan kertaskerja dan membentangkannya sama ada dalam Bahasa Malaysia atau Bahasa Inggeris.

### PENDAFTARAN

Peserta yang berhasrat menyertai persidangan kali ini dinasihatkan mendaftar awal untuk memudahkan perancangan yang baik untuk memastikan persidangan berjalan lancar.

Pendaftaran awal hanya akan diterima sebelum Mei 10, 1995. Pendaftaran lewat boleh dilakukan di Meja Pendaftaran pada hari pertama Persidangan. Hanya pembentang kertas dikecualikan daripada yuran pendaftaran.

Keahlian	Yuran Pendaftaran	Yuran Pendaftaran Lewat
Ahli Penuh/Bersekutu	RM40.00	RM50.00
Bukan Ahli	RM100.00	RM120.00
Ahli Pelajar	RM5.00	RM10.00
Bukan Ahli Pelajar	RM10.00	RM20.00

Pembayaran melalui cek berpaling atau bank-draf adalah diterima, dan hendaklah ditulis atas nama 'Persatuan Geologi Malaysia'. Cek Luar perlu menyertakan bayaran servis bank yang mencukupi.

Sila hantar yuran pendaftaran berserta borang kepada:

Bendahari Kehormat,  
Persatuan Geologi Malaysia,  
c/o Jabatan Geologi,  
Universiti Malaya,  
59100 Kuala Lumpur, Malaysia.

### PENGINAPAN

Penginapan merupakan tanggungan peserta, Persatuan akan membantu membuat tempahan berkelompok di hotel tempat Persidangan. Urusan tempahan akan dilakukan atas permintaan, dan berdasarkan yang dahulu di dahulukan. Kadar penginapan adalah seperti berikut:

*Malacca Village:*

Bilik Superior: RM125.00 net per hari

Katil Tambahan: RM40.00 net per hari

Hotel-hotel lain di Melaka bolehlah ditempah secara persendirian.

### KERJA LAPANGAN

Persatuan sedang merancang dua kerja lapangan, sehari sebelum Persidangan. Kerja lapangan pertama melibatkan cerapan terhadap batuan igneus dan permineralan di kawasan sekitar G. Ledang, Bt. Bakri dan Bt. Mor. Kerja lapangan kedua mengenai sedimentologi dan stratigrafi batuan sedimen di kawasan Air Hitam, Keluang dan Bt. Resam. Peserta yang berminat menyertai kerja lapangan diharap dapat menyatakannya melalui borang pendaftaran yang disediakan.

### ACARA KELUARGA

Untuk peserta yang membawa keluarga, Persatuan sedang merancang beberapa acara keluarga yang melibatkan lawatan di beberapa tempat menarik di Melaka. Sila nyatakan keinginan anda melalui borang pendaftaran yang disediakan.

KUALITI/Gejolak/Pengantar Kertas Kerja/Persatuan Geologi keadah kimia dalam penerokaan geologi).

Subbidang Sains Bumi moden pula meliputi ilmu berikut: *geologi petroleum* (kajian untuk meneroka dan membangun sumber minyak dan gas), *geologi kejuruteraan* (bidang geologi yang membantu penyiasatan dan pembangunan infrastruktur kejuruteraan berat), *geologi bandar* (bidang geologi yang terlibat dalam perancangan pembangunan bandar), *geologi sekitaran* (bidang geologi yang berkaitan dengan cirian dan pemuliharaan sekitaran), *hidrogeologi* (kajian untuk meneroka dan membangun sumber air tanah) dan *geologi samudera* (aspek geologi yang terlibat dengan cirian fizikal dan sumber mineral lautan).

### Ahli Sains Bumi di Malaysia

Pada masa ini jumlah ahli Sains Bumi Profesional di Malaysia dianggarkan sekitar 750 orang. Sejumlah besar mereka bertugas di pelbagai sektor berikut:

- *Jabatan Penyiasatan Kajibumi:* sekitar 250 orang, bertugas sebagai pegawai geologi
- *Universiti Tempatan:* sekitar 100 orang, sebagai pensyarah, tutur dan pegawai penyelidik
- *Institusi Penyelidikan:* sekitar 50 orang, sebagai pegawai penyelidik
- *Industri Petroleum:* sekitar 200 orang, sebagai ahli geologi petroleum
- *Industri Perlombongan:* sekitar 30 orang, sebagai ahli geologi perlombongan
- *Industri Kejuruteraan:* sekitar 50 orang, sebagai ahli geologi kejuruteraan
- *Industri Lain:* sekitar 70 orang, dalam pelbagai jabatan kerajaan, terutama kerajaan negeri, sebagai ahli perancang dan ahli geologi

Jumlah ini amat kecil dan tidak dapat menampung keperluan negara semasa.

### Keperluan Ahli Sains Bumi Masa Hadapan

Untuk mencapai hasrat menjadi Negara Maju, negara memerlukan sekurang-kurangnya 5,000 ahli Sains Bumi menjelang 2020. Angka ini berdasarkan perbandingan keperluan di negara maju seperti di Jepun, Eropah dan Amerika Syarikat. Mereka akan diperlukan dalam sektor awam dan swasta.

Di *sektor awam* mereka diperlukan dalam agensi-agensi berikut:

- **Jabatan Penyiasatan Kajibumi:** perkembangan skop dan bidang tugas kepada perancangan dan pengurusan sumber bumi, pembangunan bandar, dan kawalan bencana geologi memerlukan ramai ahli geologi dalam bidang *hidrogeologi*, *geologi bandar*, *geologi kejuruteraan*, *geologi samudera* dan *geologi sekitaran*.
- **Jabatan Kerja Raya:** perkembangan terkini memintanya mengwujudkan unit kawalan geoteknik mengawasi pembangunan kawasan bermasalah. Seperti di negara maju yang lain, unit ini memerlukan ramai ahli *geologi kejuruteraan*.
- **Jabatan Alam Sekitar:** perkembangan ke arah negara maju menuntut jabatan ini lebih bersedia dalam pelbagai aspek kawalan alam sekitar, terutamanya kawalan pencemaran dan bencana geologi. Jabatan ini perlu mempunyai ramai ahli *geologi sekitaran* dan *geologi bandar*.
- **Jabatan Bekalan Air:** pembangunan masa hadapan memerlukan pembangunan sumber air tanah, oleh itu ahli *hidrogeologi* diperlukan untuk penerokaan dan pengurusan sumber ini.
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- **Kerajaan Negeri dan Majlis Tempatan:** perkembangan terkini menunjukkan Kerajaan Negeri telah berkembang ke arah pembangunan sumber bumi untuk keperluan industri, sementara Majlis Tempatan mulai mengurus pembangunan di kawasan bermasalah, seperti kawasan bukit. Kedua-dua kegiatan ini memerlukan input daripada ahli *geologi ekonomi* dan *geologi bandar*.

# PERSATUAN GEOLOGI MALAYSIA Geological Society of Malaysia

## PERSIDANGAN TAHUNAN GEOLOGI '95 Annual Geological Conference '95

### OBJEKTIF

Persatuan Geologi Malaysia sedang merancang untuk mengadakan Persidangan Tahunan Geologi 1995 pada 27 & 28 Mei, 1995 di Malacca Village, Park Plaza Resort, Melaka. Persidangan ini merupakan siri ke-10, Persidangan Tahunan Geologi yang telah dianjurkan oleh Persatuan Geologi Malaysia.

Persidangan yang lepas telah menyediakan forum pertukaran maklumat sains dan teknik di kalangan peserta dari sektor swasta, institusi penyelidikan dan universiti. Kertas yang dibenteng turut menyumbang kepada pemahaman yang lebih baik tentang aspek geologi Malaysia khususnya, dan Asia Tenggara amnya. Persidangan tahun ini tentunya dapat memberikan peluang interaksi dan sumbangan maklumat geologi di kalangan peserta.

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## Former GSM Presidents now Heads of Geology Department UM & UKM

It is heartening to report that 2 former Presidents of the Geological Society of Malaysia have been appointed as Heads of the Geology Department Universiti Malaya and Universiti Kebangsaan Malaysia.

### **John Kuna Raj (Universiti Malaya)**

Prof. John Kuna Raj was appointed Head on 15th May 1994. Prof. John was GSM President in 1985 and 1986. He was appointed Professor to the Chair of Engineering Geology on August 19th 1994.

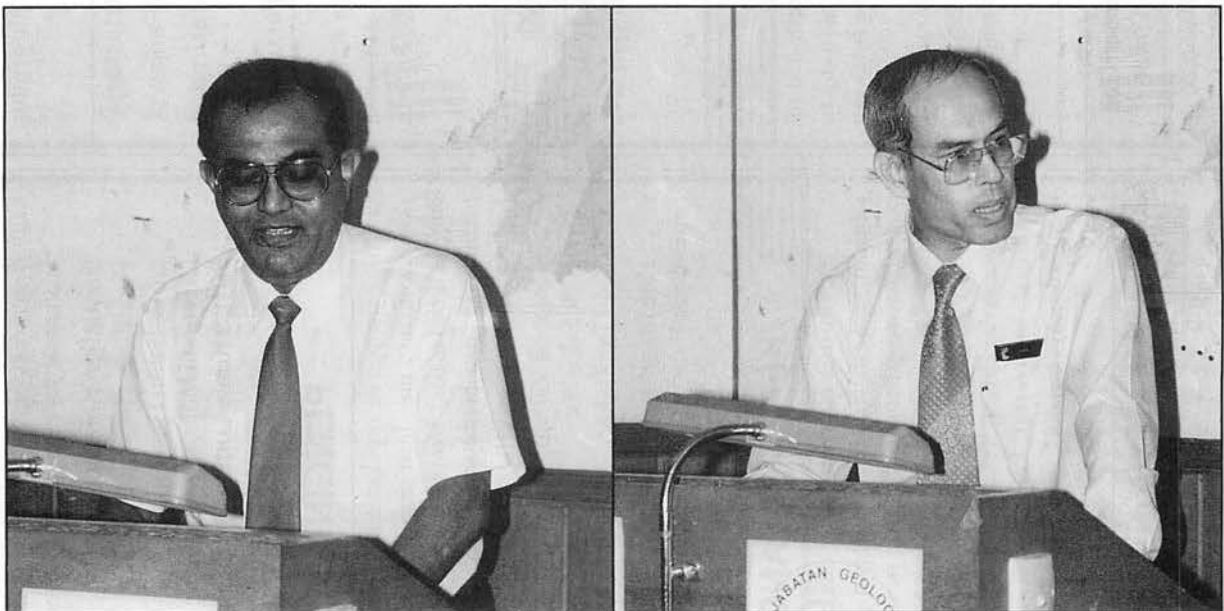
Prof. John obtained his Ph.D. from Universiti Malaya in 1983. He was Deputy Dean, Faculty of Science, Universiti Malaya in 1991. His fields of interest and research are engineering geology and geomorphology.

### **Hamzah Mohamad (Universiti Kebangsaan Malaysia)**

Associate Professor Hamzah Mohamad was appointed Head on 1st November 1994. He was previously Head of Department, Geology Department UKM from May 1985 to April 1987. He was GSM President for a record 3-term from May 1987 to April 1990. Assoc. Prof. Hamzah obtained his Ph.D. from the University of Strathclyde, United Kingdom. His fields of interest and research include metamorphic petrology and geochemistry of clastic metasedimentary rocks.

He hopes during tenure (1) to establish more collaborative research with individuals and groups outside UKM and (2) to establish a more relevant and highly responsive undergraduate curriculum to the needs of nation building.

G.H. Teh



JOHN KUNA RAJ

HAMZAH MOHAMAD

# Kertas Perbincangan Mesyuarat Dialog MPKSN Dengan Persatuan Saintifik **Sains Bumi Dalam Pembangunan Negara**

Dibentangkan Oleh:  
Persatuan Geologi Malaysia

Disediakan Oleh:  
Kumpulan Promosi Sains Bumi Untuk Negara  
Prof. Ibrahim Komoo (Timbalan Presiden PGM dan UKM)  
Dr. T.T. Khoo (Presiden Lepas PGM dan UM)  
Dr. Hamzah Mohamad (Presiden Lepas PGM dan UKM)  
Dr. Ahmad Tajuddin Ibrahim (Setiausaha Kehormat PGM dan UM)  
Dr. Syed Sheikh Almashoor (UKM)  
En. Zakaria Mohamad (Penyiasatan Kajibumi Malaysia)  
En. Teoh Lay Hock (Penyiasatan Kajibumi Malaysia)  
En. Ng Chak Ngoon (Ahli Geosains Profesional)

## **Pengenalan**

Kertas ini bertujuan memperkenalkan:

- Bidang Ilmu Sains Bumi, daripada aspek skop, cabang ilmu, peranan, aktiviti dan sumbangannya kepada pembangunan dan kemajuan negara.
- Sains Bumi kepada MPKSN supaya bidang ilmu sains ini diberikan kedudukan dan kepentingan yang setaraf dengan bidang ilmu sains yang lain.

## **Konsep Sains Bumi**

Di Malaysia Sains Bumi (atau Sains Geologi) telah dikenal oleh sebilangan kecil masyarakat sejak sebelum merdeka lagi. Pada masa itu, kerajaan Inggeris telah menubuhkan sebuah jabatan kerajaan bernama, Jabatan Penyiasatan Kajibumi (Geological Survey Department). Peranan utama jabatan ini pada masa itu ialah untuk mencarigali dan membangun sumber mineral negara, terutama bijih timah. Jabatan ini masih kekal hingga sekarang.

Di negara maju, bidang Sains Bumi telah berkembang dan bercambah menjadi ilmu yang sangat luas dan pragmatik, dan bersifat sebagai sains gunaan yang menyelesaikan persoalan semasa manusia sejagat dalam aspek sumber tabii, tenaga, dan sekitaran. Sains Bumi (earth science) disebut juga sebagai Sains Geologi (geological science) atau geosains (geoscience).

Sains Bumi boleh ditakrifkan sebagai “kajian tentang planet Bumi — meliputi bahan pembentuknya, proses yang bertindak, hasil, dan penghuraian sejarah planet dan hidupan semenjak asal mulanya”. Sains Bumi meliputi kajian mengenai udara (atmosfera), lautan (hidrosfera) dan sains tanah (agronomi).

Subbidang Sains Bumi tradisi meliputi bidang ilmu berikut: *petrologi* dan *mineralogi* (kajian mengenai batuan dan mineral), *geologi fizikal* (kajian mengenai proses yang bertindak dipermukaan dan dalaman bumi, dan hasilnya), *sedimentologi* dan *stratigrafi* (kajian mengenai sedimen dan sekitaran pembentukannya), *paleontologi* (kajian mengenai hidupan kuno dan usia bumi), *geologi ekonomi* (kajian mengenai mineral yang boleh diterokai sebagai sumber ekonomi), *geofizik* (penggunaan keadah fizik dalam penerokaan geologi), dan *geokimia* (penggunaan keadah kimia dalam penerokaan geologi).



Subbidang Sains Bumi moden pula meliputi ilmu berikut: *geologi petroleum* (kajian untuk meneroka dan membangun sumber minyak dan gas), *geologi kejuruteraan* (bidang geologi yang membantu penyiasatan dan pembangunan infrastruktur kejuruteraan berat), *geologi bandar* (bidang geologi yang terlibat dalam perancangan pembangunan bandar), *geologi sekitaran* (bidang geologi yang berkaitan dengan cirian dan pemuliharaan sekitaran), *hidrogeologi* (kajian untuk meneroka dan membangun sumber air tanah) dan *geologi samudera* (aspek geologi yang terlibat dengan cirian fizikal dan sumber mineral lautan).

## Ahli Sains Bumi di Malaysia

Pada masa ini jumlah ahli Sains Bumi Profesional di Malaysia dianggarkan sekitar 750 orang. Sejumlah besar mereka bertugas di pelbagai sektor berikut:

- *Jabatan Penyiasatan Kajibumi:* sekitar 250 orang, bertugas sebagai pegawai geologi
- *Universiti Tempatan:* sekitar 100 orang, sebagai pensyarah, tutor dan pegawai penyelidik
- *Institusi Penyelidikan:* sekitar 50 orang, sebagai pegawai penyelidik
- *Industri Petroleum:* sekitar 200 orang, sebagai ahli geologi petroleum
- *Industri Perlombongan:* sekitar 30 orang, sebagai ahli geologi perlombongan
- *Industri Kejuruteraan:* sekitar 50 orang, sebagai ahli geologi kejuruteraan
- *Industri Lain:* sekitar 70 orang, dalam pelbagai jabatan kerajaan, terutama kerajaan negeri, sebagai ahli perancang dan ahli geologi

Jumlah ini amat kecil dan tidak dapat menampung keperluan negara semasa.

## Keperluan Ahli Sains Bumi Masa Hadapan

Untuk mencapai hasrat menjadi Negara Maju, negara memerlukan sekurang-kurangnya 5,000 ahli Sains Bumi menjelang 2020. Angka ini berdasarkan perbandingan keperluan di negara maju seperti di Jepun, Eropah dan Amerika Syarikat. Mereka akan diperlukan dalam sektor awam dan swasta.

Di *sektor awam* mereka diperlukan dalam agensi-agensi berikut:

- **Jabatan Penyiasatan Kajibumi:** perkembangan skop dan bidang tugas kepada perancangan dan pengurusan sumber bumi, pembangunan bandar, dan kawalan bencana geologi memerlukan ramai ahli geologi dalam bidang *hidrogeologi*, *geologi bandar*, *geologi kejuruteraan*, *geologi samudera* dan *geologi sekitaran*.
- **Jabatan Kerja Raya:** perkembangan terkini memintanya mengwujudkan unit kawalan geoteknik mengawasi pembangunan kawasan bermasalah. Seperti di negara maju yang lain, unit ini memerlukan ramai ahli *geologi kejuruteraan*.
- **Jabatan Alam Sekitar:** perkembangan ke arah negara maju menuntut jabatan ini lebih bersedia dalam pelbagai aspek kawalan alam sekitar, terutamanya kawalan pencemaran dan bencana geologi. Jabatan ini perlu mempunyai ramai ahli *geologi sekitaran* dan *geologi bandar*.
- **Jabatan Bekalan Air:** pembangunan masa hadapan memerlukan pembangunan sumber air tanah, oleh itu ahli *hidrogeologi* diperlukan untuk penerokaan dan pengurusan sumber ini.
- **Unit Perancang Bandar dan Wilayah:** perancangan bandar dan wilayah di masa hadapan lebih rumit dan mencabar, pendekatan bersepadu diperlukan untuk memastikan pembangunan yang optimum dan selamat. Unit ini memerlukan ahli *geologi bandar*.
- **Kerajaan Negeri dan Majlis Tempatan:** perkembangan terkini menunjukkan Kerajaan Negeri telah berkembang ke arah pembangunan sumber bumi untuk keperluan industri, sementara Majlis Tempatan mulai mengurus pembangunan di kawasan bermasalah, seperti kawasan bukit. Kedua-dua kegiatan ini memerlukan input daripada ahli *geologi ekonomi* dan *geologi bandar*.

Di *sektor swasta* pula ahli geosains diperlukan dalam industri sokongan berikut:

- **Kerja Kejuruteraan Awam:** perancangan projek-projek gergasi terutama penerowongan, ruang bawah tanah, lebuhraya, empangan, dan pembangunan di kawasan bermasalah memerlukan khidmat perundingan ahli *geologi kejuruteraan*, *geologi sekitaran* dan *geologi bandar*.
- **Industri Minyak dan Gas:** industri ini masih terus berkembang dan keperluan ahli *geologi petroleum* masih terus meningkat.
- **Industri Perlombongan:** walaupun perlombongan tradisional (seperti timah dan tembaga) telah berkurangan, tetapi perkembangan terkini menuntut keperluan yang tinggi untuk bahan binaan (terutama batu dimensi) dan bahan industri (sumber bumi untuk pelbagai keperluan industri). Tuntutan ini memerlukan ramai ahli *geologi ekonomi* dan *geologi sekitaran*.
- **Industri Pelancongan:** pembangunan industri pelancongan memerlukan penerokaan dan pengurusan sumber intrinsik bumi dengan berkesan. Ahli *geologi sekitaran* diperlukan untuk sektor ini.
- **Industri Sokongan:** satu daripada khidmat sokongan yang utama kini ialah kawalan alam sekitar, kerja-kerja penyiasatan impak alam sekitar memerlukan ramai ahli *geologi sekitaran*.

## Pendidikan Sains Bumi

Pendidikan Sains Bumi di Malaysia merupakan yang terkebelakang berbanding dengan perkembangannya di negara maju (Amerika Syarikat, Eropah, Jepun, Australia). Di Malaysia Sains Bumi (geologi) hanya diajar di peringkat Universiti.

Universiti yang terlibat dalam pengajaran Sains Bumi seperti berikut:

- Jabatan Geologi, Universiti Malaya (sejak 1961)
- Jabatan Geologi, Universiti Kebangsaan Malaysia, Bangi (sejak 1970)
- Jabatan Sains Bumi, Universiti Kebangsaan Malaysia, Kampus Sabah (sejak 1985)
- Unit Geofizik, Pusat Pengajian Fizik, Universiti Sains Malaysia (sejak 1970)
- Jabatan Sains Tanah, Universiti Pertanian Malaysia (sejak 1973)

Di negara maju, bidang Sains Bumi mulai diajar di peringkat *Sekolah Menengah*. Di peringkat Universiti pula, banyak universiti mengwujudkan *Fakulti Sains Bumi* yang mengandungi beberapa Jabatan di bawahnya.

Pendidikan Sains Bumi di peringkat sekolah bukan sahaja bertujuan membangun kerjaya, tetapi sebagai bidang ilmu *sains tabii dan gunaan*. Bidang ini memberikan kesedaran tentang *Sains Fizikal*, seperti bidang biologi untuk *Sains Hayat*. Sains Bumi dan Sains Hayat merupakan dua bidang utama sains yang memberikan kesedaran kepada pelajar tentang kepentingan pemuliharaan alam sekitar.

Di samping itu, pendidikan Sains Bumi di peringkat Sekolah boleh bersifat sebagai *ilmu sokongan* tenaga kerja separuh-mahir dalam industri petroleum, perlombongan dan kejuruteraan awam.

**Disyorkan:** Negara harus memandang ke hadapan dan mula merancang program dan kurikulum Sains Bumi di peringkat Sekolah Menengah (Tingkatan 4 dan 5) seperti di negara-negara maju.

Di Peringkat Sekolah aspek Sains Bumi Berikut boleh mulai diperkenalkan. *Bumi dan Alam Semesta, Atmosfera dan Hidrosfera, Mineral dan Batuan, Sifat Dalaman Bumi, Fosil dan Skala Masa Geologi, Sejarah Perkembangan Bumi, Proses-proses Eksogen dan Endogen, Sumber Bumi dan Kegunaan, Bencana Geologi, Geologi dan Alam Sekitar.*

Tenaga pendidik pada masa ini hanya terbatas di peringkat Universiti. Jumlahnya

seperti berikut: UKM (35), UM (20), UPM (20), USM (15), Universiti lain (10). Oleh itu, program membangunkan tenaga pendidik untuk Sekolah perlu dilakukan segera. Dan pelaksanaan program Sains Bumi di peringkat Sekolah perlu dijalankan secara beransur.

## Pemuliharaan Khazanah Geologi

Ilmu geologi antara lain, melihat rekod sejarah perkembangan Bumi sejak 4,600 juta tahun yang lampau. Sama seperti ilmu arkeologi, sumber dan rekod sejarah tersimpan di dalam batuan yang terdapat di seluruh negara. Salah satu cara mengabadikan rekod sejarah ini ialah penyimpanan sumber ini di *Muzium*. Cara lain ialah dengan mewartakan kawasan tertentu sebagai khazanah sejarah iaitu dalam bentuk *Taman Tabii*.

Di Malaysia telah wujud beberapa *Muzium Geologi* dalam bentuk yang agak sederhana. Di antaranya ialah:

- **Muzium Negara, Kuala Lumpur:** Terdapat bahagian kecil menyimpan koleksi berkaitan geologi iaitu pancalogam (besi, timah, tembaga, keluli, perak, emas dan bahan tembikar pra-sejarah). Beberapa model lapuk mengenai batuan dan skala usia bumi turut dipamerkan.
- **Muzium Timah Gedung Raja Abdullah, Kelang:** Mempamerkan pelbagai koleksi berkaitan industri bijih timah di Malaysia. Maklumat geologi meliputi peta geologi dan taburan sumber mineral.
- **Muzium Geologi, Jabatan Penyiasatan Kajibumi, Ipoh:** Ditubuhkan pada tahun 1957. Bahan koleksi termasuk 600 mineral, 150 batuan, 200 fosil, 200 batu permata, 165 model hablur, 21 mineral industri, dan 5 peralatan pra-sejarah. Koleksi dalam dan luar negara. Muzium didaftar sebagai satu destinasi pelancongan dan dibuka untuk orang ramai.
- **Muzium Geologi, Jabatan Geologi, Universiti Malaya, Kuala Lumpur:** Ditubuhkan pada tahun 1965. Mempunyai koleksi batuan, mineral, fosil dan pelbagai model pengajaran mengenai sejarah perkembangan Bumi. Banyak koleksi luar negara, dan terdapat bahan dari dalam negeri.
- **Muzium Geologi, Jabatan Geologi, Universiti Kebangsaan Malaysia, Bangi:** Ditubuhkan pada tahun 1985. Mempunyai koleksi batuan dan fosil tempatan yang agak lengkap. Selain itu terdapat koleksi mineral, carta, model pelbagai proses geologi untuk pengajaran.

**Disyorkan:** Muzium sedia ada perlu ditingkatkan kualitinya. Kerajaan boleh memberikan batuan kewangan secara berterusan. Muzium ini boleh ditingkatkan tarafnya menjadi Muzium Sejarah Semulajadi Negeri atau Muzium Khas di universiti. Semua Muzium ini boleh ditingkatkan imejnya, dan dijadikan sumber tarikan pelancongan.

Sebuah *Muzium Sejarah Semulajadi Kebangsaan* perlu diwujudkan. Muzium ini boleh diletakkan di kawasan pelancongan utama dan menyediakan koleksi lengkap mengenai sejarah perkembangan muka bumi dan pembentukan batuan di Malaysia. Untuk menambahkan tarikannya, ia boleh dirancang dalam bentuk *Muzium Generasi Ke-3*, iaitu yang bersifat interaksi.

**Taman Semulajadi:** Beberapa taman negara di Malaysia mempunyai sifat taman semulajadi, contoh yang baik ialah *Taman Gua Batu Kapur Mulu*. Banyak lagi khazanah geologi yang unik dan menarik boleh dibangunkan sebagai Taman Semulajadi.

**Disyorkan:** Jabatan Penyiasatan Kajibumi, Perbadanan Pembangunan Pelancongan dan pakar geologi tempatan harus digalakkan untuk meneroka tempat baru untuk dijadikan Taman Semulajadi. Usaha ini dapat mempertingkatkan sumbangan pengetahuan geologi untuk pembangunan negara, terutama pembangunan industri pelancongan.

## Sains Bumi dan Industri

Sumbangan ahli Sains Bumi dalam pembangunan industri tidak begitu kelihatan oleh masyarakat biasa, oleh itu sering dipandang remeh atau dilupakan. Ahli Sains Bumi sejak sekian lamanya, menjalankan peranan utama dalam penerokaan dan eksploitasi bahan bumi, terutamanya *mineral, bijih dan petroleum*. Pada masa ini, ahli Sains Bumi turut menyumbang dalam pelbagai aktiviti perancangan dan kejuruteraan, terutamanya dalam *perancangan bandar dan rantau, penyiasatan tapak untuk infrastruktur kejuruteraan utama, dan pengurusan alam sekitar*.

Berikut merupakan sektor industri yang mempunyai penglibatan ahli geosains profesional:

- **Industri Perlombongan.** Pengwujudan *Jabatan Penyiasatan Kajibumi* oleh Kerajaan Inggeris sejak awal kurun ke-19 bertujuan meneroka sumber bijih, terutama bijih timah. Pembangunan ekonomi negara sebelum merdeka, terutama di daerah Ipoh dan Kuala Lumpur, didorong oleh *perlombongan bijih timah*. Walaupun pada masa ini, perlombongan bijih di negara telah menjadi kurang penting, tenaga ahli Sains Bumi harus disalurkan pula pada penerokaan sumber bumi tidak tradisi, seperti *bahan binaan dan bahan industri*. Sebahagiannya pula boleh dieksport ke negara kurang maju untuk meneroka mineral bijih di sana.
- **Industri Minyak dan Gas.** Industri minyak dan gas di Malaysia masih di tahap tinggi. Sekurang-kurangnya 200 ahli Sains Bumi tempatan bertugas di beberapa *Syarikat Minyak* untuk meneroka dan membangun sumber petroleum ini. Keperluan ahli Sains Bumi dalam sektor ini masih meningkat, lebih-lebih lagi apabila Kerajaan bercadang untuk meneroka sumber petroleum di *luar negara*.
- **Kerja Kejuruteraan Awam.** Di Malaysia, penglibatan ahli Sains Bumi dalam projek kejuruteraan awam sangat terbatas. Sumbangan mereka hanya pada kerja penyiasatan tapak projek-projek utama seperti pembinaan empangan dan penerowongan. Sumbangan ahli *Sains Bumi dan Jurutera Awam* dalam hampir semua projek kejuruteraan adalah bersifat pelengkap (*complementary*). Di negara maju, kedua-dua disiplin ini berkerjasama untuk hampir semua projek kejuruteraan sederhana dan besar, bagi memastikan projek dilaksanakan secara *berseesuaian, berekonomi* dan selamat. Dengan beberapa kejadian bencana, seperti *tragedi Highland Tower*, kesedaran kerjasama antara ahli Sains Bumi dan Jurutera Awam mulai wujud, dan diharap di masa hadapan lebih ramai ahli Sains Bumi berkecimpung dalam industri ini.
- **Penyelidikan dan Pembangunan.** Untuk mencapai hasrat menjadi negara maju, banyak usaha R&D perlu dijalankan. Di antara usaha R&D dalam bidang Sains Bumi yang perlu diperkenal dan dipertingkatkan ialah pembangunan pengkalan data potensi sumber bumi, program penerokaan sumber bumi tidak tradisi (bahan binaan dan bahan industri), penerokaan sumber petroleum, program pemetaan geologi kejuruteraan, penerokaan sumber air bawahanah, penerokaan sumber bumi di kawasan lembah dan lepas pantai, aspek geologi sekitaraan, dan beberapa aspek geologi gunaan yang lain.
- **Industri Lain.** Penglibatan ahli Sains Bumi di Malaysia dalam sektor yang lebih moden masih amat terbatas. Keadaan ini wujud kerana bukan sahaja bidang Sains Bumi itu asing kepada masyarakat awam, tetapi bidang ini juga kurang diketahui di kalangan pegawai kerajaan. Namun demikian, beberapa kerajaan negeri telah mula menggunakan ahli Sains Bumi sebagai perancang pembangunan sumber bumi dan perancangan rantau. Di antara sektor yang boleh memanfaatkan kepakaran Sains Bumi ialah *Perancangan Rantau dan Guna Tanah, Pengurusan Pembangunan Bandar, Kawalan dan Pemuliharaan Sekitaran, Pembangunan Pelancongan dan Pembangunan Sumber Air Bawahanah*.

# GEOLOGICAL SOCIETY OF MALAYSIA PUBLICATIONS

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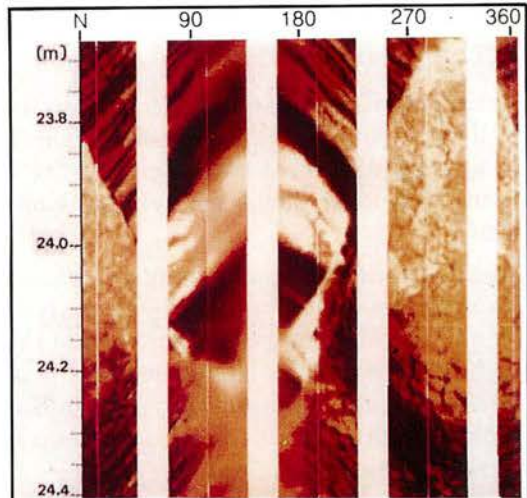
# Fullbore Micro Imager\*

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

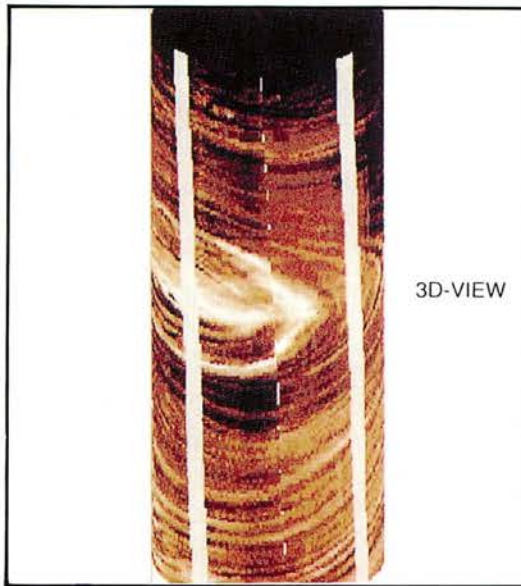
The FMI log, in conductive muds, provides electrical images almost insensitive to borehole conditions and offers quantitative information, in particular for analysis of fractures.

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

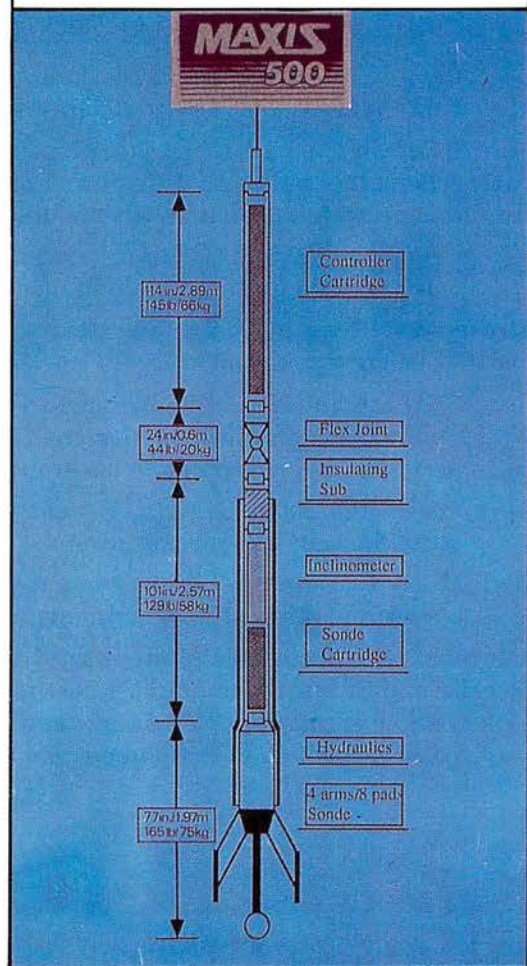
The tool's multiple logging modes allow wellsite customization of results to satisfy client needs without compromising efficiency.



*Fault without associated drag*



*"Bullseye" structure*



## Promosi Sains Bumi

Di antara langkah-langkah yang boleh diambil untuk mempromosi bidang Sains Bumi supaya ia terletak di kedudukan yang sewajarnya adalah seperti berikut:

- **Kolokium Kebangsaan:** Persatuan Geologi Malaysia mencadangkan supaya diadakan satu Kolokium Kebangsaan mengenai Sains Bumi Untuk Pembangunan Negara. Kolokium ini boleh dianjurkan bersama oleh Persatuan Geologi Malaysia dan MPKSN atau Kementerian Sains, Teknologi dan Alam Sekitar. Kolokium ini boleh dianjurkan pada pertengahan tahun 1995.
- Kolokium ini bertujuan mengwujudkan kesedaran pelbagai pihak tentang *peranan Sains Bumi dalam Pembangunan Negara* sambil meningkatkan kefahaman masyarakat mengenai bidang dan sumbangan ilmu ini kepada kesejahteraan negara. Mereka yang terlibat meliputi *pegawai pendidikan* (guru, pegawai pengubal kurikulum dan pensyarah), *ahli geosains di institusi awam* (Jabatan Penyiasatan Kajibumi, Institut Penyelidikan, Jabatan Galian), *ahli geosains swasta* (Industri Kejuruteraan Awam, Perlombongan, Petroleum), dan *penulis serta wartawan* yang berminat.
- **Promosi Di Kalangan Pelajar Sekolah:** Banyak aktiviti boleh dirancang dan digerakkan untuk menanam kesedaran dan minat mengenai bidang Sains Bumi. Di antara aktiviti yang boleh dijalankan oleh Universiti, Jabatan Kerajaan dan Persatuan adalah seperti berikut:
  - *Kemah Geosains Musim Percutian:* Aktiviti luaran yang melibatkan kerja lapangan dan berkemah sambil mengenal batu-batuan yang terdapat di Malaysia.
  - *Kelab Memburu Batuan (Rock-hunting):* Pelajar sekolah digalakkan mengwujudkan kelab seperti ini. Pelajar dididik untuk mengenal pelbagai mineral dan batuan, dan di masa lapang mereka boleh keluar membuat koleksi pelbagai spesimen yang menarik.
  - *Peraduan Menulis Geosains Popular:* Persatuan bersama Dewan Bahasa dan Pustaka boleh menganjurkan peraduan menulis di peringkat negeri dan kebangsaan.
- **Promosi Di Kalangan Masyarakat:** Di kalangan masyarakat umum beberapa aktiviti berikut boleh dianjurkan:
  - *Siri Ceramah Umum:* Beberapa siri ceramah umum yang menarik perhatian masyarakat umum boleh dianjurkan. Ceramah ini boleh disampaikan oleh ahli geosains terkenal di peringkat kebangsaan dan antarabangsa.
  - *Penerbitan Buku Geosains Popular:* Buku-buku geosains popular boleh diterbitkan untuk bacaan masyarakat awam.
  - *Poster Geosains:* Tempat-tempat yang menarik seperti Gua Mulu, Gunung Kinabalu berserta maklumat pengetahuan geosains boleh dijadikan poster pelbagai tujuan.
- **Promosi Di Kalangan Pelancong:** Ilmu Sains Bumi memang telah banyak digunakan di negara maju untuk mempromosi destinasi pelancongan. Usaha menyediakan risalah dan buku berbentuk '*guide*' boleh diterbitkan untuk tujuan menggalak industri pelancongan. Ini dapat dilakukan oleh Persatuan dengan kerjasama Perbadanan Pelancongan Negara.



## KEAHLIAN (Membership)

The following applications for membership were approved:

### Full Members

- |  |   |
|--|---|
| 1. Yong Wai Yen<br>Europasia Engineering Services Sdn. Bhd.,<br>Lot 6, The Highway Centre, Jalan 51/205,<br>46050 Petaling Jaya. | 2. Al-Farid bin Ishak<br>Jabatan Geologi, Universiti Malaya, 59100<br>Kuala Lumpur.     |
|  | 3. Abdul Jalil bin Buyadi<br>Jabatan Geologi, Universiti Malaya, 59100<br>Kuala Lumpur. |

### Student Members

- |  |   |
|--|---|
| 1. Tang Siew Ching<br>Makmal Geofizik, Pusat Pengajian Sains<br>Fizik, Universiti Sains Malaysia, 11800<br>Penang. | 4. Abdullah bin Hassan<br>Jabatan Geologi, Fakulti Sains Fizis<br>Gunaan, Universiti Kebangsaan Malaysia,<br>Bangi. |
|--|---|

GSM

## PETUKARAN ALAMAT (Change of Address)

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

- |   |   |
|---|---|
| 1. Ciceron A. Angeles, Jr.<br>18 Buckingham Street, Eastside Manors,<br>1607 Maybunga, Pasig City, Philippines. | 3. Poh Kwong Wee<br>Dept. of Petroleum Geoscience, Universiti<br>Brunei Darussalam, Gadong 3186, Negara<br>Brunei Darussalam. |
| 2. Malcolm P.R. Light<br>Lima Associates, 323B, 2905 Unwin Rd.,<br>N.W. Calgary, Alberta, Canada T2N 4M5.       |   |

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**PERTAMBAHAN BAHARU PERPUSTAKAAN**  
(New Library Additions)

The Society has received the following publications:

1. AAPG Bulletin vol. 78/11, 1994 & vol. 79/1, 1995.
2. Journal of Hebei College of Geology, vol. 16, no. 6, 1993; vol. 17, nos. 1-2, 1994.
3. Tin International, vol. 67, no. 10, 1994.
4. Report of the Technical Committee of Investigation on the collapse of Block 1 and the stability of Blocks 2 & 3 Highland Towers condominium, Hulu Klang, Selangor Darul Ehsan, vols. 1-6, 1994.
5. Monthly statistics on mining industry in Malaysia, October 1994.
6. Episodes, vol. 17, nos. 1, 2 & 3, 1994.
7. AAPG Explorer, Jan & Feb 1995.
8. Proceedings of the seminar radiological hazards in tin mining & heavy mineral processing 1994.
9. Geological Survey of Japan Bulletin, vol. 45, nos. 5-7, 1994.
10. Memoires pour servir a' l'Explication des Cartes Geologiques et Minieres de la Belgique, nos. 37, 38 & 39, 1994.
11. American Museum of Natural History, Bulletin no. 221, 1994.
12. Geology of the Cobar 1:100,000 sheet 8035, 1994.
13. Earthquakes & Volcanoes, vol. 24, no. 4, 1993.
14. American Museum Novitates, nos. 3109, 3111, 3114, 3115, 3116.
15. American Museum of Natural History, Bulletin no. 223, 1994.
16. U.S. Geological Survey Bulletin 1994: 2020, 1917-R, 2077, 2100, 2099, 1904-R, 1917-R, 2109, 2085-B, 2076.
17. U.S.G.S. Prof. Paper, 1994: 1553-C, 1538-F-G, 1551-E, 1548.
18. U.S. Geological Survey Circular, 1994: 1125, 1104, 1114.

## BERITA-BERITA LAIN Other News

### Local News

#### DOE plans tighter control over quarries

The Department of Environment is considering stricter control over quarrying activities.

*"State governments and local authorities will be advised on stricter planning and development control before approving quarry activities,"* DOE principal assistant EIA director Halimah Hassan told *The Star* here.

She said the planning would help restrict:

- QUARRIES on steep slopes where erosion control and slope stabilisation are difficult;
- QUARRIES which mar the scenic beauty of a particular area, and

- QUARRIES near or immediately upstream of waterfalls, water intake points and environmentally sensitive areas.

Quarry operators are required under Environmental Impact Assessment (EIA) approval conditions to rehabilitate abandoned quarry activities, she said.

*"Rehabilitation must be carried out in phases and not after the whole area has been abandoned,"* she said.

To date two stop-work orders have been issued in Selangor and Malacca for quarries that caused dust pollution and vibration.

*Star, 18.1.1995*

#### Consortium gets RM1.8b refinery contract

PETRONAS has awarded a US\$690 million (RM1.766 billion) contract for the second oil refinery (PSR-2) project to a consortium of four companies.

Petronas president and chief executive officer Tan Sri Azizan Zainul Abidin said the four companies were Chiyoda Corp. of Japan, Chiyoda Malaysia Sdn. Bhd., MMC Engineering Sdn. Bhd. and Mitsui & Companies.

He said the consortium was chosen from other three consortia shortlisted for the job.

Azizan said the selected consortium would be given a period of 37 months, effective Jan 20, to construct and develop the PSR-2 refinery in Malacca.

*"The refinery is expected to be operational in Jan 1998,"* he said.

PSR-2, which is part of the RM7 billion Petronas integrated refinery complex, is expected to have refining capacity of 100,000 barrels per day (bpd).

Refined products from PSR-2 would include

liquefied petroleum gas, a range of gasoline such as premium export grade, kerosene, jet A-1 fuel, diesel, asphalt and petroleum coke.

Yesterday Petronas signed a production sharing contract (PSC) with Sabah Shell Petroleum Co. Ltd., Shell Sabah Selatan Sdn. Bhd. and Petronas Carigali Sdn. Bhd.

Apart from Azizan, other signatories were Petronas Carigali managing director Datuk Mohd Idris Mansor and Shell Companies in Malaysia chairman Datuk C.J. Knight.

Under the agreement, the companies will undertake a deepwater exploration called Block SB-G, located 100 km from Labuan, offshore Sabah. It lies to the north of Block SB-1, where Shell had made an oil discovery, the *Kinabalu Field*.

Block SB-G which covers an area of 5,860 sq km is in water depths of between 1,000 metres to 1,800 metres.

This is the first deepwater PSC for offshore Sabah and is the fifth PSC which is awarded for

*deposits to the sluice pit or palong,"* he said.

He added that gold deposits would be trapped along the sluice pit while the lighter substances will wash into a pool.

Another prospector, who also refuse to be names, stressed that they felt save conducting

the mining activities as it was being done on a private land, not on State-owned land.

*"It will be better if our landowners applied for the licence. But I think, as long as there is no death or accidents everything will be alright,"* he said.

NST, 4.2.1995

## Bakun dam work projected to start by January

Ekran Bhd. will begin clearing forest totalling 69,000 hectares in April for the RM15 billion Bakun hydroelectric project.

This is because Ekran is confident that its environmental impact assessment (EIA) report for the construction of the reservoir will be approved by the Government next month, after receiving the Economic Planning Unit's letter of intent yesterday which gave Ekran the go-ahead to proceed with the project.

Its executive chairman, Tan Sri Ting Pek Kiing, said today the 69,000 ha of forests in the upper reaches of Sungai Rejang, Sarawak, would be cleared progressively over the next five years, starting with 17,500 ha for the period April 1995-96.

He said Ekran was expected to earn a minimum annual revenue of RM100 million from the extraction of logs in the affected area.

Ekran was given the right to carry out clear felling from ground level up to 288 metres, after other methods of removing timber were ruled out by the Government.

In all, Ekran's earnings from timber extraction would be a few times greater than the total cost of RM500 million to fell them, he added.

This will be in addition to Ekran's project daily earnings of RM8 million or an annual income of up to RM3 billion from the generation of 2,400 megawatts of electricity each day when the Bakun project comes into full operation by the year 2002.

The project has been forecasted to create some 2,500 jobs and the Sarawak Government is

expected to announce soon its plan to relocate the indigenous people affected by the flooding of the area.

Ting said the letter of intent would enable Ekran, through its wholly-owned subsidiary, Bakun Management Sdn. Bhd., to fully mobilise its team to proceed.

Towards this end, tenders for companies to participate in the project would be called for later this month. By May, detailed design works and the issue of tender documents for evaluation are expected to be in place. By January 1996, construction will commence.

Ting said these would be followed by negotiations on the power purchase agreement with the relevant utilities and to finalise discussions with relevant financial institutions.

The EIA report for the Bakun hydroelectric project comes in three parts and Ekran, he added, was confident that all of them would be approved by the Department of Environment. They are for

- the reservoir which Ekran submitted to the DOE four days ago and it is expected to be approved before April;
- the dam; and,
- transmission lines — one for on-land transmission and another for the 640 km submarine cable linking Tanjung Datu in Sarawak to Mersing in Johor to supply electricity to the peninsula.

The EIAs for the hydroelectric dam and the transmission lines are to be submitted to the DOE next month.

NST, 18.2.1995

## BERITA-BERITA LAIN Other News

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PSR-2, which is part of the RM7 billion Petronas integrated refinery complex, is expected to have refining capacity of 100,000 barrels per day (bpd).

Refined products from PSR-2 would include

liquefied petroleum gas, a range of gasoline such as premium export grade, kerosene, jet A-1 fuel, diesel, asphalt and petroleum coke.

Yesterday Petronas signed a production sharing contract (PSC) with Sabah Shell Petroleum Co. Ltd., Shell Sabah Selatan Sdn. Bhd. and Petronas Carigali Sdn. Bhd.

Apart from Azizan, other signatories were Petronas Carigali managing director Datuk Mohd Idris Mansor and Shell Companies in Malaysia chairman Datuk C.J. Knight.

Under the agreement, the companies will undertake a deepwater exploration called Block SB-G, located 100 km from Labuan, offshore Sabah. It lies to the north of Block SB-1, where Shell had made an oil discovery, the *Kinabalu Field*.

Block SB-G which covers an area of 5,860 sq km is in water depths of between 1,000 metres to 1,800 metres.

This is the first deepwater PSC for offshore Sabah and is the fifth PSC which is awarded for

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the mining activities as it was being done on a private land, not on State-owned land.

*"It will be better if our landowners applied for the licence. But I think, as long as there is no death or accidents everything will be alright,"* he said.

NST, 4.2.1995

## **Bakun dam work projected to start by January**

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This is because Ekran is confident that its environmental impact assessment (EIA) report for the construction of the reservoir will be approved by the Government next month, after receiving the Economic Planning Unit's letter of intent yesterday which gave Ekran the go-ahead to proceed with the project.

Its executive chairman, Tan Sri Ting Pek Kiing, said today the 69,000 ha of forests in the upper reaches of Sungai Rejang, Sarawak, would be cleared progressively over the next five years, starting with 17,500 ha for the period April 1995-96.

He said Ekran was expected to earn a minimum annual revenue of RM100 million from the extraction of logs in the affected area.

Ekran was given the right to carry out clear felling from ground level up to 288 metres, after other methods of removing timber were ruled out by the Government.

In all, Ekran's earnings from timber extraction would be a few times greater than the total cost of RM500 million to fell them, he added.

This will be in addition to Ekran's project daily earnings of RM8 million or an annual income of up to RM3 billion from the generation of 2,400 megawatts of electricity each day when the Bakun project comes into full operation by the year 2002.

The project has been forecasted to create some 2,500 jobs and the Sarawak Government is

expected to announce soon its plan to relocate the indigenous people affected by the flooding of the area.

Ting said the letter of intent would enable Ekran, through its wholly-owned subsidiary, Bakun Management Sdn. Bhd., to fully mobilise its team to proceed.

Towards this end, tenders for companies to participate in the project would be called for later this month. By May, detailed design works and the issue of tender documents for evaluation are expected to be in place. By January 1996, construction will commence.

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- the reservoir which Ekran submitted to the DOE four days ago and it is expected to be approved before April;
- the dam; and,
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The EIAs for the hydroelectric dam and the transmission lines are to be submitted to the DOE next month.

NST, 18.2.1995



## BERITA-BERITA LAIN Other News

### Local News

#### DOE plans tighter control over quarries

The Department of Environment is considering stricter control over quarrying activities.

*"State governments and local authorities will be advised on stricter planning and development control before approving quarry activities,"* DOE principal assistant EIA director Halimah Hassan told *The Star* here.

She said the planning would help restrict:

- QUARRIES on steep slopes where erosion control and slope stabilisation are difficult;
- QUARRIES which mar the scenic beauty of a particular area, and

- QUARRIES near or immediately upstream of waterfalls, water intake points and environmentally sensitive areas.

Quarry operators are required under Environmental Impact Assessment (EIA) approval conditions to rehabilitate abandoned quarry activities, she said.

*"Rehabilitation must be carried out in phases and not after the whole area has been abandoned,"* she said.

To date two stop-work orders have been issued in Selangor and Malacca for quarries that caused dust pollution and vibration.

*Star, 18.1.1995*

#### Consortium gets RM1.8b refinery contract

PETRONAS has awarded a US\$690 million (RM1.766 billion) contract for the second oil refinery (PSR-2) project to a consortium of four companies.

Petronas president and chief executive officer Tan Sri Azizan Zainul Abidin said the four companies were Chiyoda Corp. of Japan, Chiyoda Malaysia Sdn. Bhd., MMC Engineering Sdn. Bhd. and Mitsui & Companies.

He said the consortium was chosen from other three consortia shortlisted for the job.

Azizan said the selected consortium would be given a period of 37 months, effective Jan 20, to construct and develop the PSR-2 refinery in Malacca.

*"The refinery is expected to be operational in Jan 1998,"* he said.

PSR-2, which is part of the RM7 billion Petronas integrated refinery complex, is expected to have refining capacity of 100,000 barrels per day (bpd).

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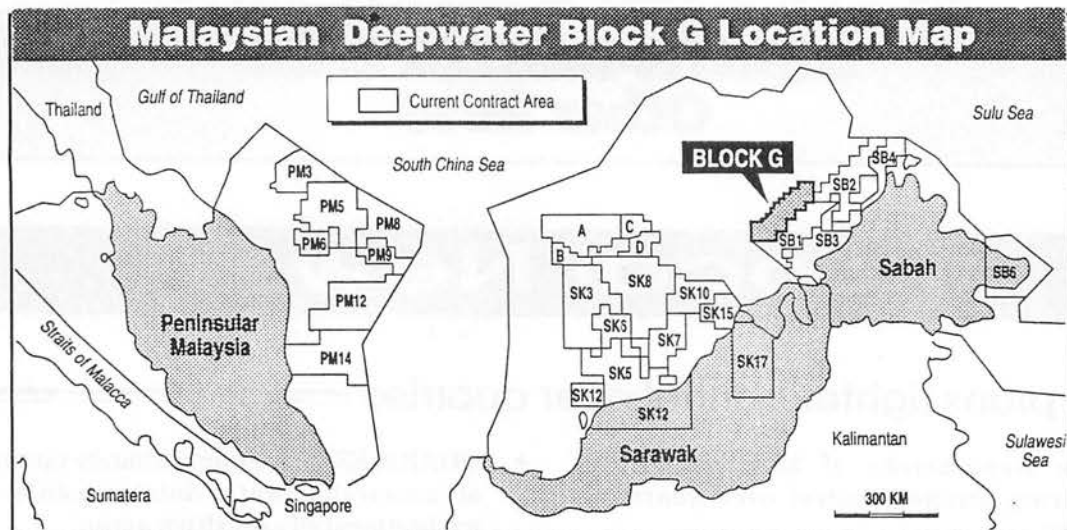
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Under the agreement, the companies will undertake a deepwater exploration called Block SB-G, located 100 km from Labuan, offshore Sabah. It lies to the north of Block SB-1, where Shell had made an oil discovery, the *Kinabalu Field*.

Block SB-G which covers an area of 5,860 sq km is in water depths of between 1,000 metres to 1,800 metres.

This is the first deepwater PSC for offshore Sabah and is the fifth PSC which is awarded for





exploration and development in waters exceeding 200 metres.

Azizan said the profit split for oil was in favour of the contractor at 86 per cent for the first 50,000 bpd, 82 per cent for the next 50,000 bpd and 63 per cent for volume exceeding 100,000 bpd.

*"Beyond a cumulative production of 300,000 million barrels, the profit split will be 50:50. The ceiling for cost recovery is at 75 per cent,"* he said.

He added that profit split for gas would be 60 per cent in favour of the contractor for the first 2.1 trillion cu ft of gas sold.

*"Beyond this volume, the profit split will be 40:60 in favour of Petronas. Cost recovery ceiling for gas will be at 60 per cent,"* he said

Due to the longer lead time required in

technology-intensive deepwater operations, Azizan said the exploration period was extended to seven years, the development to six years, and the production to 25 years.

Meanwhile, Shell chairman Datuk C.J. Knight said the exploration for Block SB-G comprised two phases.

*"Under the first phase of exploration, Shell will make a financial commitment of RM45 million for a period of four years."*

*"A substantial portion of this investment will be devoted to a 3,000 km line of two-D seismic and 710 sq km of three-D seismic surveys."*

*"We shall be applying state-of-the-art geographical processing and interpretation skills to these newly acquired seismic data,"* he said.

Star, 28.1.1995

## Landowners allowed to pan for gold

The State Government has decided to lift the freeze on the issuance of licences to carry out gold mining activities on individual land measuring less than 20 hectares effective today.

Menteri Besar Tan Sri Wan Mokhtar Ahmad said the decision was made to enable private landowners in the State to dig and pan for gold deposits for extra income.

*"We will consider all applications for licences by landowners, irrespective of the size of their land, who wish to conduct gold digging activities if there are gold deposits in their area."*

*"They can seek the cooperation of related agencies for advice pertaining to gold digging and panning activities,"* he said.

But before the licence could be issued by the State Land and Mines Department, he said the landowners concerned must agree to adopt the proper procedures in undertaking their activities to avoid any untoward incidents.

*"It is necessary for all gold prospectors to conduct the gold digging and panning activities with safety in mind. They can always seek help on the safest methods to use, as well as requesting aid from experts before starting their work,"* he said.

Speaking to reporters after chairing the State executive council meeting here, today, he said all the interested landowners had to do was inform the Government of their intention to

conduct gold digging activities.

*"Once we get the information from a landowner, tests will be conducted to determine viability before a licence can be issued.*

*"In this way we can monitor their activities and prevent prospectors trespassing including into Government-owned land to illegally dig for gold."*

Wan Mokhtar stressed that the State Government would not offer its land for gold mining activities as such projects were being undertaken by the Terengganu State Economic Development Corporation using sophisticated technology.

*"It is important to note that the traditional method of panning will only offer 40 per cent of gold deposits as the other 60 per cent remain in*

*the sand which is a waste."*

He also said those with big hectares of gold deposit discoveries could request for the mining activities to be conducted on a joint-venture basis with the State Government, using the latest mining technology.

Gold mining activities, using the digging and mining method, have been banned both on small-scale private land measuring less than 20 ha, as well as on State Government-owned land after a freeze on issuance of such licences in 1991.

The action was taken after 14 gold prospectors were buried alive in the mad rush for gold which was first unearthed in Bukit Lubok Mandi, Marang in 1989.

*NST, 2.2.1995*

## **Hundreds of prospectors rush for gold in Marang district ==**

The mad rush for gold deposits in the State — particularly around the Marang district, about 35 km from here — has entered a new phase with hundreds of prospectors carrying out the mining activities.

This was prompted by the State Government's move on Wednesday to lift its freeze on the issuance of licences to carry out mining on individual land measuring less than 20 ha.

The latest discovery of gold deposits along the Undang main road, leading to Rhu Rendang — near the famous Bukit Lubok Mandi where gold was first discovered in 1989 — has made many lucky landowners and nearby villagers earn a lucrative income over the last few months.

The prospectors use the traditional method of digging and panning.

The latest move by the Government was aimed at protecting the Government-owned land from being trespassed by unscrupulous villagers, as well as ensuring a safe method of gold mining to avoid untoward incidents like the one which occurred in 1989 where 14 illegal prospectors were buried alive.

Menteri Besar Tan Sri Wan Mokhtar Ahmad said that the issuance of licence to owners with land rich in gold would be subjected to their adherence to the proper mining methods — expert help should be sought to determine its viability.

However, many of the prospectors met by

the *New Straits Times* today said they were not aware that the State Government was willing to issue mining licences to owners with less than 20 hectares so far it has only allowed those with 20 hectares and above to conduct mining activities before the ban in 1991.

A prospector, who wished remain anonymous, said most of the gold diggers were conducting the mining activities without a valid licence.

*"We are not worried about the authorities as most of the officers from the State Land and Mines Office did not say anything when they visited us recently. I suppose it is alright for us to conduct the activities as long as they are done with safety in mind,"* he said.

He added that there were seven workers in his group who worked on a land rented from its owner in Marang town. They work from 9 am to 4 pm daily.

*"Everyday at about 5 pm, several local goldsmiths and buyers will meet us to buy the gold deposits. We can earn between RM800 and RM1,000 daily,"* he said.

He also said that the landowner would get 20 per cent of their daily earning as rental while the remainder was shared equally among the workers.

*"We spend about RM75 per day on diesel to pump water from a disused mining pool. The strong water jet from the pumps will break the ground and carry the loose gravel, mud and gold*

*deposits to the sluice pit or palong,"* he said.

He added that gold deposits would be trapped along the sluice pit while the lighter substances will wash into a pool.

Another prospector, who also refuse to be names, stressed that they felt save conducting

the mining activities as it was being done on a private land, not on State-owned land.

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NST, 4.2.1995

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The EIAs for the hydroelectric dam and the transmission lines are to be submitted to the DOE next month.

NST, 18.2.1995

## Lenggong to have artifacts museum

A museum will be built here soon to exhibit artifacts — some dating back to the paleolithic or of earlier Stone Age — discovered in the district.

District council president Fuaddin Kamaruddin said a 3.2 ha land at Kota Tampan, near here, had been identified as the site for the museum.

*"It will be the first of its kind in the country because many of the artifacts to be exhibited will be extremely old, by any standard.*

*"In fact, most of the artifacts will be from the paleolithic through to the neolithic, or of later Stone Age,"* he told *The Star* yesterday.

Fuaddin said plans for a museum started with the discovery of the Perak Man about five years ago.

The Perak Man, believed to be about 11,000 years old, was discovered by local archaeologists at Gua Gunung Runtuh.

*"Since the discovery of the Perak Man, we have had many tourists, some of whom are archeologists, coming here hoping to look at the skeleton.*

*"The museum will serve to attract more tourists and at the same time provide a place for archaeologists to study the artifacts,"* said Fuaddin.

He said many other artifacts had been discovered near the 13 caves and 10 waterfalls found in the district since.

*"The caves used to form a route to guide people to Lenggong in the past,"* he said.

*Star, 21.2.1995*

## Tin mines facing a bleak future

Tins continued low prices in world markets will lead to more mine closures and cut Malaysia's production to about 6,000 tonnes, the lowest level since the Second World War, producers said at the weekend.

*"We see tin production declining to below 6,000 tonnes this year with more mines closing down if prices remain ridiculously low,"* said Muhamad Nor Muhamad, secretary of the Malaysian Chamber of Mines.

*"The current prices are not remunerative at*

*all,"* he added.

Malaysia's Statistics Department said the country, once the world's largest tin producer, had an output of 5,968 tonnes of tin for the first 11 months of 1994, down 39.1 per cent from 9,802 tonnes for the same period in 1993.

Barring a major upturn in world tin prices, officials said Malaysia would once again be unable to meet its export quota of 14,000 tonnes set by the Association of Tin Producing Countries (ATPC).

*NST, 20.2.1995*

## Indonesia breaches tin export quota

Indonesia, the world's third-largest tin producer, exported more tin last year than it was permitted under the Association of Tin Producing Countries (ATPC) quotas, a senior industry official said.

Erry Riyana, president director of state-owned tin company PT Tambang Timah, told reporters the country exported 36,981 tonnes last year — well above the 30,500 tonne limit imposed by the ATPC.

Erry said Indonesia expected tin prices to average US\$5,500 (RM14,080) per tonne this year and planned to produce 37,740 tonnes. He said the price averaged US\$5,413 (RM13,857) in

1994.

Erry said Indonesia produced 33,320 tonnes of tin in 1994 compared with 28,353 tonnes in 1993.

*"We had stocks of more than 3,000 tonnes. Therefore, we exported more than we produced,"* Erry said, referring to 1994 exports of 36,981 tonnes.

*"We plan to produce 37,740 tonnes of tin in 1995. This figure reflects our appeal to the Government to request the ATPC for an increase in our export quota,"* he said.

Indonesia hinted last September that it might be forced to export more than it was

permitted, following calls by industry officials to raise the ATPC quota.

The ATPC's 1995 30,500-tonne export limit on Indonesia was unchanged from last year's.

The ATPC, which groups Australia, Bolivia, China, Indonesia, Malaysia, Nigeria, Thailand and Zaire, agreed last September to reduce total tin export quotas for its members to 90,600 tonnes in 1995 from 98,000 tonnes in a bid to improve prices.

*"We don't like to see the tin price above US\$6,000 (RM15,360), because it will encourage substitution with aluminium and plastic. It will be good if the price ranges between US\$5,500 and US\$6,000,"* Erry said.

*"We predict demand for Bangka (plant) tin to increase sharply this year. But if this happens, we won't be able to fulfil demand because our production is limited,"* he said.

Erry said PT Timah was still awaiting approval from the Finance Ministry for its plan to go public.

*"We will continue to improve our company and raise our competitiveness in the world market,"* he said.

Timah has emerged as one of the world's lowest-cost producers of tin following a restructuring exercise in 1990. Industry sources said the cost was around US\$4,500 (RM11,520) per tonne.

*NST, 21.2.1995*

## Sarawak may have found another natural gas field ---

Sarawak may have discovered another natural gas field, about 84 km offshore from here, State Industrial Development Minister Datuk Abang Haji Johari Tun Openg said yesterday.

He said based on initial investigations, Petronas Carigali would carry out exploration works this year.

*"The state government welcomes the move by Petronas Carigali,"* he told reporters after presenting cash contributions amounting to RM101,000 from Baitulmul Sarawak to 152 Muslim families at Dewan Majlis Islam here.

Johari said there was a proposal to set up the third liquified natural gas (LNG) plant in the state following the discovery of abundant natural gas deposits in offshore Balingian, Mukah in Sibu division.

The first and second LNG plants are sited in Bintulu, and LNG Dua is expected to come on stream in October.

Statistics showed that Sarawak exported RM2.13 billion of LNG for the first 11 months last year.

On food production, Johari said the government would identify a site near Serian, about 65 km from here, to set up food industries. The move will depend on the raw materials available.

He said the state had great potential in seafood processing for both domestic and export markets.

The ministry will work closely with the State Agriculture and Community Development Ministry to identify new food industries.

The state now produces noodles and sauces.

*Star, 26.2.1995*

# M T S F

## MALAYSIA TORAY SCIENCE FOUNDATION

### Science & Technology Research Grant

MTSF is registered with the Malaysian Authority and established through a RM4 million initial endowment. The objective of the foundation is to contribute to the progress of science and technology in Malaysia. "Science and Technology" here is limited to the fields of natural sciences and does not include clinical medicine and mathematics.

#### Qualification of Candidate

Energetic and creative young Malaysian researchers, aged below 40, residing in Malaysia, engaged in a basic research field excluding mathematics and clinical medicine of your institution at a research facility in Malaysia, whose achievement may contribute greatly to the advancement of science and technology.

#### Research Grant

The Foundation will provide a total amount of approximately RM300,000.00 in 5 to 10 grants of RM30,000.00 to RM60,000.00 each.

#### To be recommended by:

The representative of a scientific or professional institution or a university.

#### Application Procedure

Complete the Application Form supplied by MTSF and send the completed form to MTSF at the mailing address stated herein.

#### Deadline

The completed Forms must reach the Foundation on or before 31st May 1995.

#### Method of Selection

The selection of the Grant recipients is made in 3 stages:

- 1st Stage : shortlisting of applicants by the Selection Committee through the review of the Application Forms.
- 2nd Stage : interview of shortlisted applicants by the appointed interviewers.
- 3rd Stage : approval of the successful applicants by the Board of the Foundation.

For those applications that have advanced to the 2nd stage, a member representing the research group will be interviewed by September 1995.

The decision of the Foundation is final and no correspondence regarding the decision will be entertained.

#### Presentation of Research Grant

The presentation ceremony shall be held not later than January 1996.

#### Disbursement Procedure

The grant is to be disbursed through the nominating Institute according to the agreed procedure with the Foundation.

This research grant may be utilized in any manner, so long as it helps in the achievement of the purpose of the research project. However, if the recipient desires to use the grant for a different research project, prior written consent from the Foundation must be received.

The grant should be fully utilised according to the approved schedule. Prior written approval of the Foundation must be obtained for an extension to the completion of the project.

Each recipient of the Grant is to submit an annual report each year until the research is concluded, and upon conclusion, a final report. The report, covering January to December should reach the Foundation by March the following year.

This grant is not taxable in the hand of the recipient.

Please write, phone or fax to MTSF at the address/numbers stated below for clarification and/or additional forms.

#### Mailing Address/Inquiries to:

*Penang Office of the MTS,  
c/o Penfabric Sdn. Berhad.  
Prai Free Industrial Zone 1,  
13600 Prai, Penang.  
Tel: (04) 3908157/3854151  
Fax: (04) 3908260*



## Cretaceous Environmental Change in East and South Asia

### SECOND CIRCULAR

**Third Symposium**  
**International Geological Correlation Programme**  
**Project 350**  
**8-13 May 1995**

#### INTRODUCTION

The International Geological Correlation Programme (IGCP) Project 350 is an annual symposium aimed to disseminate information regarding the Cretaceous Period. This period is recognized as a period of transition and significant plate tectonism. The history of the East and South Asian during this time has been studied in the past but much remains to be discovered.

Next year, the IGCP 350 will be held at the National Institute of Geological Sciences (NIGS), University of the Philippines in Diliman, Quezon City, Philippines on 8-13 May 1995. Good responses have already been received by the Organizing Committee. More than 60 persons from 10 countries have expressed their desire to participate in the symposium. Range of topics includes paleontology, historical geology and paleogeography, tectonics and structural geology, basin analysis, sedimentology, igneous petrology, stratigraphy, sedimentary petrology, geochemistry and geophysics.

The theme for IGCP 350 1995 is Environmental Change in Cretaceous Systems in East and South Asia.

#### SCHEDULE OF SYMPOSIUM

May 7	Arrival of participants
May 8	Registration; Scientific sessions
May 9	Scientific sessions; Business Meeting
May 10	Field Trip to Cretaceous outcrops in Tanay, Rizal
May 11-13	Field Trip to Cretaceous outcrops in Palawan
May 14	Departure of Participants



#### FIELD TRIPS

The IGCP 350 1995 Third Symposium will feature field trips after the Conference proper.

#### ***Field Trip No. 1: Tanay, Rizal***

In the Philippines, Cretaceous rocks are sparsely and widely distributed. One of the most studied Cretaceous successions in the archipelago is represented by the Kinabuan Formation in the Southern Sierra Madre of Luzon Island. The formation is composed of thin-bedded siltstones and sandstones interbedded with gray shales and hemipelagic limestones. The sequence overlies the pillow basalt attributed to the Angat Ophiolite. Paleontological analyses of the Kinabuan Formation, overlying the Angat Ophiolite, yielded Late Cretaceous planktonic and benthonic foraminifera, radiolarians and nannofossils.

Convenors: Dr. Seville David, Dr. Elmer Billedo and Ms. Marietta Tan (MGB)  
 Duration: 10 May 1995  
 Cost: Free of charge

***Field Trip No. 2: Palawan***

Palawan, the westernmost island of the Philippines, is composed of a continental crust and an oceanic crust. The northern portion of the island, the Calamian Island Group and the southwestern portion of Mindoro, comprise the Northern Palawan Microcontinental Block, while the central and southern portions of the island comprise the oceanic crust. The microcontinental block, composed of Late Paleozoic to Mesozoic strata, serves as the oldest crust in the Philippine archipelago, which probably originated from mainland China. These Mesozoic rocks are overlain by several Cenozoic units including the St. Paul's Limestone. The Late Mesozoic to Cenozoic oceanic crust is composed of an ophiolite complex. The Cretaceous system in the area is represented by chert and pillow basalts in the central to southern Palawan.

Convenor: Dr. Fe Tumanda (MGB)  
Duration: 11-13 May 1995  
Cost: US\$300.00

**ADDRESS ALL INQUIRIES TO:**

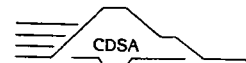
Dr. Priscilla J. Militante-Matias  
Regional Coordinator, IGCP 350 Philippines

National Institute of Geological Sciences  
College of Science, University of the Philippines  
Diliman, Quezon City 1101 PHILIPPINES  
Tel # (632) 97-60-46, (632) 97-60-60 to 69 ext. 7118, 7445  
Fax # (632) 97-12-66

# International conference on D A M ENGINEERING '95



1-2 August 1995  
Kuala Lumpur, Malaysia



**Sponsored by: Persatuan Air Malaysia (Malaysian Water Association)**  
**With the support of: Canadian Dam Safety Association**

## INTRODUCTION

With the rapid economic and industrial growth of many regions in Asia, the development of water resources is a vital element of the infrastructure to satisfy the ever increasing demand for power, irrigation and drinking water supply. This development includes both, the construction of new facilities and the rehabilitation of existing older plants. Dams are usually the key element in such facilities and their economic construction and safety are of paramount importance.

The principal aim of the conference is to provide a forum for the exchange of experiences amongst dam designers, constructors and operators on the behaviour of dams. The conference shall review the state-of-the-art of dam engineering and the practice of monitoring and safety control. Emphasis shall be on practical aspects while scientific issues will complement the understanding of dam behaviour and lead to an improvement of the state-of-the-art in design and construction.

The CONFERENCE THEMES will include:

- state of the art in the design of small and large dams (arch dams, gravity dams, embankment dams, concrete dams, etc.).
- case studies of design, construction and monitoring of dams
- dam reliability and safety assessment analysis of dams for static and dynamic loadings
- construction materials for dams
- dam foundation and seepage
- dam instrumentation and monitoring
- dam maintenance and management systems
- rehabilitation of old dams and dam heightening

- dam optimisation and expert systems
- environmental aspects of dam projects
- any other important aspects?

## CALL FOR PAPERS

We are inviting submissions of papers on any of the above themes. The above themes are not exhaustive and submissions which fall within the theme of the conference may be accepted and included for presentation.

It is an understanding that authors of accepted abstracts must attend the Conference to present their papers, in their absence co-authors can represent them.

Only papers registered and presented at the conference would be included in the conference proceedings and the language of the conference is in English.

Send your abstracts (about 300 words in a single A4 page) to the conference director.

The deadlines are:

- receipt of submissions 15 February 1995
- notification of acceptance 15 March 1995
- full text to be received 15 June 1995

## REGISTRATION FEES:

Authors/Co-Authors	—	RM800.00
Delegate Registration Fee	—	RM880.00

(It includes attendance, morning and afternoon refreshments, lunches during the Conference, conference kit and documentation.)

Please send submission to:

**Conference Director: John S.Y. Tan**  
150 Orchard Road #07-14, Orchard Plaza  
Singapore 0923 Tlx: RS 33205 FAIRCO  
Tel: 065-7332922 Fax: 065-2353530

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## MINERAL RESOURCES OF RUSSIA 1995




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We esteem it an honour to invite you to take part in the work of the next in turn International Forum, devoted to mineral-raw material and fuel-energetic resources of Russia, which will be held in St. Petersburg on September 5-9, 1995 in the best exhibition pavilions in the centre of the city.

Our Forum is the most important event in the geological branch of Russia.

***The organizers of Forum are:***

The Russian Federation Committee on Geology and Exploitation of Mineral Resources (Roskomnedra), leading Russian scientific-research institutes on regional geology, metallogeny and map development (VSEGEI), geology and mineral resources of the World Ocean (VNII Okeangeologiya), methods and technics of prospecting (VITR), the Institute of Prospecting Geophysics (VIRG), Institute of Geology and Geochronology of Pre-Cambrian of Russian Academy of Science (IGGD) with the help of the International Association of European Mining Enterprises (IAMI), European Association of Geologic Societies (EAGS) and under the protection of UNESCO.

The aim of conducting of the Forum is to promote the establishing of business, commercial and scientific contacts with leading mining-geological firms, federal geological services and scientific centres of different countries of the world; to help the expansion of contemporary scientific methods and technologies of prognosis, prospecting, mining and dressing of different types of mineral raw materials; the instillation of newest computer technologies of storing and processing of the geological and geophysical information, geoinformative system; the attraction of Russian and foreign investors to the field of mineral-raw material and energetic resources, also scientific, technologic and technic treatments.

The broad thematic tendency of Forum makes it interesting for a great number both Russian and foreign firms, funds, scientific and state organizations. This event will be attended by collectives of leading scientific and production firms.

Saint-Petersburg historically is a centre of geological study and development of mining business in Russia. Here are situated leading geological institutes of the branch: the Russian Scientific Research Geological Institute (VSEGEI), Institute of Geology and Mineral Resources of the World Ocean (VNII Okeangeologiya), Institute of Methods and Technics of Prospecting (VITR), the Institute of Prospecting Geophysics (VIRG), Institute of Geology and Geochronology of Pre-Cambrian of Russian Academy of Sciences (IGGD), Russian Petroleum Research Institute (VNIGRI), joint-stock company "Institut-Mechanobr" and others.

The oldest mining institute of Russia — St. Petersburg Mining Institute is preparing specialists here. The expeditions, which took precedence of finding new deposits and ore regions of Russia: the golden Kolyma, the copper and platinum of Norilsk, apatites of the Kola Peninsula, the oil and gas of the Western Siberia, and many-many others started from this place.

St. Petersburg, where the Forum will be held, is one of the most beautiful cities of the World. There are situated in the world famous museum: the Hermitage, Russian museum, Petrov cabinet of curiosities and many others; musical and dramatic theatres; suburban palaces of Petrodvorets, Pavlovsk, Tsarskoe Selo, Gatsyina.

The architecture of the city is inimitable — its creators are world famous architects: Qvarengi, Rastrelli, Zakharov and many others great masters. Izac and Kazan cathedrals, the Winter Palace, Peter and Paul's Fortress, splendid embankments and bridges of St. Petersburg will enjoy you and stay for ever in your memory. St. Petersburg is always an attractive city, but in golden autumn it is especially fine. All of it will be offered for the acquaintance to participants and visitors of the Forum.

***The International Forum within the limits of which will be presented***

- The Third International Exhibition and Symposium "Mineral Resources of Russia"
  - materials on deposits offered for joint development;
  - products of dressing plants and mining-chemical integrated works and other enterprises, processing mineral raw materials;
  - new methods of predictions, prospecting and exploration of deposits;
  - geological predictive metallogenic and other maps of geological and environmental geological content;
  - demonstration of computer technologies for processing of geological materials.
- International Specialized Exhibition and Symposium "Offshore of Russia"
  - geology of oilgasbearing provinces;
  - construction of deposits on the shelf of Russia;
  - technologies, geophysical and technical equipment, applied for study and exploitation of deposits on the shelf.
- International Congress "Pre-Cambrian of Europe" (Stratigraphy, structure, evolution and mineralization)
- The Second International Specialized Exhibition "ETER"
  - drilling equipment;
  - mining equipment for driving the mine workings for underground and open pit development of deposits, recent technologies for development of deposits and ore processing;
  - new devices and equipment for isolated prospecting and exploration of deposits.
- The Third International Exhibition and Gemmological Conference "Gems of Russia"
  - geology and distribution pattern of the deposits of gemstone raw materials;
  - equipment and facilities for development of deposits, enrichment and extraction of coloured stone from enclosing rocks;
  - industrial gemstone and ornamental-facing raw materials;
  - synthesis and ennobling of gems;
  - collection gemstone raw materials;
  - stone cutting and jewelry articles;
  - equipment, devices and mechanisms, abrasives and facilities for processing of gems and ornamental-facing stones;
  - diagnostics and assessment of gems' quality (devices, procedure, recommendations);
  - museum business and participation in international gemmological exhibitions.

The second circular will be sent in March to all individuals and organizations which have shown interest. It will contain:

1. General information (terms of participation in Exhibition and Symposium).
2. Program of the Exhibition, Congress and scientific Symposium; presentations; meetings of participants; work of the business club; terms of publication of materials and advertisements.
3. Requirements to materials submitted for presentations and publication.
4. Information on deposits planned for visiting, geological tours.
5. Information on accommodation, and servicing of participants of the Exhibitions, Congress and Symposium, terms of payment.

**Organizing Committee of the Exhibitions, Congress and Symposium:**

For letters: P.O. Box 215, "MINERALS", 192004, St. Petersburg, Russia.

Phone: (812) 355-7952; 218-9224 Fax: (812) 213-5926 E-mail: vs@sovamsu.sovusa.com

# GEOLOGY OF SOUTHEAST ASIA AND ADJACENT AREAS

## Joint Meeting of International Geological Correlation Programme Projects 306, 321 & 359



*Organised by:*  
Vietnam National Committee for IGCP  
Geological Survey of Vietnam  
Vietnam National University, Hanoi  
Geological Association of Vietnam

### INVITATION

The Organising Committee cordially invites you to the International Symposium on "Geology of Southeast Asia and adjacent areas", a joint Meeting of IGCP Projects 306, 321 and 359 to be held at the Geological Survey of Vietnam, Hanoi, Vietnam from 4 to 6 November 1995.

### OBJECTIVES

1. To correlate the stratigraphy of SE Asia, emphasizing the Paleozoic and Mesozoic;
2. To review the paleobiogeography of South and East Asia;
3. To discuss all aspects of Gondwana dispersion and Asian accretion;
4. To review and update the economic geology of South and East Asia.

### THEMES

1. Stratigraphic correlation in SE Asia, biostratigraphic zonation, P/T boundary;
2. Basin analysis, paleobiogeography of South and East Asia;
3. Magmatism, metamorphism, geophysics (including paleomagnetism);
4. Plate tectonics of these regions, Gondwana dispersion and Asian accretion;
5. Mineral, energy resources potential of South and East Asia;
6. Other important related problems.

### SCIENTIFIC PROGRAMME

The official language of the Scientific program is English. Papers can be presented either in oral or poster sessions. Each oral presentation will be given 15 minutes with 5 minutes at the end for open discussion. Posters will be displayed prominently throughout the duration of the program. The authors will be requested to be present during designated times to entertain queries on their displays.

### FIELD EXCURSIONS

*Pre-Symposium excursion:* 1-3 November 1995

- Trip No. 1 Cao Bang trip: Permian-Triassic carbonate sequences (cost 220 USD)  
 Trip No. 2 Son La trip: Permian-Triassic volcanoterrigenous sequences (cost 220 USD)  
 Trip No. 3. Ha Long trip: Triassic coal-basin, open pit mine: Ha Long Gulf karst topography (cost 220 USD)

### *Post-Symposium excursion:* 7-9 November 1995

- Trip No. 4. Song Ma trip: Song Ma Ophiolite (5 days, cost 420 USD)  
 Trip No. 5. Thanh Hoa trip: Song Ma Ophiolite, Co Dinh chromite deposits, Triassic limestone grottoes (3 days, cost 220 USD)  
 Trip No. 6. Ta Khoa trip: Ban Phuc nickel-copper deposits, mafic-ultramafic rocks, Devonian and Upper Paleozoic volcanic sequences in Song Da basin (3 days, cost 250 USD)

### ABSTRACTS

In English, typed on A4 sheet (297 x 210 mm), approximately 400 words.

### PROCEEDINGS

In English, prepared in electronic form on A4 sheet, approximately 5,000 words (10 pages).

### REGISTRATION FEES

100 USD.

### DATES TO REMEMBER

- |                 |   |
|-----------------|---|
| October 1994    | Release of First Circular                                 |
| 15 January 1995 | Deadline for submission of response to first circular     |
| 30 January 1995 | Release of Second Circular                                |
| 15 May 1995     | Deadline for submission of abstracts and pre-registration |

Address all inquiries to:

Prof. Dang Vu Khuc, Geological Museum  
6 Pham Ngu Lao, Hanoi, Vietnam  
Tel.: 84.4.266.802  
Fax: 84.4.254.734



# Geology, Geotechnology and Mineral Resources of Indochina

22-25 November 1995

*In commemoration of the Twentieth Anniversary of  
the Department of Geotechnology  
Faculty of Technology  
Khon Kaen University (KKU)  
Khon Kaen, Thailand*

## INTRODUCTION

The Department of Geotechnology, Khon Kaen University (KKU), the Geological Society of Thailand (GST), the Department of Geology, Chulalongkorn University (CU), and the Department of Geological Science, Chiang Mai University (CMU), take great pleasure in extending an invitation to you to participate in the international Conference on "Geology, Geotechnology and Mineral Resources of Indochina".

The Conference is aimed at updating the regional geologists, geotechnologists and engineers on the recent informations of geology, engineering geology, and other related fields in Indochina.

The Conference will provide a broader platform for those who come together and express new ideas, achievements and experiences through technical presentation and discussions. Moreover, this is to celebrate the twentieth anniversary of the foundation of Geotechnology Department, Khon Kaen University.

## CONFERENCE THEMES

The Conference Themes are:

- Geology and Mineral Resources
- Petroleum and Energy Resources
- Geotechnical Engineering
- Groundwater Resources
- Geophysics and Environmental Geology

## OFFICIAL LANGUAGES

The official languages of the Conference will be English and Thai.

## DATE AND VENUE

The Conference will be held on November 22-24, 1995, at Khon Kaen University, Thailand.

The post Conference excursion will be held on November 25, 1995.

## REGISTRATION

Those who are interested and most likely to attend the Conference are requested to complete the attached preliminary registration form and send to the Conference Secretariat not later than 31 January 1995. A registration fee of 2,000 Bht (US\$ 100 for an overseas participant) will be collected from each

participant which includes participation in Technical Session, Proceedings, Coffee Breaks and Welcome Reception.

## CONFERENCE PROCEEDINGS

The Conference Proceedings will be distributed to participants upon arrival at the conference.

## EXCURSION (25 NOVEMBER 1995)

Post Conference excursions will be organized in the Themes of:

1. "Evaporites" in the vicinity of Khon Kaen, Udornthani, Nakorn Ratchasima or Chaiyaphum.
2. "Base-Metal Minerals" in Loei Province.

The excursion fee is 1,000 Bht/person (US\$50 for an overseas participant).

## CALL FOR PAPERS

Original papers that address any of the Conference Themes and which have not been published nor will they be published elsewhere are now cordially invited. Intending authors are requested to fill the attached preliminary registration form so that details for the preparation of manuscript can be sent to them. Authors are expected to submit their titles and abstracts before 31 March 1995. The full manuscripts should be sent to the Conference Secretariat before 31 July 1995.

## OTHER INFORMATION

Information regarding travelling, currency rate, entry requirements and guidelines for the manuscript preparation will be given in Bulletin No. 2 and to those who return the preliminary registration form.

## CORRESPONDENCE

All correspondence related to the Conference should be directed to:

Assist. Prof. LADDA WANNAKAO

The Conference Secretariat

Department of Geotechnology

Faculty of Technology, Khon Kaen University,  
Khon Kaen 40002, Thailand

Telephone: (66-43) 242333-40 Ext. 2351-3

Fax: (66-43) 239329

E-Mail: ladda @ kku1.kku.ac.th

## Seminar on Urban Drainage and Flood Mitigation

**Venue:** Kristal Ballroom, PJ Hilton, Petaling Jaya

**Date:** 24th-25th April, 1995

**Organised by:**

**Water Resources Technical Division, IEM  
Department of Irrigation and Drainage (DID)**

### INTRODUCTION

The urban areas in Malaysia are rapidly expanding as a result of socio-economic development and population increase. At present, about 40% of the population live in urban areas. Many urban centers are, however, affected by the problems of flooding and poor drainage. This has necessitated large capital expenditures on urban drainage and flood mitigation works to cope with these problems.

The planning and management of urban drainage and flood mitigation works requires specialised knowhow and experience. In this respect, there is a need to develop local expertise as well as to learn from the experience of the more advanced countries. The Seminar is organised with a view to promote technological development as well as to facilitate exchange of professional experience on this subject. Two keynote addresses will be delivered by prominent experts while another 10 technical papers will be presented covering planning and design practices and case studies.

The two-day seminar will be followed by an optional technical visit to the Batu Flood Retention Pond and river improvement works under the Kuala Lumpur Flood Mitigation Project.

### OBJECTIVE

The primary objective of this seminar is to provide a forum for engineers to share and exchange experience in the planning, design and management of urban drainage and urban flood mitigation works.

### VENUE

Kristal Ballroom, PJ Hilton, Petaling Jaya.

### REGISTRATION FEE

IEM Members and Government Officers	RM300.00
Others	RM400.00

The registration fee covers one set of seminar proceedings, attendance of all sessions, lunches and tea.

### ENQUIRIES

Organising Chairman  
*"Seminar on Urban Drainage & Flood Mitigation"*  
 c/o The Institution of Engineers, Malaysia  
 Lots 60 & 62, Jalan 52/4  
 40702 Petaling Jaya  
 Tel: 03-7569173 Fax: 03-7577678

# KALENDAR (CALENDAR)

## 1995

### January 18-19

**SOUTH EAST ASIAN SYMPOSIUM ON TUNNELING AND UNDERGROUND SPACE DEVELOPMENT**, Bangkok Thailand. (SEASTUD Secretariat in Thailand, c/o M. Sugimoto (Dr.), Division of Geotechnical and Transportation Engineering, Asian Institute of Technology, G.P.O. Box 2754, Bangkok 10501, Thailand. Phone: +66-2-5245517; Fax: +66-2-5245509; Telex: 84276TH)

### February 13-24

**MINERAL DEPOSIT EVALUATION**, South Kensington, London. (Sally Verkaik, Continuing Education Centre, Imperial College, Room 558 Sherfield Building, South Kensington, London SW7 2AZ, UK. Tel: +44 (0) 171 594 6882 or 6881; Fax: +44 (0) 171 594 6883; E-mail: s.verkaik@ic.ac.uk)

### February 14-18

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

### February 20-25

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

### March 5-8

**AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS**, ann. mtg., Houston. (AAPG Convention Department, P.O. Box 979, Tulsa, Okla. 74101. Phone: 918/584-2555)

### March 5-8

**INTERNATIONAL MINERAL EXPLORATION AND DEVELOPMENT**, ann. mtg., Toronto, by Prospectors and Developers Association of Canada. (Prospectors and Developers Assoc. of Canada, Ninth floor, 34 King St. East, Toronto, M5C 2X8. Phone: 416/

362-1969. Fax: 416/362-0101)

### March 6-8

**ASIA PACIFIC OIL AND GAS MTG. AND EXHIBIT**, Kuala Lumpur, Malaysia, by Society of Petroleum Engineers. (SPE Headquarters, Box 833836, Richardson, Texas, 75083-3836. Phone: 214/952-9393; Fax: 214/952-9435)

### March 6-9

**SOCIETY FOR MINING, METALLURGY, AND ENGINEERING**, ann. mtg., Denver, Colorado, USA. (Meetings Department, SME Inc., P.O. Box 625002, Littleton, CO 80162-5002 USA. Phone: 303/973-9550. Fax: 303/979-3461)

### March 11-14

**MIDDLE EAST OIL AND GAS**, mtg., Bahrain. (Society of Petroleum Engineers, Meetings and Exhibitions Dept., Box 833836, Richardson, Texas 75083-3836. Phone: 214/952-9393. Fax: 214/952-9435)

### March 12-16

**WATER RESOURCES MANAGEMENT** (International Conference), Muscat, Oman. (Saif bin Rashid al Shaqsi, WRM. Ministry of Water Resources, P.O. Box 2575, Ruwi 112, Sultanate of Oman. Telefax: 968 799 563)

### March 13-17

**LUNAR AND PLANETARY SCIENCE** (26th Annual Conference), Houston, Texas, USA. (LeBecca Simmons, LPI Publications and Programme Services Department, 3600 Bay Area Boulevard, Houston TX 77058 1113, USA. Phone 713 486 2158)

### March 27-29

**STRUCTURAL GEOLOGY IN RESERVOIR CHARACTERIZATION**, mtg., London. (Petroleum Group, Geological Society, Burlington House, Piccadilly, London W1V0JU. Phone: 44 71 287 1433; Fax: 44 71 439 8975)

### March 28-April 7

**MOZAMBIQUE AND RELATED METAMORPHIC BELTS** (Field Workshop and 3rd Annual Meeting of IGCP 348 — part of Geocongress '95), Natal and Johannesburg, South Africa. (Bob Thomas, Council for Geoscience, P.O. Box 900, Pietermaritzburg,

South Africa. Phone: 0331 456265. Telefax: 0331 949342)

**April 2-5**

*SINKHOLES AND THE ENGINEERING AND ENVIRONMENTAL IMPACTS OF KARST*, conf., Gatinsburg, Tenn., by the Association of Groundwater Scientists and Engineers, and others. (Fifth Multidisciplinary Conference, Box 4412, Oak Ridge, Tenn. 37831-4412). Registration Fee: \$345, Student: \$100.

**April 2-7**

*GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS* (3rd International Conference), St. Louis, Missouri, USA. (Dr. Shamsher Prakesh, University of Missouri-Rolla, Continuing Education, 103 ME Annex, Rolla, MO 65401-0249, USA. Phone: (314) 341 4200. Telefax: (314) 341 4992; E-mail: prakash@novell.civil.umar.edu)

**April 3-7**

*SOUTH AFRICA CENTENNIAL GEOCONGRESS*, Johannesburg, South Africa. (Secretariat, Centennial Geocongress, P.O. Box 36815, Menlo Park, 0102 South Africa. Phone/Telefax: 27 12 47 3398)

**April 4-8**

*THE HIMALAYA, KARAKORAM AND TIBET* (10th Workshop), Monte Verita, Ascona, Ticino, Switzerland. (Dr. David A Spencer, Geologisches Institut, ETH-Zentrum, CH-8092 Zurich, Switzerland. Phone 41 1 632 3698; Telefax: 41 1 632 1080; E-mail: daspencer@erdw.ethz.ch)

**April 5-7**

*FRACTALS AND DYNAMIC SYSTEMS IN GEOSCIENCE* (2nd International Symposium), Frankfurt, Germany. (Jörn H Kruhl, Geol.-Palaont. Institut, J.W. Goeth Universität, Senckenberganlage 32. D-50054 Frankfurt/M. Germany. Phone: 49 69 7982695; Telefax: 49 69 7982958; Telex: 413 932 UNIF D).

**April 10-13**

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

**April 10-14**

*MECHANICS OF FAULTED ROCK* (2nd International Conference), Vienna, Austria. (Doz Dr. H.P. Rossmanith, Institute of

Mechanics, Technical University Vienna, Wiedner Hauptstr. 8-10/325, A-1040 Vienna, Australia. Phone: 0043 4 58 801 5514; Telefax: 0043 1 587 58 63; E-mail: rossmanith@emch80.una.ac.at)

**May 2-5**

*GEOTECHNICA* (International Trade Fair and Congress for Geosciences and Geotechnology), Cologne, Germany. (AWS-Geschäftsstelle, Wissenschaftszentrum, Ahrstrasse 45, D-53175, Bonn, Germany)

**May 8-13**

*CRETACEOUS ENVIRONMENTAL CHANGE IN EAST AND SOUTH ASIA*, 3rd Symposium, IGCP Project 350, Quezon City, Philippines. (Dr. Priscilla J. Militante-Matias, Regional Coordinator, IGCP 350 Philippines, National Institute of Geological Sciences College of Science, University of the Philippines, Diliman, Quezon City 1101 Philippines. Phone: (632) 97-60-46, (632) 97-60-06 to 69 ext. 7117, 7445. Fax: (632) 97-60-47, (632) 97-12-66)

**May 14-18**

*CANADIAN INSTITUTE OF MINING, METALLURGY AND PETROLEUM* (97th annual general meeting), Halifax, Nova Scotia, Canada. (John Gaydos, Meetings Manager, Canadian Institute of Mining and Metallurgy, 1 Place Alexis Nihon 1210-3400 de Maisonneuve Boulevard West, Montreal, Quebec H3Z 3B8, Canada. Phone: (514) 939-2710; Telefax: (514) 939-2714)

**May 14-18**

*WATER RESOURCES AT RISK*, Denver, USA. (Helen Klose, American Institute of Hydrology, 3416 University Avenue, Minneapolis Mn 55414, USA)

**May 15-18**

*GROUNDWATER QUALITY, REMEDIATION AND PROTECTION*. Prague, Czech Republic. (GQ '95, c/o Gaurant, Opletalova 15, 11000 Prague 1, Czech Republic)

**May 15-19**

*EXPLORING THE TROPICS* (17th International Geochemical Exploration Symposium), Townsville, Queensland, Australia. (Dr. Russell Myers, 171GES, National Key Centre in Economic Geology, James Cook University, Townsville, 04814, Australia. Phone: 077-814486. Fax: 61-77-

815522)

**May 16-18**

**INTERNATIONAL SYMPOSIUM ON SEQUENCE STRATIGRAPHY IN SOUTHEAST ASIA**, Jakarta, Indonesia. (International Symposium on Sequence Stratigraphy in Southeast Asia, Indonesia Petroleum Association, Jl. M. Ikhwan Ridwan Rais 3, Jakarta 10110, Indonesia. Fax: (62-21) 375228)

**May 17-19**

**GEOLOGICAL ASSOCIATION OF CANADA and MINERALOGICAL ASSOCIATION OF CANADA** (Joint Annual Meeting), British Columbia, Canada. (Dr. Chris R Barnes. General Chair, SEOS, University of Victoria, P.O. Box 1700, Victoria, BC V8W 2Y2, Canada. Phone: (604) 721-6120; Telefax: (604) 721-6200)

**May 18-31**

**WORLD GEOTHERMAL CONGRESS**, Florence, Italy, by International Geothermal Association, and others. (IAG, LBL 50C. Rooms for 106-108. One Cyclotron Road, Berkeley, Calif. 94720. Phone: 510/486-4584. Fax: 510/486-4889)

**May 24-26**

**GOLDSCHMIDT GENERAL GEOCHEMISTRY CONFERENCE**, University Park, Pa., by the Geochemical Society, and others. (Suzanne St. Pierre. Phone: 814/865-7557. Fax: 814/865-3749)

**May 28-June 1**

**MINING AND THE ENVIRONMENT — SUDBURY '95**, ann. conf., Sudbury, Canada. (Andrew J. Oliver, Mineral Sciences Laboratory, CANMET, 555 Booth St., Ottawa, Ontario, Canada K1A 0G1. Phone: 613/996-5619; Fax: 613/996-9041)

**May 29-June 2**

**EUROPEAN ASSOCIATION OF EXPLORATION GEOPHYSICISTS** (57th Annual Meeting and Exhibition), Glasgow, UK. (Evert van der Gaag, Business Manager EAEG, P.O. Box 298, 3700 AG Zeist, The Netherlands. Phone: +31(0)3404 56997; Telefax: +31(0)3404 62640)

**June 3-6**

**CARBONATE-HOSTED LEAD-ZINC DEPOSITS**, int'l mtg., St. Louis, by Society of

Economic Geologists. (Martin Goldhaber, U.S. Geological Survey, MS 973, Box 25046, Federal Center, Denver, 80225-0046. Fax: 303/236-3200; E-mail: mgold@helios.cr.usgs.gov)

**June 4-7**

**ROCKMECHANICS**, symposium, Lake Tahoe, Nev., by U.S. National Committee for Rock Mechanics. (Jaak Daemen, Mining Engineering, MS 173, University of Nevada, Reno, 89557-0139. Phone: 702/784-4309; Fax: 702/784-1766)

**June 4-10**

**MANAGING THE EFFECTS OF MAN'S ACTIVITIES ON GROUNDWATER** (26th Congress of IAH). Edmonton, Canada. (Solutions 95, 10769-99 Street, Edmonton, Alberta, Canada T5H 4H6. Phone: +403 4245281; Telefax: +403 4245306)

**June 5-12**

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

**June 7-9**

**AFRICAN MINING '95**, Windhoek, Namibia. (The Conference Office, The Institution of Mining and Metallurgy, 44 Portland Place, London W1N 4BR. Phone: +44 (0)71-580 3802; Telefax: +44 (0)71-436 5388)

**June 11-16**

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

**June 12-16**

**ORDOVICIAN SYSTEM** (7th International Symposium), Las Vegas, Nevada, USA. (Dr. Margaret Rees, Dept. of Geosciences, University of Nevada, Las Vegas, 89154-4010 USA. Phone: 702/739-3262. Fax: 702/597-4064)

**June 18-22**

**RAPID EXCAVATION AND TUNNELING**, mtg., San Francisco. (Society for Mining, Metallurgy, and Engineering, Box 625002,

Littleton, Colo. 80162-5002. Phone: 303/973-9550. Fax: 303/979-3461)

**June 18-23**

**GEOMORPHOLOGY**, (Conference, International Association of Geomorphologists, SE Asia), Singapore. (Dr. GOH Kim Chuan/NIE Division, Nanyang Technological University, 469 Bukit Timah Road, Singapore 1025. Fax: 65 469 8433)

**June 23-25**

**GRAPTOLITE WORKING GROUP**, by International Palaeontological Association; int'l conf., Long Beach, Calif. (Stan Finney, Dept. of Geological Sciences, California State Univ., Long Beach, 90840. Phone: 310/985-8637; Fax: 310/985-2315; E-mail: scfinney@beach.csulb.edu)

**June 25-27**

**HEAVY OIL**, int'l mtg., Calgary. (Society of Petroleum Engineers, Meetings and Exhibitions Dept., Box 833836, Richardson, Texas 75083-3836; Phone: 214/952-9393; Fax: 214/952-9435)

**June 25-28**

**WATER RESOURCES AND ENVIRONMENTAL HAZARDS IN THE PACIFIC RIM**, mtg., Honolulu by American Water Resources Association. (AWRA, Suite 220, 5410 Grosvenor Lane, Bethesda, Md. 20814-2192. Phone: 301/493-8600; Fax: 301/493-5844)

**June 26-30**

**ACIDIC DEPOSITION: SCIENCE AND POLICY**, int'l mtg., Gothenburg, Sweden. (Peringe Grennfelt, Swedish Environmental Research Institute, Box 47086, S-402 58 Gothenburg. Phone: +46(0)31 46 00 80; Fax: +46(0)31 48 21 80)

**June 26-July 1**

**EUROPEAN COAL CONFERENCE '95**, Prague, Czech Republic. (ECC '95, Faculty of Science, Charles University, Albertov 6, 128 43 Prague 2, Czech Republic. Phone: 2 24915472; Telefax: 2 296084)

**July 2-14**

**INTERNATIONAL UNION OF GEOLOGICAL SCIENCES** (21st General Assembly), Boulder, Colorado. (IUGG XXI General Assembly, c/o American Geophysical Washington, DC 20009, USA)

**July 2-14**

**INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS**, mtg., Boulder, Colorado, USA (IUGG General Assembly, c/o American Geophysical Union, 2000 Florida Avenue, NW, Washington, D.C. 20009, USA)

**July 3-9**

**COASTAL SEDIMENTOLOGY**, mtg., Niteroi, Brazil. (Cleverson Guizan Silva, Dept. de Geologia/LAGEMAR, Universidade Federal Fluminense, Av. Bento de Maria da Costa 115-a, Charitas, Niteroi, R.J. 24.370-190, Brazil. Fax: 5521-711-9917)

**July 10-12**

**PYROMETALLURGY**, mtg., Cambridge, England. (Conference Office, Institution of Mining and Metallurgy, 44 Portland Place, London W1N 4BR. Phone: +44 71 436 5388)

**July 10-14**

**REEFS AND CARBONATE PLATFORMS IN THE PACIFIC AND INDIAN OCEANS**, Sydney, Australia. (D.D. Bergersen, Department of Geology and Geophysics, University of Sydney, NSW, Australia. Phone: 61 2 692 4050; Telefax: 61 2 692 0184)

**July 10-14**

**APCOM 25: APPLICATIONS OF COMPUTERS AND OPERATIONS RESEARCH IN THE MINERALS INDUSTRIES, BRISBANE, AUSTRALIA**. (Australasian Institute of Mining and Metallurgy, Box 122, Parkville Victoria, Australia 3052. Phone: 03/347-3166. Fax: 03/347-8525)

**July 17-21**

**PELAGIC BIOGEOGRAPHY** (2nd International Conference). Amsterdam, The Netherlands. (S. Vander Spoel Institute of Taxonomic Zoology, P.O. Box 94766, 1090 GT Amsterdam, The Netherlands. Phone: 31 20 525 5402)

**July 18-20**

**COASTAL AND OCEAN ZONE MANAGEMENT** (9th International Symposium), Tampa, Florida, USA. (Dr. Billy Edge, Ocean Engineering Program: Civil Engineering Department. Texas A&M University, College Station, Texas 77843 3136, USA)



**August 7-12**

**6TH INTERNATIONAL KIMBERLITE CONFERENCE**, Novosibirsk, Russia. (Dr. N. Pokhilenko, United Institute of Geology Geophysics and Mineralogy, Russian Academy of Sciences, Siberian Branch, 630090 Novosibirsk-90, Russia. Telex: 133123 KORA SU; Telefax: 007 3832 3526 92; E-mail: chief@diamond.msk.su.

**August 9-10**

**TERRESTRIAL CARBON CYCLE CHANGES DURING THE LAST 150 Ky** (International Symposium, INQUA), Berlin, Germany. (H. Faure, Luminy Case 907, F 13288 Marseille Cédex, 09, France. Telefax 33 91 26 66 38)

**August 13-16**

**CONGRESS ON SEDIMENTARY GEOLOGY**, St. Petersburg, Fla., by Society for Sedimentary Geology. (SEPM, Box 4756, Tulsa, Okla. 74159-0756. Phone: 800/865-9765; Fax: 918/743-2498)

**August 13-18**

**WATER-ROCK INTERACTION** (8th International Symposium), Vladivostok, Russia. (Oleg Chudaev, Far East Geological Institute, 690022 Vladivostok, Russia. Phone: 7 4232 3172567; Telefax: 7 5098 512430; Telex: 213212 FEBAS SU; E-mail: fegi@visenet.iasnet.com)

**August 21-25**

**RESEARCH METHODS IN ANCIENT AND MODERN LACUSTRINE BASINS** (1st International Limno-geological Congress), Copenhagen, Denmark. (Dr. Nanna Noe-Nygaard, Geological Institute, University of Copenhagen, Øster Volgade 10, Copenhagen 1350 K, Denmark. Phone: 45 35322491; Telefax: 45 35322499)

**August 22-September 1**

**INTERPLATE MAGMATISM IGCP 336**, Duluth, Minn. (Penny Morton, Dept. of Geology, University of Minnesota, Duluth, 55812. Phone: 218/726-7962; Fax: 218/726-8275; E-mail: pmorton@ua.d.umn.edu)

**August 24-September 5**

**OROGENIC LHERZOLITES AND MANTLE PROCESSES** (2nd International Workshop), Granada, Spain. (H.G. Barszczus, Géofluides GBE/ISTEEM, CP 057, Université de Montpellier 2, 34095 Montpellier Cedex 5, France. Phone: 33 6714 3933; Telefax: 33 6714

4774; E-mail: barszczus@dstu.univ-montp2.fr)

**August 27-September 1**

**GEOLOGY OF THE EASTERN MEDITERRANEAN REGION** (2nd International Symposium), Jerusalem, Israel. (P.O. Box 50006, Tel-Aviv 61500, Israel. Phone: 972 3 5140014; Telefax: 972 3 5175674)

**August 28-31**

**MINERAL DEPOSITS: FROM THEIR GENESIS TO THEIR ENVIRONMENTAL IMPACTS** (3rd Biennial SGA Meeting), Prague, Czech Republic. (Dr. Jan Pasava, Secretary General, Czech Geological Survey, Klarov 131/3, 118 20 Praha 1, Czech Republic. Phone: (42) 2 537011; Telefax: (42) 2 7980965)

**August 28-September 1**

**TECTONIC AND METALLOGENY OF EARLY/MID PRECAMBRIAN OROGENIC BELTS**, Montreal, Canada. (J.A. Percival, Geological Survey of Canada, 601 Booth St., Ottawa, Ontario, Canada, K1A 0E8. Phone: (613) 995-4723; Telefax: (613) 995-9272; E-mail: ipercival@6091C.gsc.emr.ca)

**August 28-September 2**

**CARBONIFEROUS-PERMIAN** (13th International Congress), Krakow, Poland. (XIII ICC-P Secretary General, Prof. dr.hab Sonia Dybowa-Jachowicz, Państwowy Instytut Geologiczny, Oddział Córnoslaski, 1 Królowej Jadwigi, 41-200 Sosnowice, Poland. Phone: 48 32 66 20 36; Telefax: 48 32 66 55 22)

**August 28-September 2**

**ORIGIN OF GRANITES** (3rd Hutton Symposium), College Park, Maryland, USA. (Dr. Michael Brown, Dept. of Geology, University of Maryland at College Park, College Park, MD 20742 USA. Phone: 301/405-4082. Telefax: 301/314-9661)

**August 31**

**INQUA**, Berlin, Germany. (E. Derbyshire, Royal Holloway and Bedford New College, London University, Egham, Surrey TW20 0EX, UK. Telefax: +44(0)273-748919)

**September 1**

**BRACHIOPODES ACTUELS ET FOSSILES** (International congress). Sunbury, Ontario, Canada. (M. Gayet and B. Courtinat. Université Claude-Bernard Lyon 1, Centre des Sciences de la Terre, 27-43, boulevard du 11-nov., F-69622 Villeurbanne Cedex, France. Phone: 72 44 83

98 and 72 44 85 72; Telefax: 72 44 84 36)

**September 3-9**

**RADIOACTIVE WASTE MANAGEMENT AND ENVIRONMENTAL REMEDIATION**, mtg., Berlin, by American Society of Mechanical Engineers. (Steven C. Slate, Battelle Pacific Northwest Laboratory, MSIN K1-19, Box 999, 902 Battelle Blvd., Richland, Wash, 99352. Phone: 509/375-3903; Fax: 509/375-5963; E-mail: sc\_slate@pnl.gov)

**September 4-8**

**DYKES** (3rd International Conferences), Jerusalem, Israel. (Dr. Gideon Baer, Geological Survey of Israel, 30 Malkhe Israel Street, Jerusalem 95501, Israel. Telefax: 972 2 3806688)

**September 4-9**

**ASSOCIATION OF EUROPEAN GEOLOGICAL SOCIETIES** (9th Meeting), St. Petersburg, Russia. (Dr. A. Kotov, Institute of Precambrian Geology and Geochronology, Marakova Emb. 2, St. Petersburg, Russia. Phone: (812)2184701; Telefax: (812)2184801; E-mail: spire@sovamsu.sovusa.com)

**September 4-9**

**DEVONIAN MICROVERTEBRATE BIOCHRONOLOGY** (Final Meeting of IGCP 328, followed by field meeting in N. France/Belgium, 9-25 September), Paris, France. (Dr. Alan Blicek, telefax: 33 2043 6900)

**September 4-9**

**TERRESTRIAL PLANTS IN GEOLOGIC TIME**, int'l. mtg., Nanjing, China. (ICTPG, Dept. of Paleobotany, Nanjing Institute of Geology and Palaeontology, Nanjing)

**September 10-13**

**AMERICAN ASSOCIATION OF PETROLEUM GEOLOGIST**, int'l conf., Nice, France, by AAPG and Institut Francais du Petrole. (AAPG, Box 979, Tulsa, Okla. 74101. Phone: 918/584-2555). Call for Papers deadline: Nov. 15.

**September 10-14**

**GEOHAZARDS AND ENGINEERING GEOLOGY**, ann. conf., Coventry, England, by the Engineering Group of the Geological Society. (Steve Penn, Coventry University, School of the Built Environment, Priory St., Coventry, CV1 5FB). Abstracts due Nov. 30.

**September 10-20**

**KARST WATER AND ENVIRONMENTAL IMPACTS** (5th International Symposium), Antalya, Turkey. (G. Günay, Karst '95, P.O. Box 357, Kizilay, 06420 Ankara, Turkey. Phone: 90 41312 235 2543; Telefax: 90 41312 235 2862)

**September 18-20**

**REMOTE SENSING FOR MARINE AND COASTAL ENVIRONMENTS**, Seattle, by Environmental Research Institute of Michigan, and others. (Robert H. Rogers, ERIM, Box 134001, Ann Arbor, Mich., 48113-4001. Phone: 313/994-1200, ext. 3453; Fax: 313/994-5123)

**September 18-23**

**FROM RIFTING TO DRIFTING IN PRESENT-DAY AND FOSSIL OCEAN BASINS** (International Ophiolite Symposium). Pavia, Italy. (Dr. R. Tribuzio, Dipartimento di Scienze della Terra, Universita di Pavia, via Abbiategrosso, 209, 1-27100 Pavia, Italy. Phone: 382 505874; Telefax: 382 505890)

**September 29-October 2**

**PALEOBIOLOGY AND EVOLUTION OF THE BIVALVIA** (5th Canadian Paleontology Conference and International Symposium — Joint Meeting), Drumheller, Alberta, Canada. (Paul A. Johnston, CPC-V, Royal Tyrrel Museum of Paleontology, P.O. Box 7500, Drumheller, Alberta T0J 9Y0. Phone: 403 823 7707; Telefax: 403 823 7131)

**October 9-13**

**GEOLOGY FOR DEVELOPMENT WITHIN A SUSTAINABLE ENVIRONMENT** (10th Conference of the Geological Society of Africa), Nairobi, Kenya. (Secretary GSA 95 Organising Committee, P.O. Box 60199, Nairobi)

**October 10-14**

**AMERICAN ASSOCIATION OF STRATIGRAPHIC PALYNOLOGISTS** (28th Annual Meeting), Ottawa, Canada. (Ms Susan A. Jarzen, Canadian Museum of Nature, P.O. Box 3443, Station D, Ottawa, Ontario, Canada K1P 6P4. Telefax: 613 954 4724)

**October 10-14**

**PALEOCEANOGRAPHY** (International Meeting) Halifax, Nova Scotia. (Larry Mayer, Ocean Mapping Group, Dept. of Surveying and Engineering, Box 4400, Fredericton, New Brunswick, Canada E3B 5A3)

**October 16-20**

*LAND SUBSIDENCE — FISOL '95* (1st International Symposium), La Haye, The Netherlands. (F.H. Schröder, Netherlands Geodetic Commission, P.O. Box 5030, NL-2600 GA Delft, The Netherlands)

**October 17-19**

*SEISMIC ZONATION* (5th International Conference), Nice, France. (5th ICZS, AFPS Domaine de Saint-Paul, BP 1, 78470 Saint Remy Les Chevreuse, France. Telefax: (33-1) 30 52 75 75)

**October 22-25**

*AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS* (International Conference and Exhibition), Cairo, Egypt. (AAPG Convention Department, P.O. Box 979, Tulsa, OK 74101, USA. Phone: (918) 584-2555)

**November 4-6**

*GEOLOGY OF SOUTHEAST ASIA AND ADJACENT AREAS*, Joint Meeting of IGCP Projects 306, 321 & 359, Hanoi, Vietnam. (Prof. Dang Vu Khuc, Geological Museum, 6 Pham Ngu Lao, Hanoi, Vietnam. Phone: 84.4.266.802, Fax: 84.4.254.734)

**November 5-9**

*SOCIETY OF EXPLORATION GEOPHYSICISTS* (Annual Conference), Denver, Colorado, USA. (Society of Exploration Geophysicists. Convention Assistant, P.O. Box 702740, Tulsa, OK 74170, USA)

**November 6-10**

*CURVED OROGENIC BELTS: THEIR NATURE AND SIGNIFICANCE*, Buenos Aires, Argentina. (Dr. Jose Selles-Martinez, COB '95, Dpto. de Ciencias Geologicas, Pabellon 2 Ciudad Universitaria, 1428 Buenos Aires, Argentina. Phone: 54 1 781 8213; Telefax: 54 1 788 3439; E-mail: postmast@lpgfcf.uba.ar)

**November 7-11**

*RIVER SEDIMENTATION* (6th International Symposium), New Delhi, India, (Shri C.V.J. Varma, Central Board of Irrigation and Power, Malch Marg, Chanakyapuri, New Delhi 110021, India. Phone: 91 11301 5984; Telefax: 91 11301 6347; Telex: 31 66415 CBIP IN)

**November 19-22**

*PACRIM* (Congress), Auckland, New Zealand. (Mrs. Charmayne Perera, Congress Secretariat, Australasian Institute of Mining and

Metallurgy, P.O. Box 122, Parkville, Vic 3052, Australia. Phone: (03) 347-3166; Telefax: (03) 347-8525; E-mail: j.mauk@auckland.ac.nz)

**December 9-11**

*QUATERNARY DESERTS AND CLIMATIC CHANGE* (JIGCP 349 Meeting), Al Ain, United Arab Emirates. (A.S. Alsharhan, Desert and Marine Resource Center, UAE University, P.O. Box 17777, Al ain United Arab Emirates. Phone: 971 3 638 150; Telefax: 971 3 620486)

**1996**

*CANADIAN INSTITUTE OF MINING, METALLURGY AND PETROLEUM*, (98th Annual General Meeting), Quebec City, Quebec, Canada. (John Gaydos, Meetings Manager, Canadian Institute of Mining and Metallurgy, 1 Place Alexis Nihon, 1210-3400 de maisonneuve Boulevard West, Montreal, Quebec H3S 3B8, Canada. Phone: (514) 939-2710; Telefax: (514) 939-2714)

*GEOSTATISTICS* (5th International Congress). Wollongong, New South Wales, Australia. (Géostatistique de li École des Mines de Paris, 35 rue Saint Honoré, 77305 Fontainebleau, France. Phone: (1) 64 69 47 04; Telefax: (1) 64 69 47 05)

**February 19-23**

*GEOSCIENCE IN THE COMMUNITY* (13th Australian Geological Convention and Celebration of the Jubilee of BMR/AGSO), Canberra, Australia. (ACTS, GPO Box 220, Canberra ACT, 2601 Australia)

**March 8-15**

*GEOLOGICAL SURVEYS AND SUSTAINABLE DEVELOPMENT* (Conference to mark the Centennial of the Geological Survey of Egypt), Cairo, Egypt. (M. El. Hinnawi, Geological Survey of Egypt, 3 Salah Salem Road, Abbassiya, Cairo, Egypt. Telefax: 002 02 820 128)

**April 24-27**

*NATURAL HAZARDS, LAND-USE PLANNING AND THE ENVIRONMENT* (6th Spanish Congress and International Conference), Granada, Spain. (Clemente Iligaray Fernández, Departamento de Ingenieria Civil, Facultad de Ciencias,

Universidad de Granada, Campus Fuentenueva,  
18071 Granada, Spain. Phone/Telefax: 34 58  
243 367; E-mail: jchacon@ugr.es)

#### May 19-22

*AMERICAN ASSOCIATION OF PETROLEUM  
GEOLOGISTS* (Annual Conference), San Diego,  
California, USA. (AAPG Convention  
Department, P.O. Box 979, Tulsa, OK 74101,  
USA. Phone: (918) 584-2555)

#### May 27-29

*GEOLOGICAL ASSOCIATION OF CANADA  
and MINERALOGICAL ASSOCIATION OF  
CANADA* (Joint Annual Meeting), Winnipeg,  
Manitoba, Canada. (G.S. Clark, Department of  
Geological Sciences, University of Manitoba,  
Winnipeg, Manitoba, Canada R3T 2N2. Phone:  
(204) 474-8857; (204) 261-7581)

#### June 3-7

*EUROPEAN ASSOCIATION OF  
EXPLORATION GEOPHYSICISTS and  
EUROPEAN ASSOCIATION OF  
PETROLEUM GEOLOGISTS* (EAEG 58th  
Annual Assembly and EAPG 8th Annual  
Congress), Amsterdam, Netherlands. (EAPG,  
Attention of Mr. E. van der Gaag, P.O. Box 298,  
NL-3700 AG, Zeist, Netherlands)

#### June 9-12

*NORTH AMERICAN PALEONTOLOGICAL  
CONVENTION* (6th). Washington, DC, USA.  
(NAPC-VI, c/o Department of Paleobiology, Mail  
Stop 121, National Museum of Natural History,  
Washington, DC, 20560, USA)

#### June 17-21

*INTERNATIONAL SYMPOSIUM ON  
LANDSLIDES* (7th), Trondheim, Norway.  
(Norwegian Geotechnical Society, P.O. Box 40,  
Taasen N-0801, Oslo, Norway)

#### June 22-29

*INTERNATIONAL PALYNOLOGICAL  
CONGRESS* (9th), Houston, Texas. (Dr. Vaughn  
M. Bryant, Department of Anthropology, Texas  
A & M University, College Station, TX 77843,  
USA. Phone: 409 845 5242; Telefax: 409 845  
4070; E-mail: glwrenn@lsuvm.sncc.lsu.edu)

#### August 4-14

*30TH INTERNATIONAL GEOLOGICAL  
CONGRESS* (30th), Beijing, China. (Prof. Zhao  
Xun, Deputy Secretary General, 30th IGC, P.O.  
Box 823, Beijing 100037, P.R. China. Phone: 86

1 8327772; Telefax: 86 1 8328928)

#### October 28-31

*GEOLOGICAL SOCIETY OF AMERICA*  
(Annual Meeting), Denver, Colorado, USA.  
(Jean Kinney, GSA Headquarters, Box 9140,  
3300 Penrose Place, Boulder, CO 80301, USA.  
Phone: 303/447-2020. Fax: 303/447-1133)

### 1997

*ASSOCIATION OF EUROPEAN  
GEOLOGICAL SOCIETIES* (10th Meeting),  
Karlovy Vary, Czechoslovakia. (Geological  
Society, Burlington House, Piccadilly, London  
W1V 0JU, UK. Phone: +44 (0) 71 -434 9944)

*CANADIAN INSTITUTE OF MINING,  
METALLURGY AND PETROLEUM* (99th  
annual general meeting), Vancouver, British  
Columbia, Canada. (John Gaydos, Meetings  
Manager, Canadian Institute of Mining and  
Metallurgy, 1 Place Alexis Nihon, 1210-3400 de  
Maisonneuve Boulevard West, Montreal,  
Quebec H3Z 3B8, Canada. Phone: (514) 939-  
2710; Telefax: (514) 939-2714)

### 1998

*CANADIAN INSTITUTE OF MINING,  
METALLURGY AND PETROLEUM* (100th  
annual general meeting), Quebec, Canada.  
(John Gaydos, Meetings Manager, Canadian  
Institute of Mining and Metallurgy, 1 Place  
Alexis Nihon, 1210-3400 de Maisonneuve  
Boulevard West, Montreal, Quebec H3Z 3B8,  
Canada. Phone: (514) 939-2710; Telefax: (514)  
939-2714)

*10TH IAGOD SYMPOSIUM*, Australia.  
(Professor I.R. Plimer University of Melbourne,  
Parkville, VIC 3052, Australia. Phone: 613  
3446520; Telefax: 613 3447761)

#### August 9-15

*INTERNATIONAL MINERALOGICAL  
ASSOCIATION: IMA '98* (17th General  
Meeting) Toronto, Canada. (Professor A.J.  
Naldrett, Department of Geology, University of  
Toronto, Canada M5S 3B1. Phone: (461) 978  
3030; Telefax: (416) 978 3938; E-mail:  
ima98@quartz.geology.utoronto.ca)



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**Annotated bibliography of the geology of the  
South China Sea and adjacent parts of Borneo**

Emphasis on publications relevant to Petroleum Geology

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Edited by  
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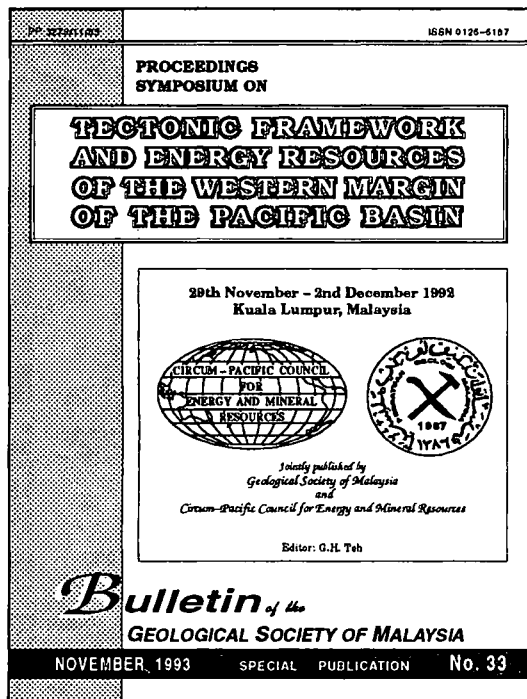
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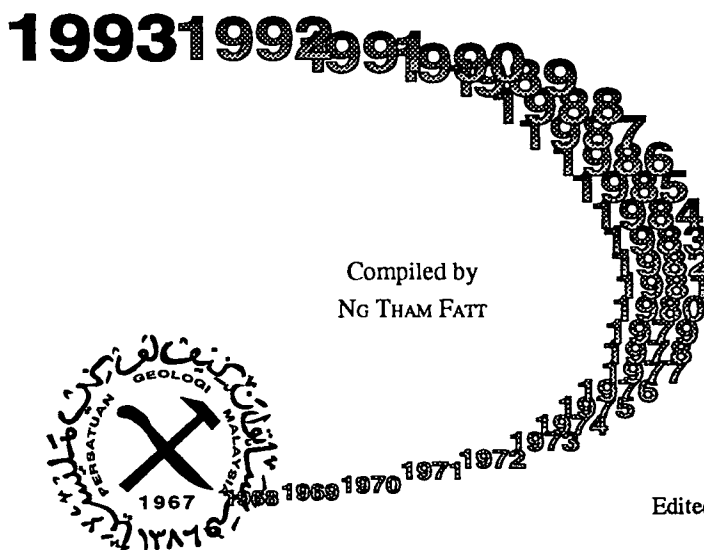
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