

## PERSATUAN GEOLOGI MALAYSIA

# WARTA GEOLOGI

## NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MALAYSIA



GEOLOGICAL  
SOCIETY OF  
MALAYSIA

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# PERSATUAN GEOLOGI MALAYSIA

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### About the Society

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

### Diaspore-corundum rock: a new member of the tourmaline-corundum rock diaspora from the New Lahat Mine, Lahat, Kinta Valley, Perak

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**Abstract:** A pebble of diaspore-corundum rock occurs in the Pleistocene Old Alluvium at the New Lahat Mine together with tourmaline-corundum pebbles. The corundum occurs in alternate fine and coarse bands co-existing with diaspore which also occurs in late veinlets. It is interpreted that the diaspore-corundum rock developed as a result of metamorphism associated with the emplacement of granite at the Kledang Range nearby. The co-existing corundum and diaspore allow a determination of the pressure of metamorphism to be made and it is suggested from geological and mineralogical considerations that the temperature of metamorphism could be approximately 400°C giving a pressure of about 2–3 kb. At 2–3 kb the depth of emplacement of the Kledang Range granite would be about 6–9 km and this is consistent with the reported occurrence of low pressure chiastolite and andalusite in pelitic rocks in the area.

#### INTRODUCTION

Scrivenor (1931) and in several of his papers published before this date (references given in his 1931 publication) attempted to present the tourmaline-corundum rocks occurring on the western part of the Kinta Valley, Perak as the main member of a suite of corundum-bearing or tourmaline-bearing rocks which may have somewhat similar evolution with each of the type as variant. Amongst the suite of rocks are reported corundum-white mica (with wide axial angle), and corundum-margarite rocks with possible diaspore and gibbsite and several other varieties.

In this short note I shall report the occurrence of a diaspore-corundum rock occurring as a pebble, specimen K11, in the Pleistocene Old Alluvium exposed in the New Lahat Mine, Lahat (GR 640838). This pebble occurs together with the more abundant clasts

of sizes from pebble to boulder of tourmaline-corundum rock in the Old Alluvium at the mine. They probably occur together in close proximity and association at the source area which could be nearby considering the high specific gravity of the corundum-bearing rocks.

Small as the pebble may be, the rock has a mineralogical content and texture of significance far beyond its size. The chemistry of the diaspore occurring will be presented and the implications of the assemblage interpreted. Although not mentioned I believe the effort of Scrivenor to record as much as possible the diaspora of corundum-bearing rocks and their associates is aimed toward a better overall understanding of the development of the tourmaline-corundum rock. So a detail study and conclusive identification of the minerals occurring in one of the variants such as in this study will contribute toward Scrivenor's intention.

**Table 1.** X-ray diffraction data of diaspore-corundum rock, K11 from the New Lahat Mine, Lahat. Column 1: d-spacing for diaspore, JCPDS. Only more intense reflections listed. Column 2: d-spacing of diaspore from K11. Column 3: d-spacing for corundum, JCPDS. Only more intense reflections listed. Column 4: d-spacing of corundum from K11.

1 (°Å)	2 (°Å)	3 (°Å)	4 (°Å)
4.71	4.75	3.48	3.50
3.99	4.03	2.55	2.56
3.21	3.23	2.38	2.39
2.56	2.56	2.09	2.09
2.32	2.33	1.74	1.74
2.13	2.14	1.60	1.61
2.08	2.09	1.40	1.41
1.71	1.71	1.37	1.37
1.63	1.64	1.24	1.24
1.61	1.61		
1.48	1.48		

## PETROGRAPHY

The pebble is greyish white and in section it can be seen to be composed of bands of fine corundum alternating with bands of coarser corundum grains. The coarser bands appear to show a faint schistose fabric at a high angle to the fine bands. Diaspore occurs as late veinlets and also as coarser grains individually or as clusters in both fine and coarse bands of the corundum. In addition to these two main minerals are calcite and fluorite, both confirmed optically and under the microprobe. Some calcite grains have scalloped 'eaten' edges and appear to be early or relict. The calcite is concentrated within the fine corundum bands and at the contact between the coarse and fine bands of corundum. Fluorite occurs as late grains and only very minor amounts are present.

X-ray diffraction data which confirmed the identification of the diaspore and corundum are shown in Table 1. Table 2 shows the chemical composition of the diaspore determined by microprobe. The compositions of the diaspore from the late vein, larger discrete grains and as inclusion in late fluorite are all similar except that the diaspore within the late fluorite has a very slightly higher CaO content. They are essentially very pure.

**Table 2.** Microprobe analysis of diaspore in diaspore-corundum rock, K11 from the New Lahat Mine, Lahat. K11.1.3, diaspore inclusion in late fluorite. K11.2.2, larger discrete diaspore grain. K11.3.1, diaspore in veinlet cutting corundum masses.

	K11.1.3	K11.2.2	K11.3.1
SiO <sub>2</sub>	0.00	0.04	0.02
Al <sub>2</sub> O <sub>3</sub>	87.72	87.91	87.33
FeO	0.01	0.04	0.00
MgO	0.02	0.00	0.17
MnO	0.04	0.00	0.00
Na <sub>2</sub> O	0.01	0.03	0.00
K <sub>2</sub> O	0.00	0.00	0.00
CaO	0.14	0.00	0.03
TiO <sub>2</sub>	0.03	0.05	0.02
Total	87.97	88.07	87.57

## DISCUSSION

### Texture and Origin

Opinions for the origin of the tourmaline-corundum rock fall into two groups. The larger body of opinion had placed emphasis on the texture of the tourmaline-corundum rock with ovoid or spherical bodies of corundum suggesting similarity to pisolitic or oolitic textures. So such sediments are suggested to be possible parental material and the high alumina content could well indicate bauxite (Scrivenor, 1910, 1913, 1931; Scrivenor and Jones, 1919; Hutchison, 1973; Senathi Rajah, 1979). The minority opinion is represented by Willbourn (1931) who placed more emphasis on the field occurrence of close association of the rock with pelitic schists and phyllites and suggested a source from the pelitic rocks with the so-called relict pisolitic texture to be no more than a form of spotted development in metamorphic rocks, that is, porphyroblastic. The authors of the classic on the geology of the Kinta Valley, Ingham and Bradford (1960) prefer to keep a neutral stance until more data become available. Unfortunately, little or no new data have become available since then.

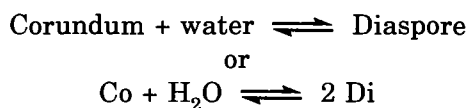
If the pale diaspore-corundum rock described in this note belongs to the same suite of rocks as the dark tourmaline-corundum rocks

as it seems certain to be, then obviously the occurrence of the corundum in bands and not as ovoid or spherical bodies as in its darker cousins is noteworthy. A source from oolitic or pisolitic parental material is not necessary. Indeed (a) the banded occurrence of the corundum, (b) the occurrence of faint schistosity, probably inherited from the original rock, in the coarser corundum bands and (c) the occurrence of calcite preferentially concentrated at the contact of the coarse and fine corundum bands reminiscent of the structures at the contact between the tourmaline-corundum rock and marble described in Khoo (2002) would together support an origin from a pelitic parent.

### Co-existence of corundum and diaspore

Other than the diaspore forming veinlets which are evidently late and related to the cooling of the rock after metamorphism, the larger diaspore grains as individuals in the corundum matrix or accumulated as clusters

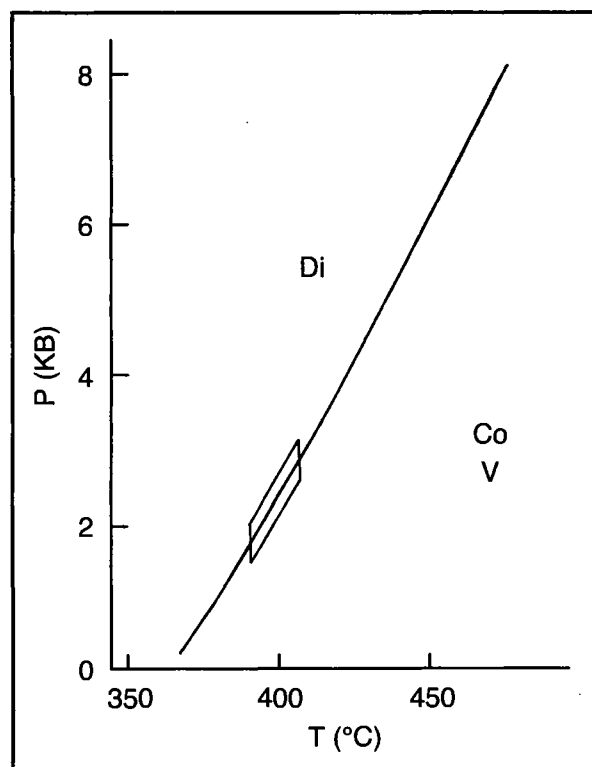
appear to be early and co-existing with the corundum in equilibrium. Therefore, the assemblage of corundum and diaspore appears to be univariant which can be represented by the reaction



The reaction has been studied by Perkins *et al.* (1979) and reproduced in Figure 1. From Figure 1 there is a possibility of obtaining the pressure if the temperature of the reaction is known.

The temperature for the development of the corundum-diaspore assemblage can be approximated by several considerations. In the Lahat and adjacent areas the bedrock is represented by marble and pelitics such as schists and phyllites intruded by Mesozoic tin granites forming the Kledang Range on the west. The foliated rocks and marbles are believed by Khoo (1993) to be Lower Palaeozoic rocks regionally metamorphosed to a low grade during an orogenic event near the Silurian-Devonian transition period. Later contact metamorphism by the granite gave rise to minerals of higher temperatures and coarsening of the existing foliated rocks.

The New Lahat Mine is about 1 km or less from the Kledang Range granite to the west and the rocks at the mine and closer to the granite are schists, phyllites and marble. In particular, the impure marble in the mine is schistose with the development of tremolite as a result of contact metamorphism by the adjacent granite which without doubt provided the boron for the development of the tourmaline-corundum rocks. Also the contact metamorphic temperature evidently had not been high enough to recrystallize the foliated rocks to hornfelses other than to coarsen the schistose texture and the development of biotite. As the diaspore-corundum pebble is unlikely to be transported from a distance and most likely from a nearby source it is possible that the rock is formed at a rather low temperature, maybe approximately 400°C. If this is near the mark then from Figure 1 the Kledang Range granite could well be emplaced at a high level under about 2–3 kb pressure which can be translated to 6–9 km



**Figure 1.** The reaction, 2 Diaspore = Corundum + Vapour from Perkins *et al.* (1979). The range within the boxed area is the possible temperature for the development of the corundum-diaspore assemblage in K11 from the New Lahat Mine, Lahat.

depth of emplacement. This will be consistent with the reports of occurrence of low pressure minerals such as chiastolite and andalusite in the schists and phyllites by Ingham and Bradford (1960).

#### ACKNOWLEDGEMENTS

All laboratory studies were made in the Department of Applied Geology, University of New South Wales in collaboration with Prof. Bas Hensen whilst a Visiting Fellow there in 1995 and I am grateful for all the assistance and guidance extended to me. I would also like to thank the Department of Geology, University of Malaya and its staff for cooperation and facilities in the preparation of this note.

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# CATATAN GEOLOGI

## Geological Notes

### Oil staining in the onshore Togopi Formation, Dent Peninsula, NE Sabah Basin

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**Abstract:** This note reports on the extensive occurrence of an oil stain in a remote outcrop of Togopi Formation, Dent Peninsula, Northeast Sabah Basin. This is a preliminary description of the Togopi limestone outcrop and the organic geochemical characteristics of the samples analysed. It is hoped that this note provides some evidence for the existence of hydrocarbon charge in this under explored region.

#### INTRODUCTION

The Togopi Formation consists primarily of carbonate rocks. The carbonates of the Togopi Formation are regarded as a secondary reservoir objective (Leong and Azlina Anuar, 1999). Several gas seepages have been reported within the onshore area of Dent Peninsula (Fig. 21.6 of Leong, 1999). With the exception of unconfirmed reports mentioned in Haile and Wong (1965), there are no known occurrences of oil seeps in the area. Exploration activity has focused on the offshore areas of the Sandakan Sub-basin and the Labuk Bay area, with the remainder of the area being practically unexplored (Leong and Azlina Anuar, 1999). It was therefore intriguing to fortuitously encounter dark staining in a white to brownish yellow Togopi limestone during fieldwork in the Dent Peninsula, eastern Sabah.

#### GEOLOGICAL BACKGROUND

The Togopi Formation of the Dent Peninsula, Sabah is Pliocene to Pleistocene in age as suggested by shallow marine fossil assemblages of foraminifera and molluscs (Haile and Wong, 1965). The formation lies

unconformably on the Ganduman Formation. These formations, together with the Sebahat Formation, which conformably underlie the Ganduman Formation, make up the Dent Group (Upper Miocene-Pleistocene) of the onshore and offshore NE Sabah Basin.

The Togopi Formation, as originally described by Haile and Wong (1965) and by later workers (e.g. Woo, 1994 and Noad, 1998), consists predominantly of rubbly and loosely to well cemented limestone with occasional calcareous sandstone, marl and clay, that are generally poorly bedded. Although a variety of carbonates, often rich in coral assemblages, are present, no large carbonate build ups occur (Ismail Che Mat Zin, 1994).

#### RESULTS AND DISCUSSION

A characteristic feature of these limestones is very high porosity (Fig. 1) but further work needs to be carried out to determine the diagenetic history of these limestones and the origin and type(s) of porosity present.

The most striking feature of the locality described here is shown in Figure 2 in which layers of dark staining occur in the Togopi



Formation limestone. Samples collected were extracted using Soxhlet apparatus in order to collect any free hydrocarbons from the samples. This was followed by liquid chromatography analysis and gas chromatography-mass spectrometry analysis (GC-MS). The fingerprint of the hydrocarbons extracted from the dark-stained limestone is shown in Figure 3 and

revealing an obvious bimodal distribution. The front portion of the trace displays characteristics suggestive of a marine facies, such as low Pr/Ph ratio and moderate Pr/nC<sub>17</sub> ratio. This part of the fingerprint is thought to represent indigenous bitumen of the host carbonate. In contrast, the back half of the fingerprint in Figure 3 is quite waxy, with a clear odd over



**Figure 1.** Porous and loosely cemented limestone with oil stains (dark patches) and coral fragments (centre right).



**Figure 2.** Layers of dark staining can be distinctly observed in the white to brownish yellow limestone of Togopi Formation.



even preference in carbon number — characteristics that are typical of a higher plant input. Such features are unusual for a limestone extract and are not consistent with the front half of the trace. These back portion hydrocarbons are therefore likely to be non-indigenous to the limestone, representing migrant hydrocarbons of some sort, a residual oil perhaps.

Considering that the Togopi Formation is immature, as it occurs at a very shallow depth (Ismail Che Mat Zin, 1994), it could not itself have generated this particular oil, which appears to be quite mature as suggested by biomarker data — triterpane ( $m/z$  191) showing an isomerization ratio for  $C_{31}$  hopane S:R of 60:40 implying that it has reached equilibrium stage (chromatogram not shown).

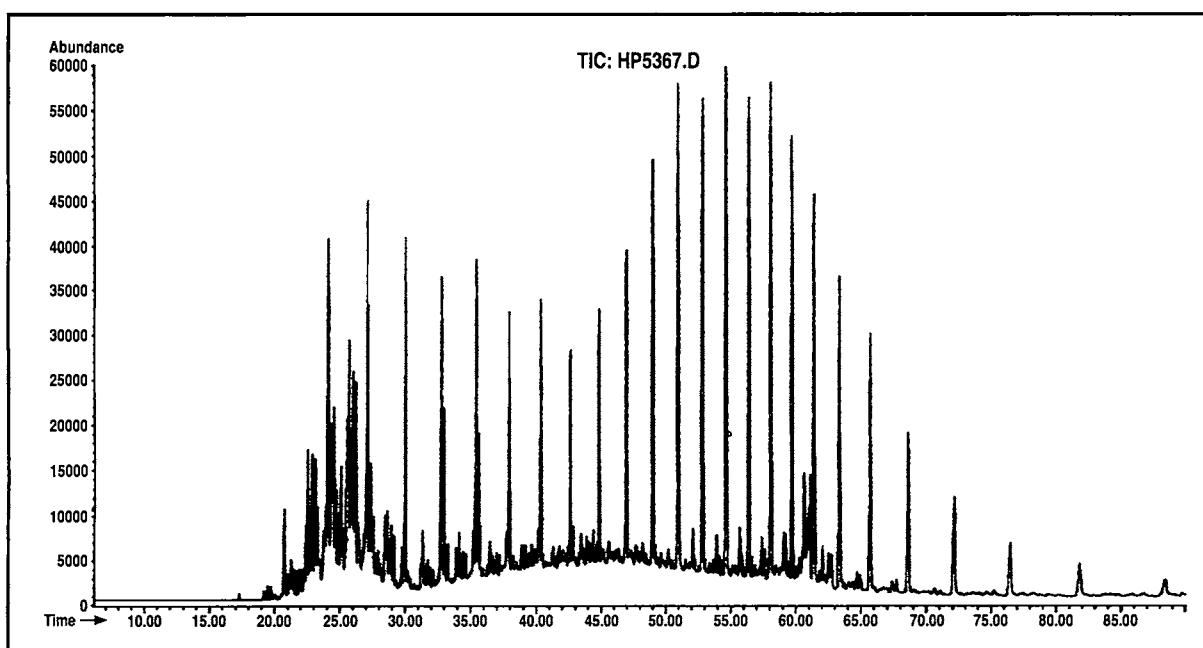
It is important to confirm that this hydrocarbon stain is naturally occurring. Field relations show the black staining to be laterally quite extensive, occurring in distinct bands. Furthermore, the staining occurs many meters below the ground surface. These features are not particularly indicative of contamination.

If the stain is a true migrated hydrocarbon, the bulk of the oil would be predominantly represented by the waxy part of the fingerprint

in Figure 3 (higher molecular weight n-alkane domination), thus suggesting a terrestrially-derived organic matter for the source of the oil. Terrigenous organic matter is a common source for oils of the offshore NE Sabah Basin (Leong and Azlina Anuar, 1999). The lower n-alkane molecular weight components in the fingerprint would therefore represent the marine fingerprint of the host rock, presuming that the limestone contains phytoplanktonic and/or algal-derived organic matter.

### CONCLUDING REMARKS

Clearly there is more work to be done here as these current observations are based on a very brief visit to the site and the analysis of only a small number of samples. A more detailed field mapping, and further geochemical and petrological analyses need to be performed to fully understand the nature and origin of the residual oil in this limestone. If such work proves encouraging then a detailed study of the reservoir qualities of the limestone could be warranted. In the light of this localised onshore oil stain occurrence it is hoped the possibility of a hydrocarbon charge in this remote area is strengthened and therefore further work of the whole petroleum system would be justified.



**Figure 3.** Total ion current (TIC) chromatogram of the aliphatic fraction of the Togopi Formation.

**ACKNOWLEDGEMENTS**

Assistance received from individuals, in particular, Dr. Abdul Hadi Abd. Rahman in the field is much appreciated. This study is supported by University of Malaya research grant No. F0729/2002A.

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## PERTEMUAN PERSATUAN Meetings of the Society

### Laporan Majlis Ceramah Kerjaya Geosains dan Pameran “Peranan Bidang Geosains Dalam Pembangunan Negara” di MRSM Jasin, Melaka, pada 13 April 2002

#### Aturcara Majlis

- 08.30 : Pelajar dan guru mengambil tempat duduk
- 08.55 : Ketibaan tetamu kehormat
- 09.00 : Kata-kata Aluan Prof. Dr. Hamzah Mohamad  
Pengerusi Jawatankuasa Mempromosikan Bidang Geosains, mewakili Presiden Persatuan Geologi Malaysia
- 09.10 : Ucapan Y. Bhg. Dr. Fatanah Mohaamed, Pengetua MRSM Jasin dan Perasmian Majlis Ceramah Kerjaya dan Pameran Geosains Persatuan Geologi Malaysia
- 09.25 : Penyampaian poster dan cenderamata kepada guru-guru pengiring oleh Presiden Persatuan Geologi Malaysia
- 09.40 : Ceramah “Geosains dan Kerjaya” oleh Prof. Madya Dr. Abdul Ghani Rafek (Presiden Persatuan Geologi Malaysia/UKM)
- 10.30 : Jamuan Ringan
- 11.00 : Lawatan ke pameran “Peranan Bidang Geosains dalam Pembangunan Negara”
- 12.00 : Majlis Bersurai
- 15.00 : Pameran Tamat

#### Laporan

##### HURAIAN KEGIATAN

Majlis terbahagi kepada tiga bahagian, iaitu Majlis Perasmian, Ceramah Kerjaya dan Pameran Geosains.

Majlis Perasmian dihadiri oleh En. Mohamad Tajri Kamaruzzaman. Penolong Pengetua (Hal Ehwal Akademik) MRSM selaku wakil Pengetua, Prof. Madya Dr. Abdul Ghani Rafek, Presiden PGM; Tuan Haji Kasim Bahali, Guru Kanan Fizik MRSM; Puan Rohani Mohamad dan Prof. Dr. Hamzah Mohamad. Prof. Dr. Hamzah Mohamad telah berucap bagi pihak Presiden PGM dan En. Mohamad Tajri bagi pihak MRSM Jasin.



Ceramah Kerjaya bertajuk “Geosains dan Bidang Kerjaya” telah disampaikan oleh Prof. Madya Dr. Abdul Ghani Rafek, Presiden PGM, dalam bentuk persembahan *power-point*.

Pameran Geosains bertema “Peranan Bidang Geosains dalam Pembangunan Negara” disedia oleh enam pelajar Geologi UKM dan pengendalian pameran dibantu oleh tiga pelajar Geologi UM. Pameran ini mengandungi enam komponen, iaitu: (1) Geosains? Geologi?, (2) Kerjaya Geosaintis, (3) Bahan Geologi Asas Peradaban, (4) Unsur Estetik dalam Geosains, (5) Geosains dan Anda (pameran interaktif), dan (6) Jualan Cenderamata. Sebanyak 10 poster dan 120 bahan geologi telah dipamerkan. Pameran ini telah dirasmikan oleh En. Mohamad Tajli Kamaruzzaman.

Majlis menyampaikan cenderamata kepada guru-guru pengiring oleh Presiden PGM turut diadakan. Cenderamata berupa kalendar meja 2002 PGM (1) dan poster *Common Rocks of Malaysia* (2).

Dr. Ahman Tajuddin Ibrahim, Setiausaha Kehormat PGM menjadi pengacara majlis.

### KEHADIRAN

Seramai 700 orang menghadiri Majlis, terdiri daripada:

Pelajar MRSM Jasin	550
Guru MRSM Jasin	20
Guru pengiring sekolah selain MRSM Jasin	17
Pelajar dari 17 buah sekolah selain MRSM, Jasin	100
(1) SM Teknik Tuanku Jaafar, Aapangan, Negeri Sembilan	
(2) Kolej Tunku Kurshiah, Seremban, Negeri Sembilan	
(3) SM Teknik Muar, Johor	
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(17) SM Sri Tanjung, Melaka	
Pelajar geologi UKM dan UM	10
Pegawai PGM	3

Disediakan oleh  
Hamzah Mohamad

## Ceramah Teknik (Technical Talk)

### **Preliminary study on hazard zonation mapping in karst terrain**

JEONG HWAN KIM

### **The importance of geology in the urban development of Hong Kong**

C.J.N. FLETCHER

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

There was a good turnout for the above two talks on Tuesday 25th June 2002, held at the Geology Department, University of Malaya.

Prof. Jeong Hwan Kim is from the Seoul National University while Prof. Chris J.N. Fletcher is Director, Applied Geoscience Centre, University of Hong Kong.

### **Preliminary study on hazard zonation mapping in karst terrain**

JEONG HWAN KIM

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

Rock mass classification and its characterization are most important things to evaluate the ground conditions especially foundation design and tunnelling stages. In many cases, these works are carried out with the synthesis of surface geological, geophysical and drilling data, and proposed appropriate methods in these stages. However, in soluble rock masses such as carbonate rocks of limestone and dolomite, the processes described above are not adequate to predict the underground condition in some cases because the underground works of limestone terrain are mainly related to karstic features.

We present a hazard zonation mapping technique in karst terrain and its risk assessment from the detailed surface mapping in engineering point of view. Controlling factors of sink hole and cave formation are discussed and 4 main hazard factors affecting hazard potential are identified, which are prerequisite hazard factor of distributions of pre-existing sink holes and caves, geomorphological factors of slope gradient, vegetation and drainage patterns, geological hazard factors of lithology, geophysical survey data, fracture patterns, and geological structures, and hydraulic conditions of annual fluctuation of ground water table and composition of ground water.

We construct the hazard zonation map around the Jecheon-Maepo area, Korea and present the classification of karst terrain based on the hazard factors. The hazard and risk maps are constructed based on the decision tree model (fish bone model). The cross-sectional hazard and risk assessment are also performed at the specific tunnel-planning site. The rock quality is classified into 5 categories based on the engineering classification and suggest 5 different types of support measures to be applied in an appropriate manner to the different rock qualities with the comparison between RMR and the result of this study.

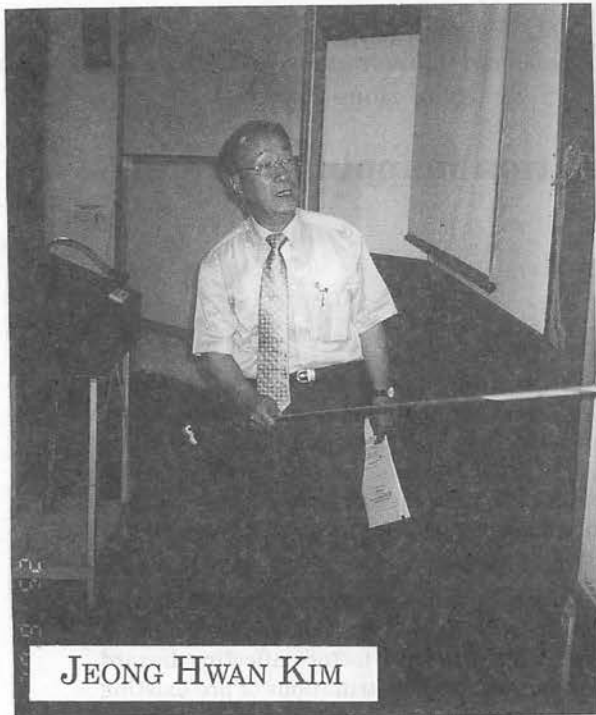
## The importance of geology in the urban development of Hong Kong

C.J.N. FLETCHER

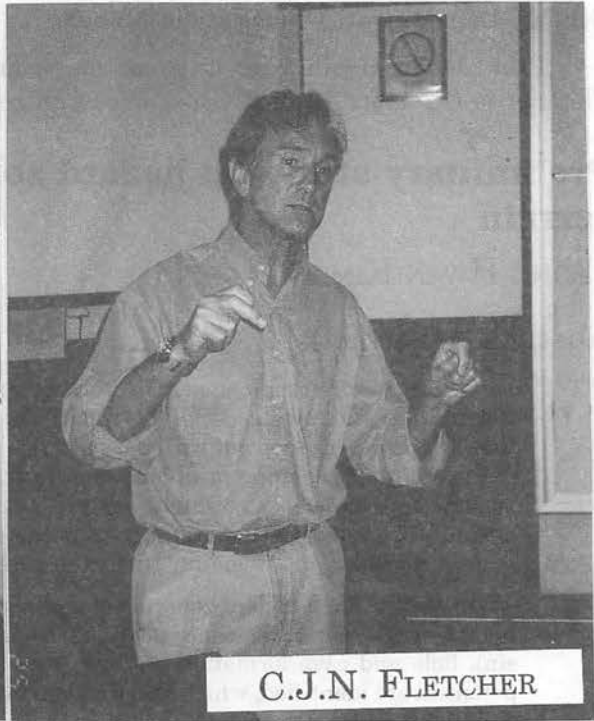
### Abstrak (Abstract)

Hong Kong is a rapidly expanding city of about 6.5 million people and over the last decade has undertaken several major infrastructure projects including: a new international airport, many major bridges, an extensive deep sewage disposal system, and numerous road and rail links. In addition, as the urban development has expanded onto reclamation areas and close to rugged mountains, foundation and slope design in tropically weathered material and natural terrain landslides have become important issues. The crucial role of the geological model in the urban development of Hong Kong is discussed with reference to these projects. The importance of geological databases is also emphasised, and examples of how visualisation techniques can assist in the understanding of complex datasets are presented.

GSM



JEONG HWAN KIM



C.J.N. FLETCHER



## Ceramah Teknik (Technical Talk)

### Issues hindering exploration and mineral development in Malaysia

TEOH LAY HOCK

#### Laporan (Report)

Mr. Teoh Lay Hock, Business Development Director, TOR Minerals (M) Sdn. Bhd., Ipoh, Perak, gave the above talk on Saturday 29th June 2002 at 10.00 am. The talk organised by the Minerals Committee of Institute Geology of Malaysia was in collaboration with the Economic Geology Working Group of the Geological Society of Malaysia.

There was a good round of questions and lively discussions after the very informative presentation.

#### Abstrak (Abstract)

Exploration and mineral development are important and beneficial to the state, country and society. There is great potential for the development of mineral resources in Malaysia but the level of investment into exploration and mineral development is far from satisfactory. This is because there are numerous issues relating to land, taxation, regulations, government support and perception of the mineral industry that are hindering investment.

The land issues can be redressed by giving priority to mineral extraction during land use planning, providing security of tenure and granting leases with periods that are long enough and sizes that are large enough for a reasonable return to be made. As an incentive for restoration and rehabilitation, miners should be allowed to convert part or all of their mined-out land for other approved forms of development. Taxes imposed should be equitable and, on the whole, better than those offered by other countries competing for mineral investment. Laws and regulations should be modernised and harmonised to make them competitive, transparent and easy to understand by potential investors. States should set up one stop centres to facilitate access to information and, easy and fast processing of applications. Mineral rights should be given only to companies which have the funds and technical capabilities, and are genuinely interested to undertake exploration and mineral development. Approving authorities should give a fair hearing to applicant's proposal for environmental protection before rejecting purely on environmental grounds. The government should look at avenues for raising local venture capital for mineral projects. A mineral industry development board should be set up immediately to spearhead the promotion of the industry.

G.H. Teh



GSM

## Ceramah Teknik (Technical Talk)

### The contribution of fossils to the creation — evolution debate

KURT WISE

#### Laporan (Report)

The talk by Dr. Kurt Wise, a creationist paleontologist from Bryan College in Dayton, Tennessee, was attended by a mixed crowd of our society's members and friends from the Department of Science and Technology, University of Malaya and the Graduates Christian Fellowship of Malaysia on 4 July 2002.

Dr. Wise tickled our minds with some alternative interpretations of the various sedimentary formations from the Grand Canyon from a creationist's/flood geologist's perspective in an attempt to build up a type section for what he and his colleagues envisage as deposits from Noah's flood. In the process, typical aeolian dunes of the Cocconino Sandstone, for example, were reinterpreted to be giant sandwaves caused by underwater redeposition of subaerial sands under very catastrophic conditions. A two meter thick deposit of nautiloid fossils in the Redwall Limestone was interpreted to be deposited from an avalanche deposit from 400 km upstream resulting in a nautiloid mass-kill. The Kwagut Stromatolites which lie unconformably beneath the Tapeats Sandstone marks the Pre-Flood/flood Boundary with the missing section in the Grand Canyon located in the East Mojave Desert where glacial diamictites of the Kingston Peak Formation has been reinterpreted to be gigantic clasts deposited by extremely high energy turbidites. Dinosaur bones, some oriented vertical to bedding, from the Lance Formation were interpreted to be catastrophically deposited in mudflows originating 800 km away.



They believe that the flood/post-flood boundary (likely to be the K-T boundary) is located outside of the Grand Canyon in the Hancu Ranch area where the Lance Formation of Uppermost Maastrichtian age is exposed. After the Flood, deposition was restricted to smaller isolated basins as evidenced by the localized Tertiary deposits compared to worldwide Palaeozoic-Mesozoic deposits.

Dr. Wise and his creationists colleagues are presently compiling a database of the world's geology in their Column Project to identify global patterns of the Flood. They will try to trace the paleontological discontinuity, time discontinuity, sedimentary discontinuity, tectonic discontinuity, erosional discontinuity found in the Grand Canyon type section to other places in the world.

C.P. Lee

## ***Report on*** **Seminar on Reflection on Geological Career**

This half day seminar, organized by the Young Geologists' Working Group of Geological Society of Malaysia and supported by the Institute of Geology Malaysia, was held on 13 July 2002 at Bangunan Geologi, Universiti Kebangsaan Malaysia. The purpose of this seminar was to gather and explain to geological students and fresh graduates on career opportunities based on their interests and capabilities: serve as a platform for sharing and exchanging ideas and experiences; and to introduce the Geological Society of Malaysia and Institute of Geology Malaysia and highlight their roles and functions.

This seminar was officiated by Prof. Dr. Basir Jasin, Head of Geology Programme, Pusat Sains Sumber dan Sekitaran, Fakulti Sains dan Teknologi, Universiti Kebangsaan Malaysia.

Some of the topics covered in this seminar and the presenters are as follows:

- Geological Career in the Petroleum Industry  
by Mohd Fauzi Kadir (*Petronas Research Scientific Services Sdn. Bhd.*)
- Geological Career in Engineering, Environmental and Groundwater  
by Abd Rasid Jaapar (*Soils & Foundations Sdn. Bhd.*)
- Geological Career in the Public Sector  
by Tuan Rusli Tuan Mohammad (*Mineral & Geosciences Department, Malaysia*)
- How to prepare yourself? Geology alone is not enough!!  
by Abd Rasid Jaapar (*Soils & Foundations Sdn. Bhd.*)
- Geological Career in Engineering, Environmental and Groundwater  
by Raja Abdul Halim (*ENSR Corporation Sdn. Bhd.*)

It was very sporting of Raja Abdul Halim to turn up for his presentation as he has just arrived back by air from Indonesia a few hours before the Seminar.

An active discussion session followed the presentations.

More than 100 participants were involved in this seminar and they were students from UKM and UM, graduates and lecturers.

The closing remarks by the President of Geological Society of Malaysia, Prof. Madya Dr. Abdul Ghani Rafek ended the seminar at 1.00 pm.

One important conclusion made from this seminar was that the geological students in local universities hunger for this type of event. The Young Geologists' Working Group is looking forward to organising this event annually and alternately between UM, UKM and UMS.

Abd Rasid Jaapar  
Chairman  
Young Geologists' Working Group  
Geological Society of Malaysia



## Ceramah Teknik (Technical Talk)

### Regional geological provinces of Brunei

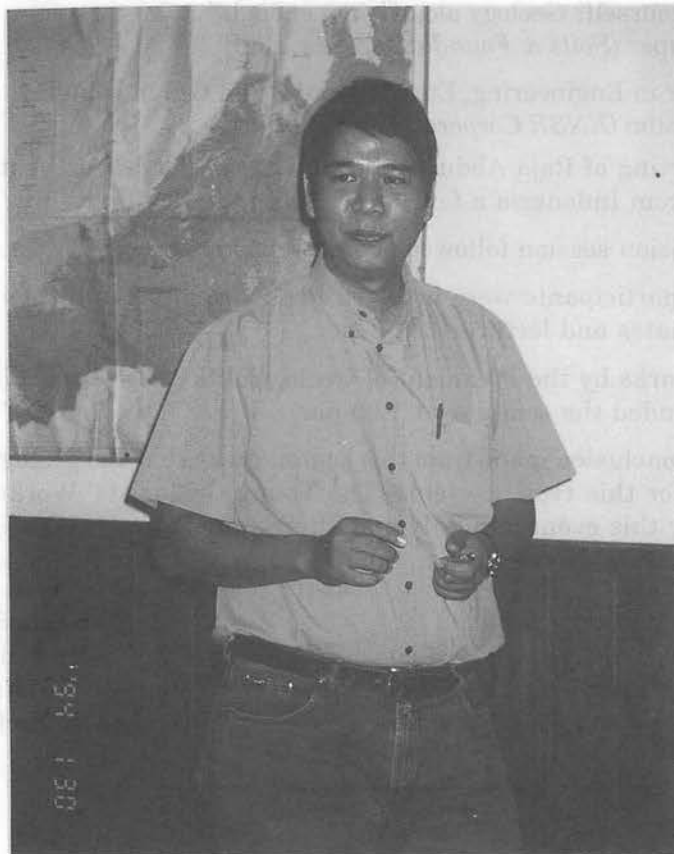
HERMAN H. DARMAN

#### Laporan (Report)

Herman from Brunei Shell Petroleum gave his talk on the Regional Geological Provinces of Brunei as AAPG Visiting Geologist to about 20 members of the Society at the Department of Geology, University of Malaya on 2.08.2002.

The northwest Borneo region is a very active area for petroleum exploitation because of the abundant accumulation of Tertiary sediments especially in the Baram Delta area. After reviewing the stratigraphy, seismics and structures of Brunei, he proceeded to compare the West Baram and East Baram (Champion) Provinces. Although these two provinces are similar in their stratigraphy, shoreface to deltaic depositional environments and petrography of quartzose sandstones, they differ in the presence of counter-regional faults in the Eastern Province where major fault dips are landward to the SE as opposed to basinward to the NW in the Western Province. The slopes are gentler in the Western Province and steeper in the Eastern Province. Sediment distribution is extensive laterally in the Western Province as it is more basinward compared to the Eastern Province where they are more stacked. Growth faults and shale diapirism feature prominently in the sediments in the area.

C.P. Lee



## Ceramah Teknik (Technical Talk)

### Coal resources of Malaysia

AZIMAH BTE ALI

#### Laporan (Report)

Puan Azimah's talk was held at the Geology Department Lecture Hall, University of Malaya on 10th August at 10.00am. A total of 41 participants made up of IGM, IMM, GSM members and students attended the talk entitled "Coal Resources of Malaysia". This talk was jointly organised by IGM, GSM and IMM. Puan Azimah gave a comprehensive talk touching on international and national use of coal, Malaysian reserves and quality as well as the prognosis on its use in Malaysia. The talk ended with a lively session of questions and comments from the floor.

P. Loganathan



## Ceramah Teknik (Technical Talk)

### Geological characteristics: their descriptions & engineering significance

NG CHAK NGOON

#### Laporan (Report)

Sdr. Ng delivered the above talk on 14 August 2002 to an audience of about 30 members.

Based mainly on his work experiences for the last 25 years or so, Sdr. Ng stressed the point of recording accurately, **relevant** geologic features in site investigation borelogs outcrops, etc. so that these information can be useful to the engineers. He also related some interesting incidences during his work with consulting companies. In addition to the factual reports based on actual borehole or other data, Sdr. Ng also encourages submitting interpretative reports either written or based on oral discussions, to enhance the contributions of geologists to engineers's works.

The presentation was completed in about 1/2 hour, leaving ample time for much discussions and comments from the floor.

Members of the audience were also presented with a handy "field description chart" for S.I. works, courtesy of Sdr. Ng. & Co. (These charts will be made available to all members at a low (RM5) "cost-price" only — please contact Anna for details.)

Tan Boon Kong  
Chairman

Working Group on Engineering Geology & Hydrogeology  
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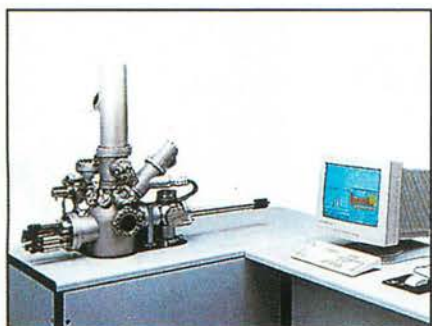
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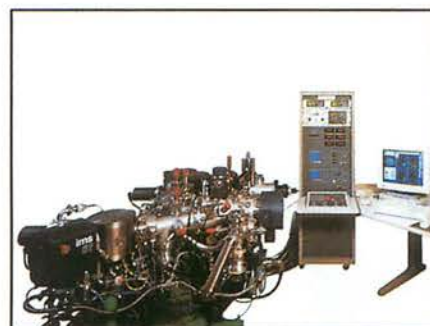
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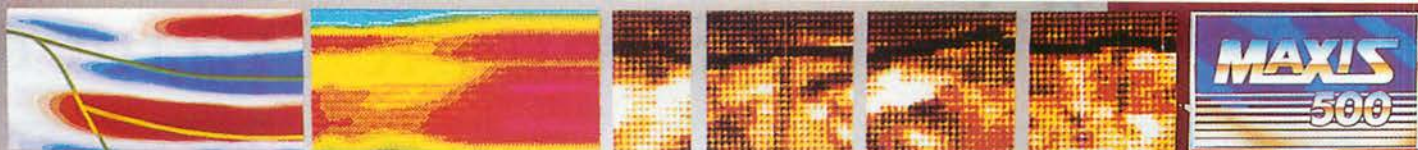
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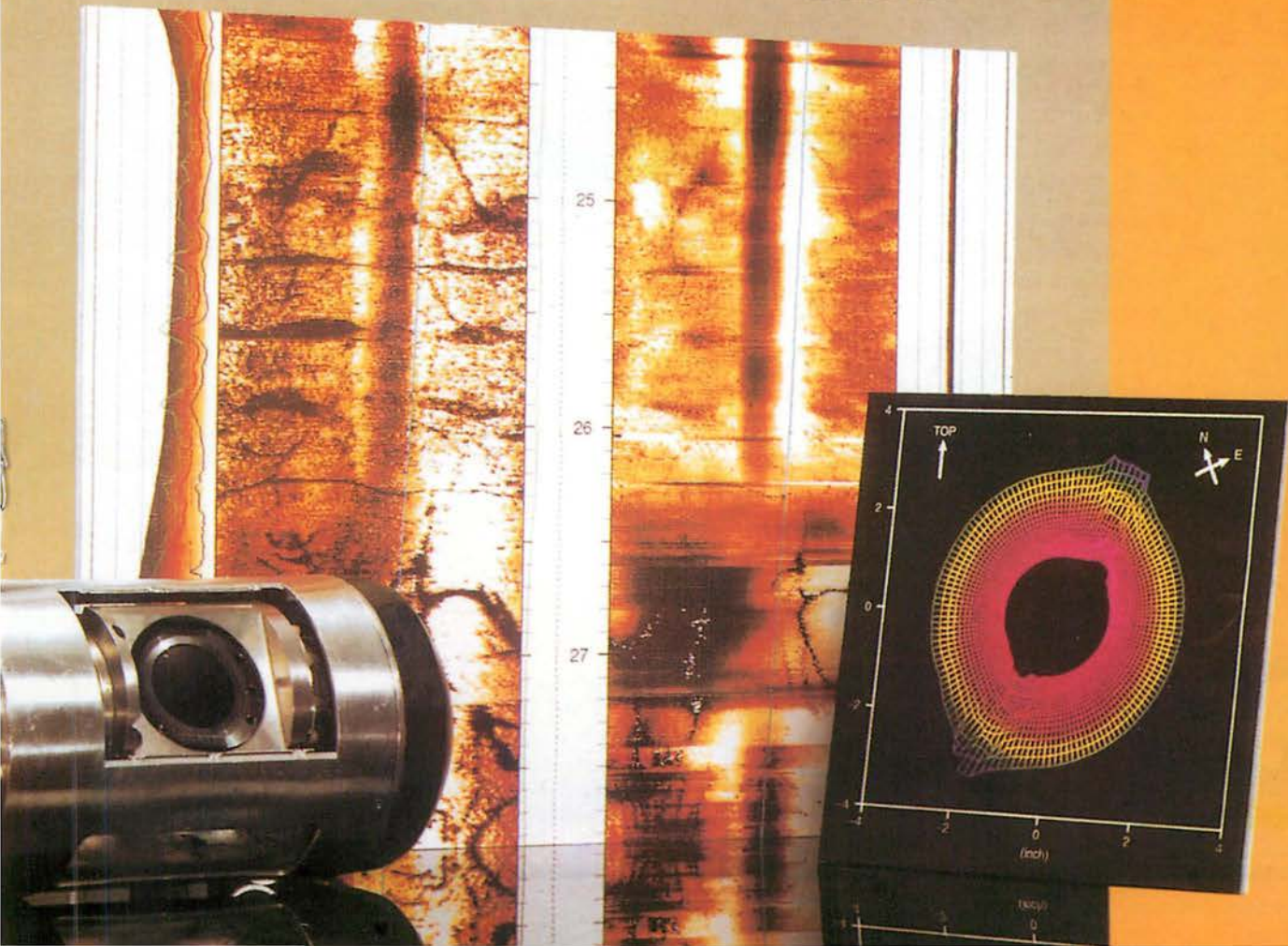
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## Public Lecture

### Doing science in a theistic universe

ROBERT C. NEWMAN

#### Laporan (Report)

Dr. Newman who is both a scientist (PhD in astrophysics from Cornell University) and a theologian, gave a very interesting talk to a mixed audience of geologists, other scientists and non-scientists on the topic "Doing Science in a Theistic Universe" at Dewan Kuliah 3, Fakulti Sains, Universiti Malaya on 16 August 2002. The talk was jointly hosted by the Geological Society and the Centre for Civilisation Dialogue University of Malaya and Graduates Christian Fellowship of Malaysia and was attended by about 40 people.

Newman started with a review of how Science is currently done (explaining nature without recourse to the supernatural) and addressed the crucial question of whether its conclusions would lead to convergence with reality since the differing worldviews of scientists do influence their approach to Science. An atheistic approach based on the belief that the cosmos is all there is will lead to the conclusion that everything is nature and there are no supernatural causes so they seek only natural causes for observed phenomena. Deists on the other hand believe that nature is not everything and there are supernatural causes to phenomena in addition to natural causes but they are limited in investigating the supernatural causes. They would let the character of the data influence their decision on the kind of causes for the phenomenon. They accept the providence of God where natural law regulates natural phenomena most of the time but do not rule out that supernatural intervention by God in the form of miracles from time to time. This leads them to invoke supernatural causation as a better inference in cases where natural causation seems insufficient.

Newman went on to give examples from cosmology, planetary astronomy, biology and anthropology to press his point that a theistic approach would lead to better convergence with reality than the reductionism of secular science. He concluded by urging us to be on the lookout for phenomena in our various disciplines that are resisting naturalistic explanations and check if a theistic explanation might fit the data better.



Lee Chai Peng

GSM



**Malam Geologis Muda VI**  
**Young Geologist Nite VI**  
**Wednesday, 21 August 2002**  
**Dept. of Geology**  
**University of Malaya**

**Laporan (Report)**

Although 4 speakers were scheduled for the event, only 1 (**ONE**) turned up! (One e-mailed 2 days before the event to say he was going for fieldwork; another called up 1 day before the event to say he was still “stucked” in the field; while the 3rd “no-show” maintained a complete silence mode throughout — whatever happened to the sense of commitment and responsibility?!?)

Fortunately, the sole speaker who turned up, Sdr. Dr. Wan Zuhairi Wan Yaacob of UKM, saved the day/night. He was given the extra time (resulting from the other missing speakers) to make his presentation, and he did utilised 40 minutes for presentation and another 20 minutes for question & answers.

Sdr. Dr. Wan gave some details on the leaching column test set-up, methods for selective sequential extractions of the various component species of heavy metals, and their applications in clay liner applications in sanitary landfills.

An abstract of his presentation is given below. the presentation represents only one part of Dr. Wan’s Ph.D. thesis completed recently in the University of Wales at Cardiff Wales. Undoubtedly, more presentations on other parts of his thesis would be forth-coming in the near future.

Tan Boon Kong  
 Chairman

Working Group on Engineering Geology & Hydrogeology  
 (28th August 2002)



## Partitioning of heavy metals in soil columns using selective sequential extractions

WAN ZUHAIRI WAN YAACOB

### Abstrak (Abstract)

Heavy metals that entered the soil columns after the leaching experiment were bound to different phases by various retention mechanisms. The quantity of heavy metals bound in these phases can be extracted selectively using selective sequential extraction technique (SSE). The technique involves different types of chemical reagents utilised to destroy the bonding between the heavy metals and various active soil components. There are five different groups of binding phases between the soil components and heavy metals, i.e. in association with an exchangeable phase; carbonate phase; amorphous oxides/hydroxides phase; organic phase and residual fractions.

The results from the SSE technique should be considered as operationally defined by the method of extraction. The results from the study show that the retention of heavy metals Pb, Cu and Zn was mainly associated with various processes, where the main process of retention in the leaching columns was precipitation with the carbonates. The second most important process was also a precipitation process involving the association of the heavy metals with amorphous materials (oxides/hydroxides). The third process was complexation (chelation) with organic matter. The fourth process was via adsorption into soil primary and secondary mineral lattice (residual fractions). And finally the fifth process was via exchangeable cations of heavy metals on negatively charged clay mineral surface.

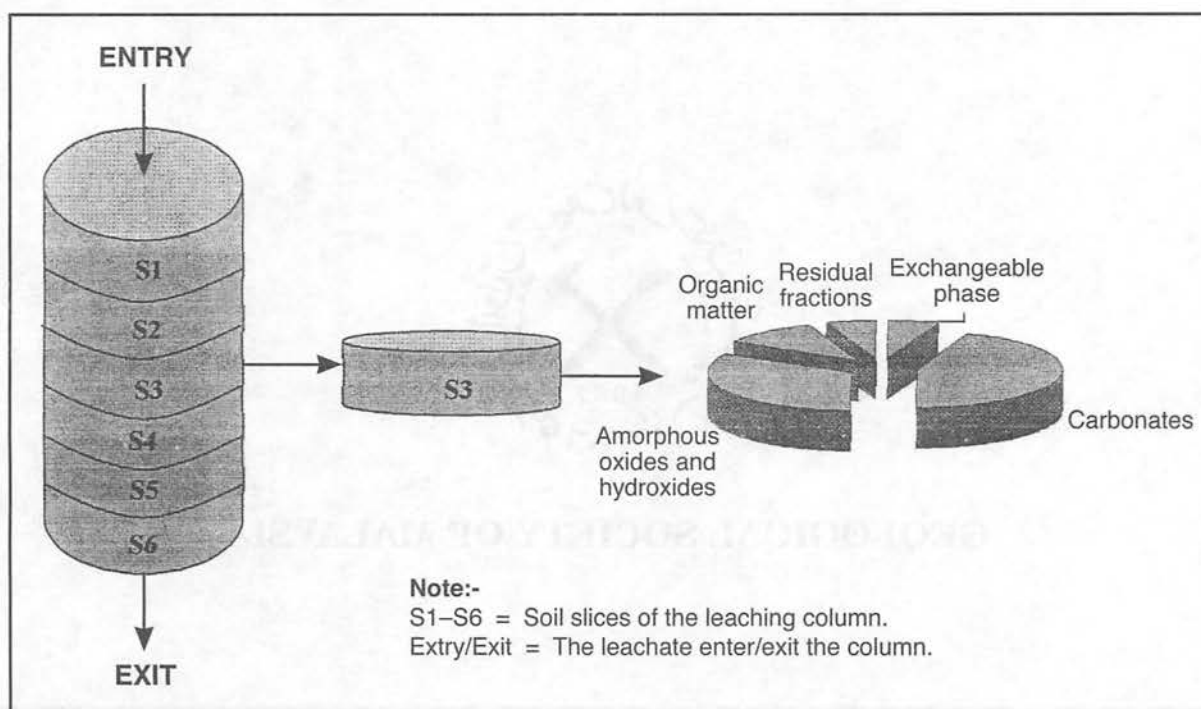


Figure 1. The sketch of partitioning of heavy metals on each slice of soil column.



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## BERITA-BERITA PERSATUAN

### News of the Society

#### KEAHLIAN (Membership)

The following applications for membership were approved:

#### Full Members

1. Zakaria Mohamad  
Jabatan Mineral dan Geosains, Tkt 19-23,  
Bangunan Tabung Haji, Jalan Tun Razak,  
50658 Kuala Lumpur.
2. Yves Cheze  
d/a Aysel Global Holdings, Lot 44, Plaza  
Ampang, Jalan Tun Razak, 50400 Kuala  
Lumpur.
3. Liaw Vui Kong  
APMC, Bt. 13<sup>1/2</sup> Jalan Kuala Kangsar,  
31200 Chemor.

#### Student Members

1. Maruah Musa  
Program Geologi, Universiti Kebangsaan  
Malaysia, Bangi.
2. Mohamed Ghuzal Yahya  
Program Geologi, Universiti Kebangsaan  
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Program Geologi, Universiti Kebangsaan  
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14. Amirul Fadzley Rahmat  
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Program Geologi, Universiti Kebangsaan Malaysia, Bangi.
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21. Ani Aiza Asha'ari  
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22. Lucia Linda Your  
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23. Arnie Salfarina Arshad  
Program Geologi, Universiti Kebangsaan Malaysia, Bangi.
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25. Nor Azila Mat Nor  
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26. Adzimah Adi  
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40. Dayang Suraya Sirat  
Program Geologi, Universiti Kebangsaan Malaysia, Bangi.
41. Marilyn Andrew Anyi  
Program Geologi, Universiti Kebangsaan Malaysia, Bangi.
42. Norfahanna Ismail  
Program Geologi, Universiti Kebangsaan Malaysia, Bangi.
43. Esther Michael  
Program Geologi, Universiti Kebangsaan Malaysia, Bangi.
44. Felicia Nasip  
Program Geologi, Universiti Kebangsaan Malaysia, Bangi.

- |  |   |
|--|---|
| 45. Nancy Koh Siew Ching<br>Program Geologi, Universiti Kebangsaan<br>Malaysia, Bangi. | 48. Nik Mohd Nishamuddin Nik Rahimi<br>Program Geologi, Universiti Kebangsaan<br>Malaysia, Bangi. |
| 46. Kahireen Mohamad<br>Program Geologi, Universiti Kebangsaan<br>Malaysia, Bangi.     | 49. Norazean Hamdan<br>Program Geologi, Universiti Kebangsaan<br>Malaysia, Bangi.                 |
| 47. Renny Lee<br>Program Geologi, Universiti Kebangsaan<br>Malaysia, Bangi.            |   |

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## PETUKARAN ALAMAT (Change of Address)

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

1. Jerome A. Eyer  
6 Chantilly Place, Hendersonville, North  
Carolina, 28739 USA.

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GSM

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## CURRENT ADDRESSES WANTED

The GSM is seeking the address of the following members. Anyone knowing the new address please inform the Society.

- |   |  |
|---|--|
| 1. Huzaidi Hashim<br>Tenggara Capital Bhd., 51 Medan Setia 1,<br>Plaza Damansara, bukit Damansara,<br>50490 Kuala Lumpur. | 3. Charlie Lee<br>Sarawak Shell Bhd., EPS-WS1, 98100<br>Lutong, Sarawak. |
| 2. Mellisa Johansson<br>Schlumberger Geoquest, 8th Floor Rohas<br>Perkasa, 8 Jalan Perak, 50450 Kuala<br>Lumpur.          |  |

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## PERTAMBAHAN BAHARU PERPUSTAKAAN (New Library Additions)

The Society has received the following publications:

- |   |   |
|---|---|
| 1. Science Reports of the Institute of Geoscience, Univ. of Tsukubo, vol. 23, 2002. | 10. Natural History Musium & Institute, Chiba, Journal, vol. 7, no. 1, 2002.                  |
| 2. National Science Museum Monographs no. 22, 2002.                                 | 11. Geological Survey of Japan, Bulletin, vol. 52, nos. 10–12 (2001) & vol. 53, no. 1 (2002). |
| 3. Episodes, vol. 25, no. 2002.   | 12. Geologica Belgica, vol. 4, nos. 1–4, 2001.  |
| 4. AAPG Bulletin, vol. 86, no. 7, 2002.   | 13. Tin International, vol. 75, no. 5, 2002.  |
| 5. AAPG Explorer, June & August 2002.   | 14. Annales Academiae Scientiarum Fennicae Geologica-Geographica, no. 162, 2002.              |
| 6. Geological Bulletin of Turkey, vol. 45, no. 1, 2002.                             | 15. USGS Bulletin: 2002: no. 2185.  |
| 7. Geosciences Journal, vol. 6, no. 2, 2002.  | 16. USGS Circular: 2001: no. 1198.  |
| 8. SOPAC News no. 2002(1), 2002.  | 17. USGS Professional Paper: 2001: nos. 1606, 1647.   |
| 9. Natural History Research, vol. 7, no. 1, 2002.                                   |   |

GSM

## CURRENT ADDRESSES WANTED



## Editor's Note

At the AGM 2002, the Editor was given 6 months to bring the Society's publications up-to-date and inform the members the schedule of publications within 3 months.

I am sure you all have the schedule of publications by now. I am happy to report that before the end of October 2002, all the remaining *Warta Geologi* of 1999, and all the issues of *Warta Geologi* of 2000, and 2001 will be available as all material has been submitted to the printers on Sunday 13th October 2002. The *Warta Geologi* for 2002 is up-to-date.

Bulletins 38, 39, 40, 42 & 44 are now being finalised for submission before the end of October 2002.

We lost 2 weeks because we had to bring out the Programme & Abstracts for Petroleum Geology Conference & Exhibition 2002 and another week as I had to lead my University of Malaya students on a week-long fieldtrip from 13–19 October 2002.

I have reported earlier, at previous AGMs, that the delay of our publications is due to the hard disc of our computer crashing in mid 1999. This happened when we had just upgraded our old computer. The hard disk was subsequently replaced and we also had a new computer. In fact the old computer was not working well and at the AGM it was suggested the old computer be replaced. At the time the engineer was installing the new computer, the hard disk crashed. Luckily the engineer was around to salvage some of the files of formatted Newsletters and Bulletins.

As it was our duty and responsibility to members and subscribers, we began the tedious task of reformatting a large portion of the Newsletters and Bulletins. In between we had to delete some news items from the Newsletters which were already obsolete and reorganise the pagination.

I must convey our sincere apologies to all authors of papers who have been supporting the Society's publication with their many articles for the unfortunate delay. We are also touched by the many members who have voiced concerned about the Society's delayed publications.

Now there is light at the end of the tunnel (I hope

not a lawyer!) and if I am still around until mid November 2002 all the delayed publications should be in your hands.

All the recent publications have in fact been on time. The Proceedings for Annual Geological Conference 2000 and 2001, and Bulletin 45 (Annual Geological Conference 2002) were ready and distributed at the Conferences concerned. So were the Programme & Abstracts for the Petroleum Geology Conference for 2000, 2001 and recently 2002. Subsequently, the ever popular GSM calendars, the Langkawi brochure and the various Conference circulars have also been prepared on time. In addition, the CD on the Geology of Borneo was brought out in time for the Petroleum Geology Conference & Exhibition 2001 and the Geological Map of Borneo and its accompanying booklet were brought out in time for the Petroleum Geology Conference & Exhibition on 15 & 16th October this year.

In other words, what is current we have brought out in good time and what has been stalled by the hard disc crash has been constantly worked on and is almost completely done. So once again it is time again to renew the "call for papers" for the forthcoming Newsletters and Bulletins. So far we have 3 new manuscripts.

In order to bring the Society's stalled publications on track, I have to thank my Editorial Subcommittee, in particular T.F. Ng and A.K. Fan, for their dedication, sacrifices, support and cooperation. The Society should be proud to have such dedicated people who care for the quality and frequency of our publications.

I have been Editor for 22 years, a long time, and I have Dr. T.T. Khoo to thank for this thankless job when I just got back from Germany. I find the job challenging despite the many ups and downs and hiccups one encounters in any job.

The Newsletters and Bulletins have constantly undergone significant changes and improvements to keep up with the changes in technology. However, I have always seen to that the Society maintains the quality and standard of its publications and I hope whoever is Editor in future will adhere to it.

23 October 2002



GEOLOGICAL SOCIETY OF MALAYSIA



# PROCEEDINGS GEOSEA '98

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

*Earth Science in Support of Growing Southeast Asian Economies*

August 17 - 19, 1998

Kuala Lumpur, Malaysia

Published by:

Geological  
Society of  
Malaysia

Editor: G.H. Teh



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December 1999

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PP 3279/8/2001

ISSN 0126-6187

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**GEOLOGICAL SOCIETY OF MALAYSIA**

# **ANNUAL GEOLOGICAL CONFERENCE 2002**

**Renaissance Hotel,  
Kota Bharu, Kelantan**  
**26 – 27 May 2002**

Editors: G.H. Teh, Ismail Yusoff, Azman Abdul Ghani & T.F. Ng

Collaborators:  
Minerals and Geoscience Department Malaysia  
Universiti Kebangsaan Malaysia  
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*Bulletin of the Geological Society of Malaysia*

**MAY 2002**

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OF MALAYSIA



# ANNUAL GEOLOGICAL CONFERENCE 2001

Pan Pacific Resort, Pangkor Island, Perak Darul Ridzuan  
2 - 3 June 2001



Editors: G.H. Teh, Mohd. Shafeea Leman & T.F. Ng

Collaborators:

Minerals and Geoscience Department Malaysia  
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# ANNUAL GEOLOGICAL CONFERENCE 2000

Shangri-La Hotel, Penang • 8 – 9 September 2000

Editors: G.H. Teh, Joy J. Pereira & T.F. Ng

Collaborators:

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# GEOLOGICAL SOCIETY OF MALAYSIA PUBLICATIONS

- Bulletin 1** (Feb 1968). 79 p. Studies in Malaysian Geology. Edited by P.H. Stauffer. A collection of papers presented at a meeting of the Geological Society on 31st January 1967. **Out of stock.**
- Bulletin 2** (Dec 1968). 152 p. Bibliography and Index of the Geology of West Malaysia and Singapore by D.J. Gobbett. Price: RM5.00.
- Bulletin 3** (Mar 1970). 146 p. Papers in Geomorphology and Stratigraphy (with Bibliography supplement). Edited by P.H. Stauffer. Price: RM5.00.
- Bulletin 4** (Jun 1971). 100 p. Papers in Petrology, Structure and Economic Geology. Edited by P.H. Stauffer. Price: RM5.00.
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- Bulletin 9** (Nov 1977). 277 p. The relations between granitoids and associated ore deposits of the Circum-Pacific region. IGCP Circum-Pacific Plutonism Project Fifth Meeting. 12-13 November 1975, Kuala Lumpur. Edited by J.A. Roddick & T.T. Khoo. **Out of stock.**
- Bulletin 10** (Dec 1978). 95 p. A collection of papers on the geology of Southeast Asia. Edited by C.H. Yeap. **Out of stock.**
- Bulletin 11** (Dec 1979). 393 p. Geology of Tin Deposits. A collection of papers presented at the International Symposium of 'Geology of Tin Deposits', 23-25 March 1978, Kuala Lumpur. Edited by C.H. Yeap. Price: RM20.00.
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- Bulletin 18** (Nov 1985). 209 p. Special Issue on Petroleum Geology. Edited by G.H. Teh & S. Paramanathan. Price: RM15.00.
- Bulletins 19** (Apr 1986) & **20** (Aug 1986). GEOSEA V Proceedings Vols. I & II, Fifth Regional Congress on Geology, Mineral and Energy Resources of SE Asia, Kuala Lumpur, 9-13 April 1984. Edited by G.H. Teh & S. Paramanathan. Price for both Bulletins 19 & 20: Members: RM30.00; Non-Members: RM60.00.
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- Bulletin 43** (Dec 1999). 698 p. Papers from GEOSEA '98 (Ninth Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia). Edited by G.H. Teh. Price: RM70.00.
- Bulletin 45** (Jun 2002). 375 p. Annual Geological Conference 2002 Conference Issue. Edited by G.H. Teh, Ismail Yusoff, Azman Abdul Ghani & T.F. Ng. Price: RM50.00.
- Field Guide 1** (1973). 40 p. A 7-day one thousand mile, geological excursion in Central and South Malaya. By C.S. Hutchison. **Out of stock.**
- Abstracts of papers** (1972). Regional Conference on the Geology of Southeast Asia, Kuala Lumpur, 1972. 64 p. 8 figs, 3 tables, many extended abstracts. Edited by N.S. Haile. Price: RM2.00.
- Proceedings of the Workshop on Stratigraphic Correlation of Thailand and Malaysia Vol. 1** (1983). 383 p. Technical Papers. Price: Member: RM5.00; Non-member: RM15.00.
- WARTA GEOLOGI** (Newsletter of the Geological Society of Malaysia). Price: RM5.00 per bimonthly issue from July 1966.
- Geological Evolution of Southeast Asia** (1996) (Reprinted Edition) by C.S. Hutchison. 368 p. Price: Member: RM50.00; Non-member: RM100.00; Student: RM30.00.
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## Other News

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**September 1-6**

*MINERALOGY FOR THE NEW MILLENNIUM*, Edinburgh, Scotland. (Contact: E-mail: info@minersoc.org; Website: www.minersoc.org/IMA2002)

**September 12-22**

*6TH INTERNATIONAL SYMPOSIUM ON THE JURASSIC SYSTEM*, Palermo, Sicily, Italy. (Contact: Dr. Luca Martire, Fax: 39 011 541755; E-mail: martire@dst.unito.it)

**September 15-19**

*INTERNATIONAL CONFERENCE ON URANIUM MINING AND HYDROGEOLOGY*, Freiberg, Germany. (Contact: E-mail: umh@geo.tu-freiberg.de; Website: www.geo.tu-freiberg.de/umh)

**September 16-20**

*INTERNATIONAL ASSOCIATION OF ENGINEERING GEOLOGY AND THE ENVIRONMENT (IAEG), "Engineering Geology for Developing Countries"* (9th International Congress), Durban, South Africa. (Contact: South African Institute for Engineering and Environmental Geologists, P.O. Box 2812, Pretoria, 0001, South Africa. E-mail: saieg@hotmail.com; Website: home.geoscience.org.za/saieg/2002.htm)

**September 22-27**

*SOCIETY OF EXPLORATION GEOPHYSICISTS* (72nd Annual Meeting and International Exposition), Las Vegas, Nevada, USA. (Contact: SEG Business Office, Tel: +1-918 497 5500; Fax: +1-918 497 5557; Website: seg.org/)

**September 24-28**

*URANIUM DEPOSITS: FROM THEIR GENESIS OF THEIR ENVIRONMENT IMPACTS*, Prague, Czech. (Contact: Bohdan Kribeck, Czech Geological Survey, 152000 Prague 5. Tel: 422 51085 518; Fax: 422 5817 390; E-mail: kribeck@cgu.cz)

**October 15-19**

*INTERNATIONAL WORKSHOP ON INTEGRATED WATER RESOURCE MANAGEMENT*. Organised by the US Bureau of Reclamation, Denver, Colorado, U.S.A. (Contact: International Affairs Team, D-1520, US Bureau of Reclamation, P.O. Box 25007, Denver, CO 80225, U.S.A. Tel: +1 303 445 2127; Fax: +1 303 445 6322; E-mail: lprincipe@do.usbr.gov; Website: http://www.usbr.gov/)

**October 21-25**

*INTERNATIONAL ASSOCIATION OF HYDROGEOLOGISTS, "Groundwater and Human Development"* (32nd International Congress), Mar del Plata, Argentina. (Contact: Dr. Emilia Bocanegra, Centro de Geología de Costas y del Cuaternario, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Mar del Plata, Casilla de Correo 722, 7600 Mar del Plata, Argentina; Tel: +54 223 475 4060; Fax: +54 223 475 3150; E-mail: ebocaneg@mdp.edu.ar)

**October 27-30**

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

**November 20-23**

**ROLE OF NATURAL RESOURCES AND ENVIRONMENT FOR SUSTAINABLE DEVELOPMENT IN SOUTH AND SOUTHEAST ASIA**, Dhaka, Bangladesh. (Contact: Ms. Afia Akhtar, Convenor, NESDA & Vice President, AGID, Director, Geological Survey of Bangladesh, 153 Pioneer Road, Segunbagicha, Dhaka 1000, Bangladesh. Tel: 880-2-418545 (O), 9337559, 9350412 (H); E-mail: afia@agni.com or mnhasan@agni.com; or Mr. Nehal Uddin, Member Secretary, NESDA, Deputy Director, Geological Survey of Bangladesh, 153 Pioneer Road, Segunbagicha, Dhaka 1000, Bangladesh. Tel: 880-2-9348318; E-mail: nehalu@bttb.net.bd)

**2003**

**SIXTH INTERNATIONAL SYMPOSIUM ON ENVIRONMENTAL GEOCHEMISTRY**, Edinburgh, Scotland. (Contact: John Farmer, Dept. of Chemistry, The University of Edinburgh, Joseph Black Building, Kings Buildings, West Mains Road, Edinburgh EH9 3JJ Scotland. Tel: 0131-650-1000; Fax: 0131-650-4757; E-mail: J.G.farmer@ed.ac.uk)

**March 27-30**

**NATIONAL EARTH SCIENCE TEACHERS ASSOCIATION** (Annual Meeting), Philadelphia, Pennsylvania, USA. (Contact: NESTA, 2000 Florida Ave., N.W., Washington, D.C. 20009, USA. Tel: +1-202 462 6910; Fax: +1-202 328 0566; E-mail: fireton@kosmos.agu.org)

**May**

**INTERNATIONAL SYMPOSIUM ON KARST AND HARD ROCK FORMATIONS**, Esfahan, Iran. (Contact: Dr. A. Afrasiabian, National Karst Study and Research Center, P.O. Box 15875-3584, Tehran, Iran. Tel: +98 21 7520474; Fax: +98 21 7533186)

**June 15-17**

**7TH ICOBTE — INTERNATIONAL CONFERENCE ON BIOGEOCHEMISTRY OF TRACE ELEMENTS**, Uppsala, Sweden. (Contact: George R. Gobran. Fax: 46 (18) 67 34 30; E-mail: George.Gobran@eom.slu.se or ICOBTE7@slu.se; Website: http://www.eom.slu.se)

**June 16-18**

**5TH INTERNATIONAL CONFERENCE ON THE ANALYSIS OF GEOLOGICAL AND ENVIRONMENTAL MATERIALS**, Rovaniemi, Finland. (Contact: Website: http://www.gsf.fi/geoanalysis2003)

**August 18-21**

**9TH INTERNATIONAL SYMPOSIUM ON THE ORDOVICIAN SYSTEM, 7TH INTERNATIONAL GRAPTOLITE, AND FIELD MEETING OF THE SUBCOMMISSION ON SILURIAN STRATIGRAPHY**, San Juan City, Argentina. (Contact: ISOS: Guillermo L. Albanesi. E-mail: galbanesi@arnet.com.ar or Matilde S. Beresi. E-mail: mberesi@labocricyt.edu.ar; IGC-SSS field meeting: Gladys Ortega. E-mail: gcortega@arnet.com.ar or Guillermo F. Aceñolaza. E-mail: acecha@unt.edu.ar)

**September 15-18**

**INDUSTRIAL MINERALS AND BUILDING STONES — IMBS 2003**, Istanbul, Turkey. (Contact: Erdogan Yüzer, Maden fakültesi, Ayazaga Kampüsü, 80626 Maslak/Istanbul, Turkey. Tel/Fax: 90 212 285 61 46; E-mail: yuzer@itu.edu.tr)



**September 22–26**

**1ST INTERNATIONAL CONFERENCE — GROUNDWATER IN GEOLOGICAL ENGINEERING**, Ljubljana, Slovenia. (Contact: Slovene Committee of IAH, Andrej Juren, Kebetova 24, SI-1000 Ljubljana, Slovenia. E-mail: andrej.juren@siol.net or Nadja Zalar, E-mail: nadja.zalar@siol.net; Website: <http://www.iah.org>)

**September 28 – October 3**

**SOCIETY OF EXPLORATION GEOPHYSICISTS** (73rd Annual Meeting and International Exposition), Dallas, Texas, USA. (Contact: SEG Business Office, Tel: +1-918 497 5500; Fax: +1-918 497 5500; Fax: +1-918 497 5557; Website: [seg.org/](http://seg.org/))

**November 2–5**

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

**2004****March 27 – April 4**

**NATIONAL EARTH SCIENCE TEACHERS ASSOCIATION** (Annual Meeting), Atlanta, Georgia, USA. (Contact: NESTA, 2000 Florida Ave., N.W., Washington, D.C. 20009, USA. Tel: +1-202 462 69 10; Fax: +1-202 328 0566; E-mail: [fireton@kosmos.agu.org](mailto:fireton@kosmos.agu.org))

**August**

**32ND INTERNATIONAL GEOLOGICAL CONGRESS**, Florence, Italy. Congress theme: "The Renaissance of Geology: From the Mediterranean area toward a global Geological Renaissance-Geology, Natural Hazards, and Cultural Heritage". (Contact: E-mail: [32igc@32igc.org](mailto:32igc@32igc.org); Website: <http://www.32igc.org/>)

**October 10–15**

**SOCIETY OF EXPLORATION GEOPHYSICISTS** (74th Annual Meeting and International Exposition), Denver, Colorado, USA. (Contact: Debbi Hyer, 8801 S. Yale, Tulsa, OK 74137, USA. Tel: (+1-918) 497 5500; E-mail: [dhyer@seg.org](mailto:dhyer@seg.org); Website: [meeting.seg.org](http://meeting.seg.org))



# GEOLOGICAL SOCIETY OF MALAYSIA PUBLICATIONS

## General Information

Papers should be as concise as possible. However, there is no fixed limit as to the length and number of illustrations. Normally, the whole paper should not exceed 30 printed pages. The page size will be 204 x 280 mm (8 x 11 inches).

The final decision regarding the size of the illustrations, sections of the text to be in small type and other matters relating to printing rests with the Editor.

The final decision of any paper submitted for publication rests with the Editor who is aided by a Special Editorial Advisory Board. The Editor may send any paper submitted for review by one or more reviewers. Authors can also include other reviewers' comments of their papers. Scripts of papers found to be unsuitable for publication may not be returned to the authors but reasons for the rejection will be given. The authors of papers found to be unsuitable for publication may appeal only to the Editor for reconsideration if they do not agree with the reasons for rejection. The Editor will consider the appeal together with the Special Editorial Advisory Board.

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## Script Requirements

**Scripts** must be written in Bahasa Malaysia (Malay) or English.

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**Figure captions** must be typed on a separate sheet of paper. The captions must not be drafted on the figures. The figure number should be marked in pencil on the margin or reverse side.

**Original maps and illustrations** or as glossy prints should ideally be submitted with sufficiently bold and large lettering to permit reduction to 18 x 25 cm: fold-outs and large maps will be considered only under special circumstances.

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HAMILTON, W., 1979. Tectonics of the Indonesian region. *U.S. Geological Survey Professional Paper 1078*, 345p.

HOSKING, K.F.G., 1973. Primary mineral deposits. In Gobbett, D.J. and Hutchison, C.S. (Eds.), *Geology of the Malay Peninsula (West Malaysia and Singapore)*. Wiley-Interscience. New York, 335-390.

HUTCHISON, C.S., 1989. *Geological Evolution of South-east Asia*. Clarendon Press, Oxford. 368p.

SUNTHARALINGAM, T., 1968. Upper Paleozoic stratigraphy of the area west of Kampar, Perak. *Geol. Soc. Malaysia Bull. 1*, 1-15.

TAYLOR, B., AND HAYES, D.E., 1980. The tectonic evolution of the South China Sea basin. In: D.E. Hayes (Ed.), *The Tectonic and Geologic Evolution of Southeast Asian Sea and Islands, Part 2. Am. Geophy. Union Monograph 23*, 89-104.

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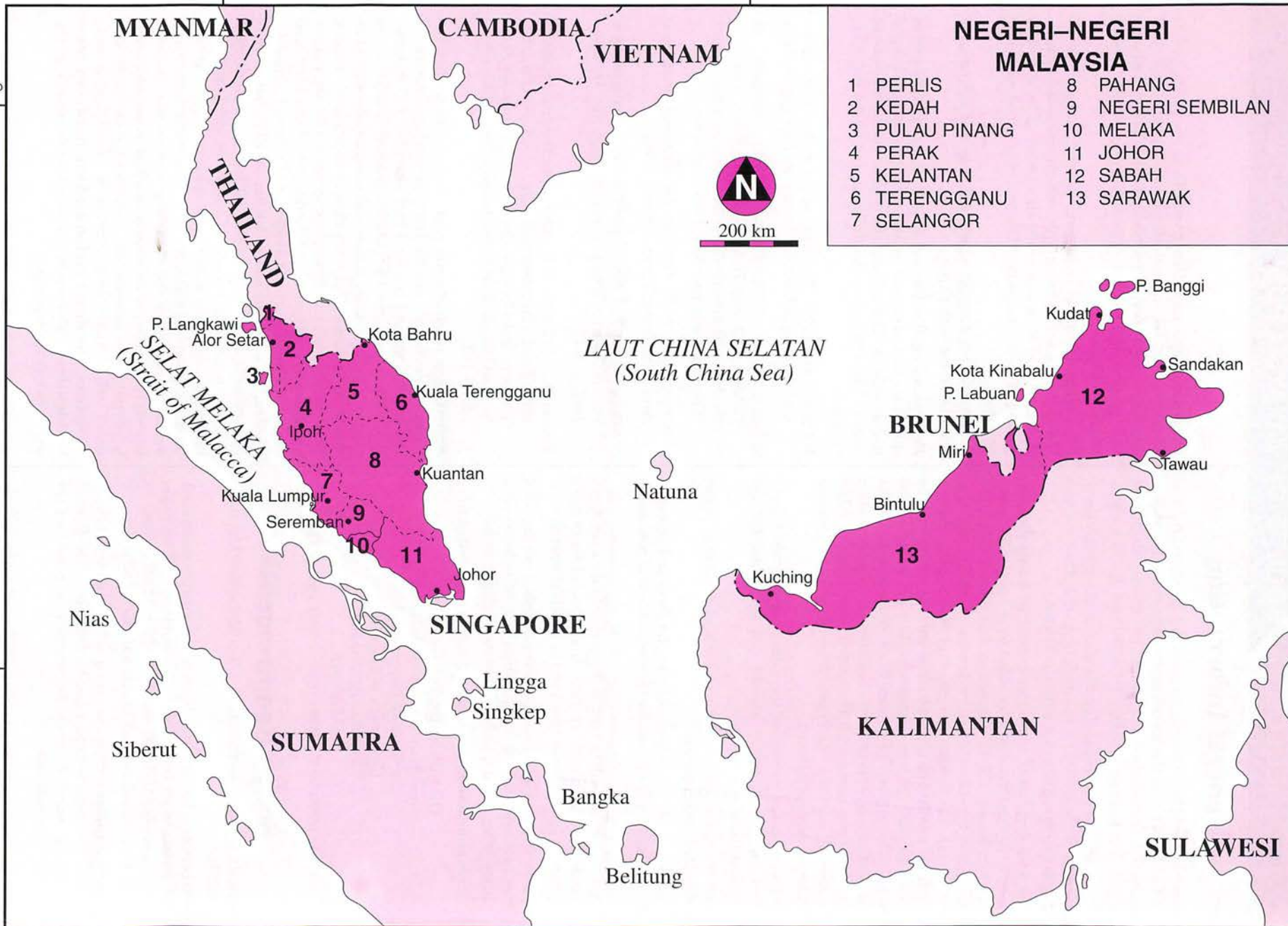
VIETNAM

### NEGERI-NEGERI MALAYSIA

- |                |                   |
|----------------|-------------------|
| 1 PERLIS       | 8 PAHANG          |
| 2 KEDAH        | 9 NEGERI SEMBILAN |
| 3 PULAU PINANG | 10 MELAKA         |
| 4 PERAK        | 11 JOHOR          |
| 5 KELANTAN     | 12 SABAH          |
| 6 TERENGGANU   | 13 SARAWAK        |
| 7 SELANGOR     |                   |



200 km



Nias

Siberut

SUMATRA

SINGAPORE

Lingga  
Singkep

Bangka

Belitung

LAUT CHINA SELATAN  
(South China Sea)

Natuna

Kota Bahru

Kuala Terengganu

Kuantan

Kuala Lumpur

Seremban

Johor

P. Langkawi

Alor Setar

THAILAND

P. Banggi

Kudat

Kota Kinabalu

P. Labuan

BRUNEI

Miri

Bintulu

Kuching

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