PP 2509/8/96

ISSN 0126-5539

WARTA GEOLOGI

PERSATUAN GEOLOGI MALAYSIA

NEWSLETTER OF THE GEOLOGICAL SOCIETY OF MALAYSIA

GEOLOGICAL SOCIETY OF MALAYSIA

Jil. 22, No. 4 (Vol. 22, No. 4) Jul–Aug 1996

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Published by the Geological Society of Malaysia,
Department of Geology, University of Malaya, 50603 Kuala Lumpur.
Tel: 603-757 7036 Fax: 603-756 3900

Printed by Art Printing Works Sdn. Bhd., 29 Jalan Riong, 59100 Kuala Lumpur.

CATATAN GEOLOGI
Geological Notes

Discovery of Early Permian Radiolaria from the Semanggol Formation, northwest Peninsular Malaysia

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Abstract: One species of *Pseudoalbaillella* and three morphotypes of *Pseudoalbaillella scalprata* were identified from the lowermost chert unit exposed at Bukit Kampung Yoi and Bukit Larek in the vicinity of the Pokok Sena town, Kedah. The radiolarian assemblage represents the *Pseudoalbaillella scalprata* m. *rhombothoracata* Zone of the latest Wolfcampian, Early Permian. The discovery of these radiolarian faunas suggests that the base of chert unit in the Semanggol Formation extends to Early Permian, older than previously recorded.

INTRODUCTION

The Semanggol Formation is composed of three units; the chert unit, the interbedded sandstone-mudstone unit and the conglomerate unit (Teoh, 1992). Numerous Radiolaria are found in the chert unit. The radiolarian chert has been studied by Sashida *et al.* (1992, 1993, 1995), Basir Jasin (1994), and Spiller and Metcalfe (1995a, 1995b). Sashida *et al.* (1995) recorded some Middle and Late Permian Radiolaria in the formation. Basir Jasin (1994) has reported the occurrence of Middle Triassic Radiolaria and Spiller and Metcalfe (1995b) recorded the occurrence of latest Lower Permian to Middle Triassic Radiolaria from the formation.

Recently more samples were collected from the Semanggol Formation exposed in the vicinity of Pokok Sena town. Eleven samples were collected from an isolated abandoned earth quarry at Bukit Kampung Yoi and fifteen samples were picked from an excavation site of Bukit Larek. Two samples from Bukit Kampung Yoi and five samples from Bukit Larek yielded some identifiable radiolarian fauna.

GEOLOGICAL SETTING

The Semanggol Formation is located in three areas; north Kedah, south Kedah and west-central Perak. In north Kedah, the chert is found in the west and followed by interbedded sandstone-mudstone and conglomerate in the east. In south Kedah only interbedded sandstone-mudstone, and chert were observed. Conglomerate is absent. In west-central Perak, however, the rocks consist of conglomerate and interbedded sandstone-mudstone only. The Semanggol Formation has been folded into open to slightly asymmetrical folds. At places, the bedding become very steeply dipping or even overturned caused by reverse or thrust faults which have modified the previously simple structures.

The chert unit is widely exposed in north and south Kedah. At some places, the chert is strongly folded due to slumping. In north Kedah, the chert forms prominent strike-ridges which are oriented approximately north-south direction. The occurrence of limestone lenses at the top of the chert unit has been reported

by Ahmad Jantan *et al.* (1987). In south Kedah the strike-ridges are lying NNE-SSW direction which were probably modified by the intrusion of Late Triassic granite in the area.

The lowermost chert unit is found at Bukit Kampung Yoi and at Bukit Larek (Fig. 1). The chert exposed at Bukit Kampung Yoi is thinly bedded and folded. The exposure is small and covered by soils and vegetation. The thickness of individual chert layers ranges from 5 cm to 15 cm.

The chert sequence at Bukit Larek is well-exposed. The chert consists of siliceous shale at the bottom and grades to bedded chert. The chert strikes 345° and dips 65°–75°. The thickness of the individual chert layers ranges from 5 cm to 25 cm. The lower part of the chert is well bedded, with more complex folding due to slumping at the middle and it is well-bedded again at the top of the section. The chert sequence is underlain by at least 10 m thick laminated black mudstone.

RESULT AND DISCUSSION

Many forms could not be identified because of the poor-state of preservation. A total of three morphotypes and one species of the Early Permian Radiolaria were identified. The species consist of:-

Pseudoalbaillella scalprata Holdsworth and Jones morphotype *scalprata* Ishiga

Pseudoalbaillella scalprata Holdsworth and Jones morphotype *postscalprata* Ishiga

Pseudoalbaillella scalprata Holdsworth and Jones morphotype *rhombothoracata* Ishiga and *Pseudoalbaillella elongata* Ishiga and Imoto.

Two samples from Bukit Kampung Yoi (Locality 1) yielded some quite well-preserved Radiolaria. Sample Y-1 yielded two species; *Pseudoalbaillella scalprata* m. *scalprata* and *Pseudoalbaillella scalprata* m. *postsaclprata*. Sample Y-2 yielded three species, *Pseudoalbaillella scalprata* m. *scalprata*, *Pseudoalbaillella scalprata* m. *postscalprata* and *Pseudoalbaillella elongata*.

Five samples from Bukit Larek (Locality 2) yielded identifiable Radiolaria. Three species, *Pseudoalbaellella scalprata* m. *scalprata*, *Pseudoalbaillella scalprata* m. *postscalprata*, *Pseudoalbaillella scalprata* m. *rhombothoracata* were retrieved from samples BL-3 and BL-4 (the lowermost chert samples). Samples BL-7 yielded *Pseudoalbaillella scalprata* m. *scalprata*, and *Pseudoalbaillella scalprata* m. *postscalprata*. Sample BL-8 yielded *Pseudoalbaillella scalrata* m. *scalprata*, *Pseudoalbaillella scalprata* m. *postscalprata*, *Pseudoalbaillella scalrata* m. *rhombothoracata* and *Pseudoalbaillella elongata*. Only one species, *Pseeudoalbaillella scalprata* m *postscalprata* was identified from Sample BL-9.

The radiolarian assemblages from all those samples indicate that the age of the oldest chert unit is Early Permian. The presence of *Pseudolabaillella scalprata* m. *scalprata*, *P. scalprata* m. *postscalprata*, *P. scalprata* m. *rhombothoracata* and *Pseudoalbaillella elongata* suggests that this assemblage belongs to the *Pseudoalbaillella scalprata* m. *rhombothoracata* Zone of Ishiga (1990). The zone is equivalent to the latest Wolfcampian (Ishiga, 1986). This is the oldest age obtained from the Radiolaria from the base of the Semanggol Formation. *Pseudoalbaillella elongata* is a very short-ranged species. It is only found in the middle of the *Pseudoalbaillella scalprata* m. *rhombothoracata* Zone. This indicates that Samples Y-1 and BL-8 belong to the middle of the *Pseudoalbaillella scalprata* m. *rhombothoracata* Zone.

The lowermost chert unit was dated as Middle Permian by Sashida *et al.* (1995) based on the chert exposed at Bukit Nyan. Spiller and Metcalfe (1995b) tentatively assigned the age of the oldest chert to latest Early Permian based on poorly preserved *Pseudoalbaillella longtanensis?* Sheng and Wang, retrieved from the chert exposed in the Kuala Nerang area (Locality K1). In this report, however the *Pseudoalbaillella scalprata* m. *rhombothoracata* Zone was identified. It is now confirmed that the age of the lowermost chert of the Semanggol Formation is Early Permian, older than previously thought.

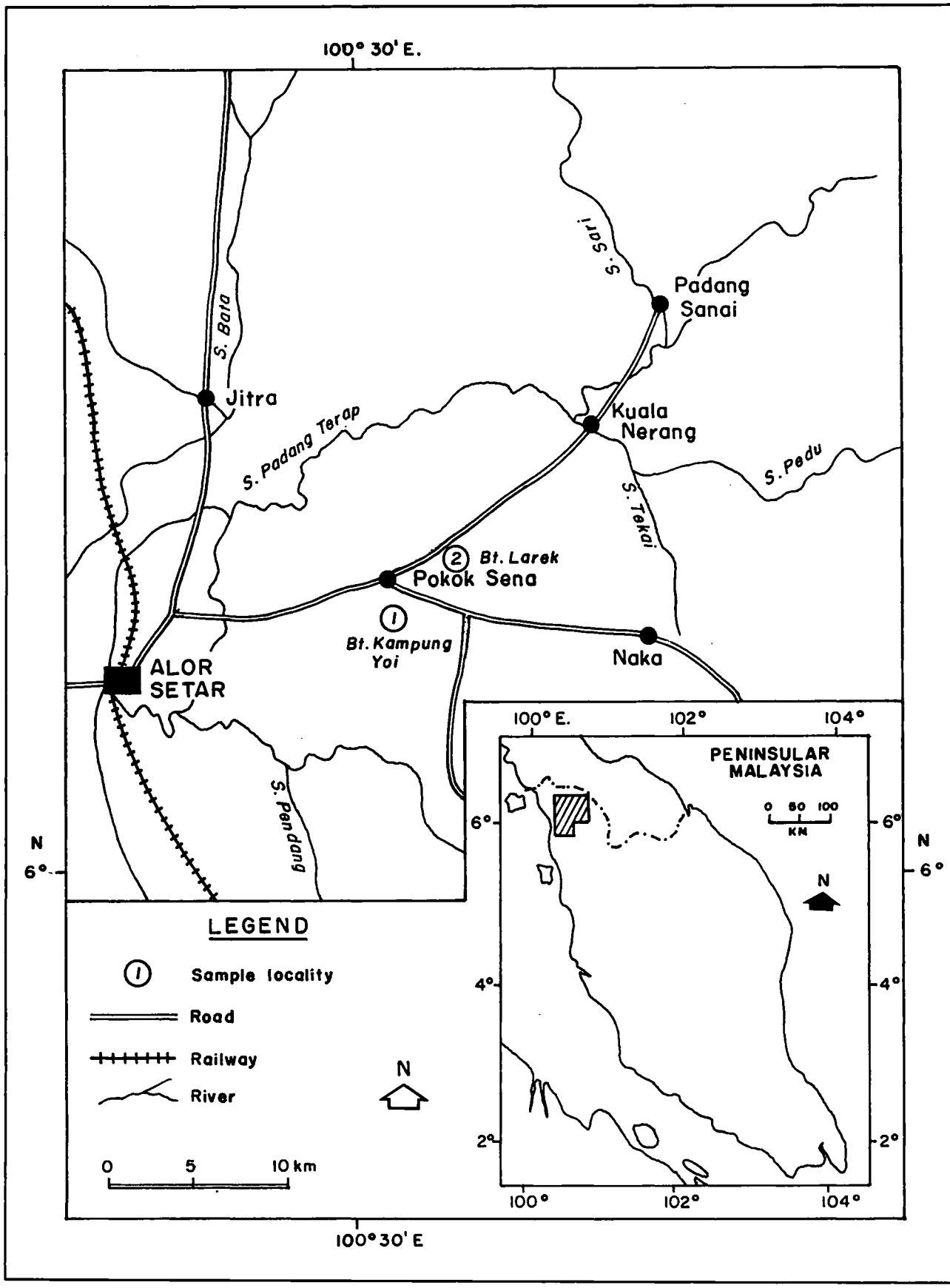

Figure 1. Map showing sample locality.

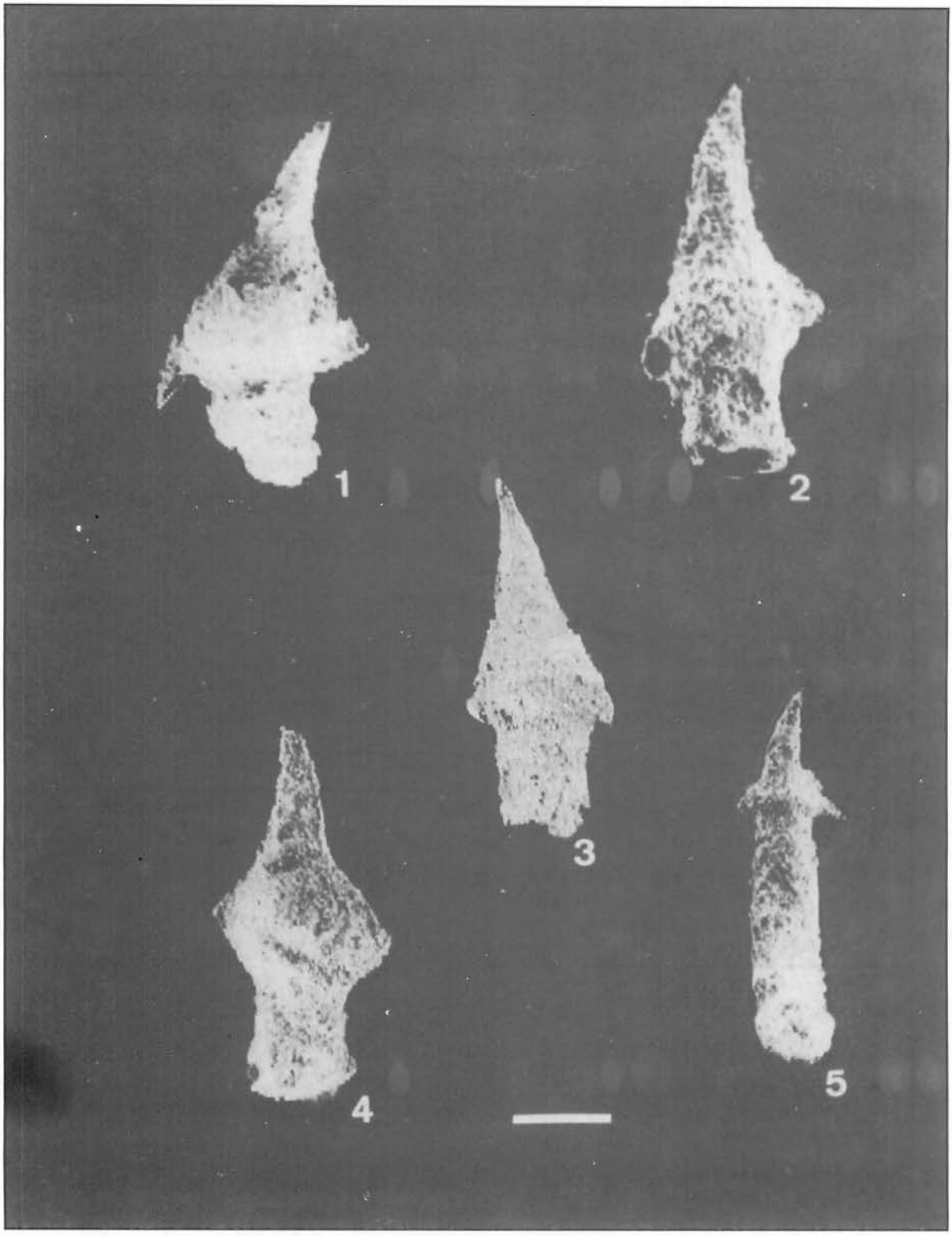

Plate 1. Lower Permian Radiolaria. Scale bar in μm is indicated in the parenthesis.

1. *Pseudoalbaillella scalprata* m. *scalprata* (100 μm)
2, 3. *Pseudoalbaillella scalprata* m. *postscalprata* (60 μm and 94 μm respectively)
4. *Pseudoalbaillella scalprata* m. *rhombothoracata* (75 μm)
5. *Pseudoalbaillella elongata* (116 μm).

The contact between the Semanggol and Kubang Pasu Formations is not yet known. It was thought to be a fault contact. To date, we assume that the base of the Semanggol Formation comprises the chert unit. However, the section exposed at Bukit Larek may give some clues about the base of the Semanggol Formation. At Bukit Larek, Lower Permian chert unit is underlain by at least 10 meter thick, laminated mudstone. This mudstone forms the base of the Semanggol Formation which is only exposed in this area. It cannot be the top of Kubang Pasu Formation because the top of Kubang Pasu Formation consists of mainly thick sandstone. A detailed structural study is required in order to solve this problem.

CONCLUSION

Discovery of the Early Permian radiolaria has changed the age of the Semanggol Formation. Radiolarian assemblage from the chert sequence at Bukit Kampung Yoi and Bukit Larek indicates the fauna belongs to the *Pseudoalbaillella scalprata* m. *rhombothoracata* Zone of latest Wolfcampian, Early Permian. The age of the Semanggol Formation is now ranging from Early Permian (Late Wolfcampian) to Middle Triassic. The base of the Semanggol Formation consists of laminated mudstone. The chert unit conformably overlies the mudstone.

ACKNOWLEDGEMENTS

I would like to thank Haji Mohd. Amin Abu Bakar for his assistance in sampling radiolarian cherts. I would like to express my gratitude to Encik Mohd. Yaakob Dato' Ismail for his assistance in SEM photography. I thank Encik Mohamad Ali and Encik Abdul Ghani Idris for their help in preparation of map and photographic plate. I am grateful to Universiti Kebangsaan Malaysia for providing the research grant (UKM 55/92) to study Radiolaria from Peninsular Malaysia.

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Manuscript received 22 January 1996

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CATATAN GEOLOGI
Geological Notes

Craters at Bukit Paloh, Terengganu-Pahang border

H.D. TJIA
Petronas Research & Scientific Services Sdn. Bhd.
Lot 1026 PKNS Industrial Estate
54200 Hulu Kelang

Circular features as large as 10 kilometres across are clearly shown by satellite images for many parts of Peninsular Malaysia. Single as well as multi-ringed structures have been noted by geologists of the Geological Survey of Malaysia (e.g. Foo, 1976; Lai, 1986) and others. At Sisik, a few kilometres west of Kota Tinggi, Johor, at least ten concentric rings, mainly represented by tonal differences, combined into a structure about 8 km across (Tjia, 1989). Circular features have been seen on all rock types and of ages as young as Jurassic-Cretaceous. One, 7-km diameter, circular tonal feature was even seen at the surface of the Quaternary coastal plain near Tanjung Kukup, SW Johor. However, this could represent a feature in the underlying basement rock that is incompletely masked by a relatively thin cover of Quaternary sediments.

Circular features could represent a variety of phenomena. These could be domes or basins

Figure 1. Satellite image of the circular depression at Bukit Paloh (arrow). The depression has a diameter of about 3.5 km.

ISSN 0126-5539 *Warta Geologi, Vol. 22, No. 4, Jul–Aug 1996, pp. 289–291*

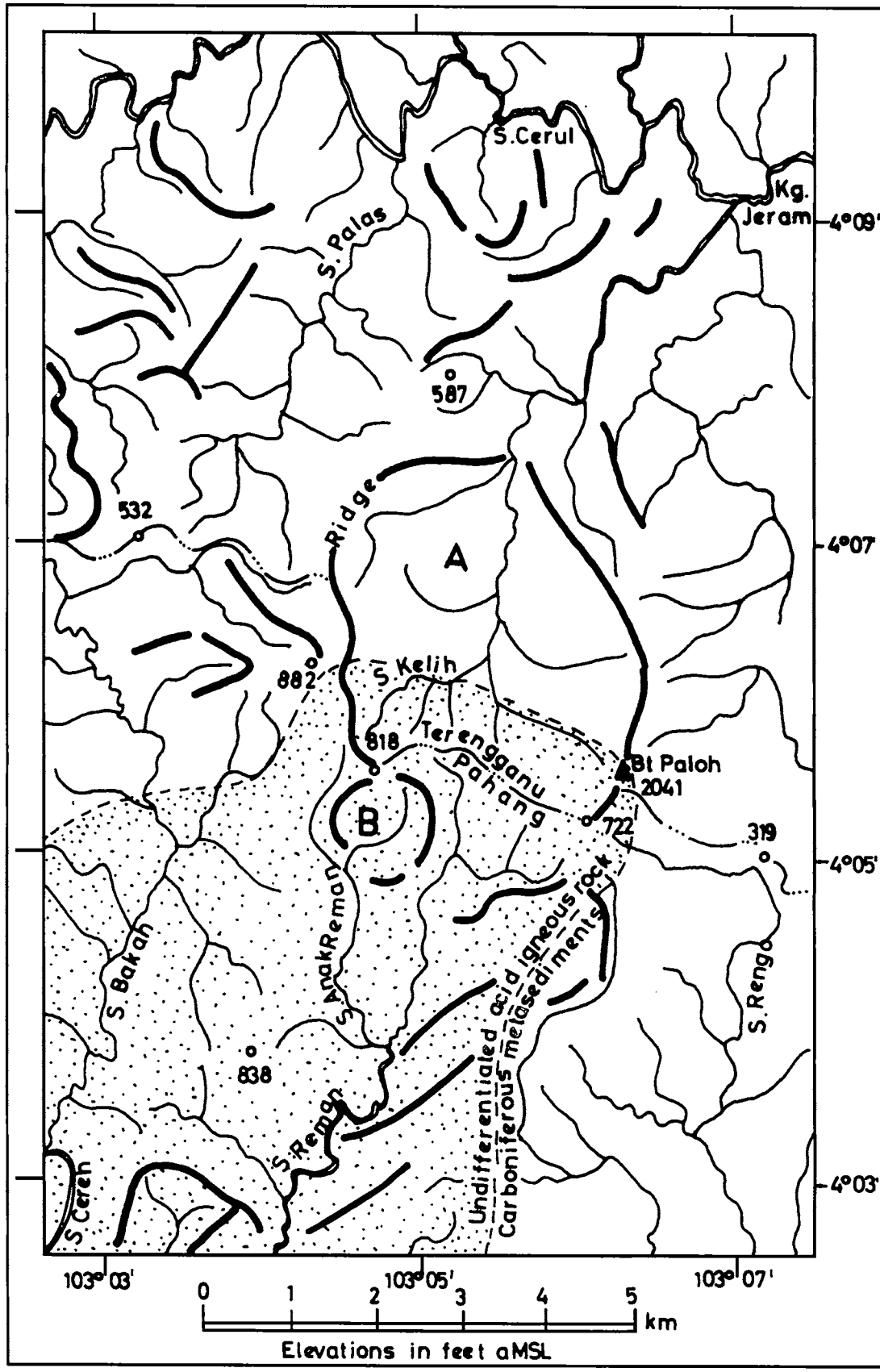

Figure 2. The Bukit Paloh depression (A) as defined by the arcuate ridges shown by the topographic map, Sheet 72, Ayer Puteh. Note structural control (east-of-north lineament) on the drainage of S. Kelih and S. Bakah shows NE lineament. A double-ring structure (ridge and drainage) marks depression B.

formed by folded sedimentary layers, igneous rock cupolas and stocks, subvolcanic centres, rounded collapse structures (sinkholes in limestone areas), volcanic craters, or impact craters resulting from falls of extraterrestrial objects, and, of course, artefacts such as mines and bomb craters.

Figure 1 is a satellite image of the Pahang-Terengganu border area, about 30 km west of Tanjung Gelang. An almost perfectly circular depression, about 3.5 km in diameter, is clearly seen. A well-developed east-of-north lineament bisects the depression. On topographic map sheet 72, Ayer Puteh of scale 1:63,360, the depression is found to correspond with a not-so-circular area which is rimmed by arcuate ridges. The eastern arcuate ridge is crowned by Bukit Paloh, 2,041 feet or about 620 metres above mean sea level. Average local relief between ridge and geology (the latter taken from the 8th edition of the regional geological map; Geological Survey of Malaysia, 1985). The east-of-north bisecting lineament coincides with Sungai Kelih and Sungai Reman flowing north and south, respectively. The depression A (Fig. 2) is not as circular as shown by the satellite image. I have no explanation for the discrepancy. The southern-most part of depression A is underlain by "undifferentiated acid igneous rock" (most probably a granitoid) whose K/Ar-determined age on mica shows 243 Ma, or earliest Triassic. This igneous rock body occupies a relatively small area surrounded by Carboniferous metasedimentary rocks.

The topographic map also shows another, smaller circular depression in the headwaters of Sungai Anak Reman, or B on Figure 2. Two concentric rings, one by drainage and the other by ridges, build the feature. Depression B is entirely underlain by the acid igneous rock. On the original satellite image, at a scale of one-to-a-quarter-million, depression B can also be observed.

From Peninsular Malaysia, circular features have been known for some time, but one of a distinct crater-like shape as at Bukit Paloh, has, to my knowledge, not been reported before. The youthful morphology strongly suggests a recent development. It is widely accepted that the peninsula has been geologically stable since early Tertiary time. Early Quaternary (Haile *et al.*, 1983) alkali basalt flows are known from the Jabor area, a score kilometres to the southeast of Bukit Paloh. The petrological character of the lava is consistent with a tectonically stable basement. However, the presence of shock-metamorphic features consisting of lamellae, cleavages and kink bands in quartz grains of the *in situ* granitic soil below almost completely weathered basalt flows at Gebeng near Tanjung Gelang, was interpreted by Anizan Isahak (1990) to have resulted from impact with an extraterrestrial object. In other words, the cause of early Quaternary volcanism in the Jabor area did not originate from within the Earth, but the volcanism was induced by the impact.

Of the various possible causes for the existence of the youthful circular depression A at Bukit Paloh, an impact origin by an extraterrestrial body seems most probable. Could the Bukit Paloh foreign object be a smaller companion or a fragment of the one that caused the Jabor lava outflows?

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Manuscript received 26 March 1996

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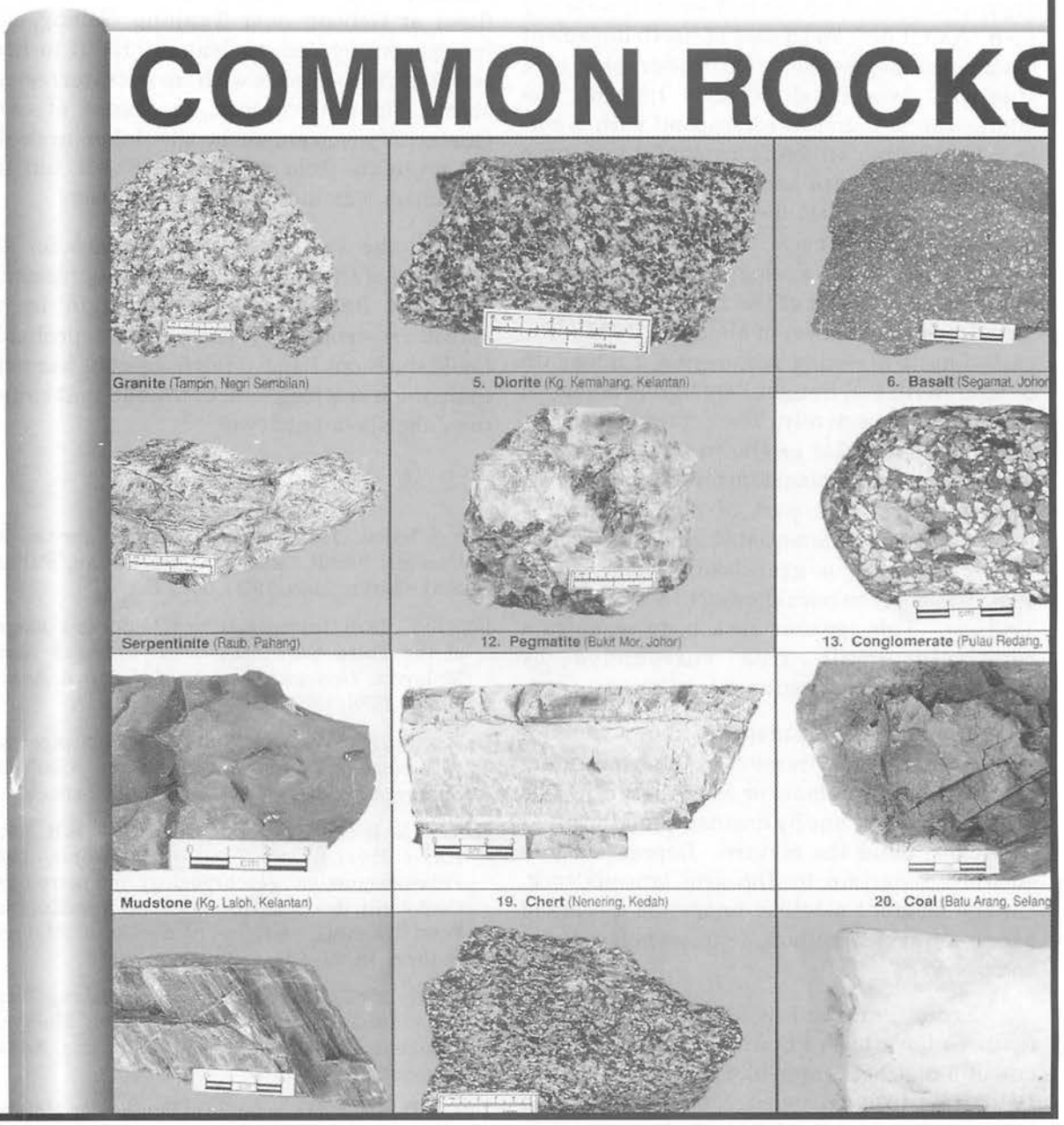

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PERTEMUAN PERSATUAN
Meetings of the Society

Ceramah Teknik (Technical Talk)

Anomalous pressure: Key to unlocking unconventional hydrocarbon resources

RONALD C. SURDAM

Laporan (Report)

On 15th July, 1996 at the Department of Geology, University of Malaya, the society was presented a talk on *"Anomalous pressure: Key to unlocking unconventional hydrocarbon resources"* by Professor Ronald C. Surdam. His trip to Malaysia is part of the *AAPG Foundation's Roy M. Huffington Distinguished Lecturer* tour organised by the American Association of Petroleum Geologists. Petronas Petroleum Research and Scientific Services was his host in Malaysia.

Professor Surdam has been Professor of Geology at the University of Wyoming since 1973, and is director of the Institute for Energy Research (IER) at the University. He formed the IER, a multidisciplinary organization devoted to energy research at the University, in 1993, to foster research on fossil energy resource assessment and the development of new approaches to hydrocarbon exploration and exploitation in Wyoming.

This talk is based on his work as well as those of his students and co-worker at the Institute of Energy Research. His main contention is that unconventional hydrocarbon accumulations, in particular deep gas, will be that next focus for exploration by the industry. He showed that the understanding of these accumulations is based upon advances in different fields of geological disciplines. His talk was illustrated with examples from the Laramide Basin and the Powder River Basin.

Professor Surdam's early work was on the sedimentology and geochemistry of lacustrine deposits, which led to the recognition of lacustrine deposits as tremendous sources for hydrocarbons and an understanding of their origin and distribution in sedimentary basins throughout the world. Subsequent work on lake deposits led him to examine the relationships between the hydrocarbon source rocks in the lakes, the mobile hydrocarbons, and the associated sand deposits. He and his students discovered organically based mechanisms for the dissolution of minerals in hydrocarbon reservoirs, identified the agents of the reactions, and delineated their implications for hydrocarbon exploration. Prof. Surdam and his co-workers continue to investigate the interaction between the organic and inorganic components of sedimentary deposits, most recently the reduction-oxidation reactions associated with the emplacement of hydrocarbons into water-bearing sandstones. A current research interest is the origins and characteristics of pressure variations in sedimentary basins, useful in hydrocarbon exploration as an indicator of oil and gas generation and entrapment.

Prof. Surdam's group at the IER has clearly demonstrated that the traditional theories on the origin of high pressure in sedimentary basins do not explain overpressure in most basins,

and has proposed alternative mechanisms which are more generally operative. In so doing, they also explained the relationships between sedimentary deposits, diagenetic reactions, thermal maturation and hydrocarbon expulsion, migration and accumulation at great depths.

Some 80 members turned up for this very interesting and informative talk. More interestingly, it was also memorable as the first part had to be delivered with electric supply from a small generator due to power failure. Even in this unfavourable situation, Prof. Surdam was able to deliver his talk with enthusiasm, finesse and clarity.

Abstrak (Abstract)

Anomalously pressured, compartmentalized gas accumulations represent a huge and largely untapped gas resource. At present, these unconventional gas accumulations tend to defy exploitation by conventional exploration and production technologies. Based on work in Rocky Mountain Laramide basins (e.g., Western Canada (Alberta), Powder River, Bighorn, Wind River, Greater Green River, Denver, and San Juan basins), a new paradigm has been created for gas exploration in basins characterized by anomalously pressured, compartmentalized gas accumulations. This paradigm is defined as: "The determination and, if possible, three-dimensional evaluation of the pressure boundary between normal and anomalous pressure regimes, and the detection and delineation of porosity/permeability 'sweet spots' (i.e., areas of enhanced storage capacity and deliverability) below this boundary are the two most important elements in exploring for basin-center, or deep-basin gas accumulations" (Surdam, 1995). The evaluation of the regional pressure boundary and detection of underlying storage sweet spots are paramount when designing any new exploration strategies to exploit anomalously pressured gas accumulations and constitute a new way to search for and exploit such deposits. Certainly, there are other critical aspects, but these two elements are absolutely essential; they are as important to finding the gas-saturated, anomalously pressured section of a basin as structural closure and stratigraphic pinch-outs are to finding conventional hydrocarbons in the water-saturated, normally pressured section.

RONALD C. SURDAM

The new paradigm is a product of a dynamic, process-oriented conceptual model for the formation and destruction of anomalously pressured, compartmentallzed gas accumulations. Another product of the process-oriented conceptual model is an innovative exploitation technology and the diagnostic tools necessary to (1) expedite the discovery of additional gas reserves, (2) substantially increase the rate of such discovery, and (3) eliminate much of the exploration risk presently associated with developing unconventional accumulations. This technology and resultant strategy eliminate many of the problems presently plaguing operators in anomalously pressured basins. Specifically, this strategy gives the explorationists the ability to:

- determine the position of the pressure boundary;
- evaluate the 3-D aspects of the pressure boundary surface, with special emphasis on areas characterized by positive relief;
- establish which depositional facies have the greatest potential for enhanced storage and deliverability below the pressure boundary (sweet spots);
- document the potential determinative elements that control sweet spot development in the targeted lithofacies (e.g. fractures, early migration of liquid hydrocarbons, overpressuring, chlorite rims, and/or dissolution of early carbonate cement);
- detect porosity/permeability sweet spots using 2-D and 3-D models of well log and/or seismic data.

The new technology, exploration paradigm, and diagnostic tools provide the keys to unlocking anomalously pressured, compartmentalized gas accumulations. Armed with new knowledge and diagnostic tools explorationists, with substantially less risk, will be able to more efficiently and effectively convert unconventional gas resources to conventional energy reserves.

Azhar Hj. Hussin

Report on Technical Talks on Engineering Geology & Geotechnics and Site Visit, July 1996

An investigation on ground subsidence in Kuala Lumpur

GUE SEE SEW

Project Shah Alam Expressway: Geology, soils and ground treatment

V.R. RAJU

Geological investigation of the landslide at Genting Sempah slip-road, Selangor

CHOW WENG SUM

Three technical talks were held on three consecutive Fridays during the second half of July 1996 (it's the Olympics season, right?) as follows:

	Date	Speaker	Title of Talk
1.	12 July '96	Ir. Dr. Gue See Sew (SSP Geotechnics)	An investigation on ground subsidence in Kuala Lumpur
2.	19 July '96	Dr. Ing. V.R. Raju (Keller (M) Sdn. Bhd.)	Project Shah Alam Expressway: Geology, soils and ground treatment
3.	26 July '96	Mr. Chow Weng Sum (Geosurvey, Ipoh)	Geological investigation of the landslide at Genting Sempah slip-road, Selangor

In addition, a ½-day site visit to the Shah Alam Expressway was conducted on Saturday, 20 July 1996.

Dr. Gue presented a case study of ground subsidence over limestone bedrock. Unfortunately, this talk was "hit" by a power failure and the presentation was made with a couple of sketches only. **Numerous** figures and transparencies brought along by the speaker could not be presented. Nonetheless, there was great interest shown and prolonged discussions followed the talk in spite of the hot and humid lecture hall and sunlight dimming towards the end of the day.

Dr. Raju showed an overview of the Shah Alam Expressway project, touching a little on geology and soils, and emphasising more on ground treatment, in particular the "Stone Column" method for treating soft soils (mining slimes, etc.). A very clear picture of the entire "Stone Column" method of ground treatment was presented with the help of various high-quality, "commercial-standard" graphics and illustrations.

Mr. Chow gave a very good presentation on the Genting Landslide, touching on the geological aspects of the post-failure investigations. Of particular interest is the mapping of the occurrences of landslides/slope failures not only for the particular debris flow incidence of June 1995, but also sequential aerial-photo studies of landslides/slope failures in the Genting area from 1960's to 1990's.

As expected, due to the nature of the topics, all three talks were well received.

Technical Talks on Engineering Geology & Geotechnics

GUE SEE SEW

V.R. RAJU

CHOW WENG SUM

Site visit — Shah Alam Expressway

1. Briefing at site office, Shah Alam Expressway.
2. Soil improvement by vacuum pre-loading. The guy on the extreme left is about to "take-off".
3. Lunch time — courtesy of Keller.
4. Group photo at "Stone Column" site.

The ½-day site visit to the Shah Alam Expressway was attended by 20 members. A rather long briefing was conducted at the project site office touching mostly on various ground treatment methods such as stone columns, dynamic compaction, vacuum preloading, vertical drains, etc. A video show on the highway was also presented. Participants were then taken to the site to see various ground treatment methods in operation (e.g. vacuum preloading, etc.). A sumptuous lunch, generosity of Dr. Raju/Keller, followed by a visit to observe "Stone Columns" in action, brought the visit to a fruitful end.

The Society records its sincere thanks to the three speakers for taking time off to prepare and present their talks, and also to KESAS and Keller for hosting the site visit to the Shah Alam Expressway.

Tan Boon Kong
Chairman
Working Group on Engineering Geology
& Hydrogeology

An investigation on ground subsidence in Kuala Lumpur

GUE SEE SEW

Summary

A ground subsidence of about 25 m diameter and maximum depth of depression of 1.5 m occurred near a Dewan Bandaraya Kuala Lumpur's road. It had caused structural damage to the adjacent single storey bungalow which was scheduled for redevelopment and also threatened the safety of an adjacent 6-storey apartment.

SSP Geotechnics Sdn. Bhd. was appointed by Dewan Bandaraya Kuala Lumpur (DBKL) to investigate the causes of subsidence and to advise DBKL on the effect of the subsidence to the adjacent properties and to recommend appropriate remedial measures.

The desk study included analysing the geology, its previous and present land use topography and the activities at the site as well as its surrounding areas. The site geology consists of Kenny Hill formation overlying the Kuala Lumpur limestone/marble.

A layer of sandy or silty alluvium of up to 16 m was found above the Kenny Hill residual soil. The Kenny Hill residual soil consists of medium dense clayey silty sand or gravel, with occasional gravel and clayey silt of up to 45 m thick. A 13 m cavity in limestone without in-fill was found in one of the four boreholes drilled during this investigation.

This cavity confirmed the hypothesis that the subsidence occurred due to the collapse of voids or arching soils above the limestone. The voids or arching soils formed over the cavities or subterranean channels in the limestone bedrock due to loss of soils into the cavities, when the cavities or channels collapsed or extended to soil rock interface. The voids enlarged with time and arched over the limestone until the collapse of the arch. In this site the collapse of voids or arched soils was likely triggered by the boring activities a few metres away from the subsurface. In view of the close proximity of the adjacent structure to the cavities, it was recommended that DBKL direct the developer, especially the recently completed 6 storey apartment, to appoint an independent engineering consultant to assess the safety and recommend precautionary measures if needed. DBKL only needs to backfill the subsided area and rehabilitate the road since the road is considered to be low risk as compared to the adjacent building.

Multiple collisions on the southeastern margin of Sundaland: The tectonic evolution of Sulawesi

A.J. BARBER

Laporan (Report)

Dr. Barber who is with the Geological Research in Southeast Asia, Department of Geology, Royal Holloway, University of London, Egham, Surrey, TW20 0EX, U.K., gave the above talk on 22 July 1996 at the Geology Department, University of Malaya.

Abstrak (Abstract)

It is now generally recognised that Southeast Asia (Sundaland) has been constructed since the Late Palaeozoic by the successive collision of continental fragments. Along the southern margins of Sundaland, in Sumatra and Eastern Indonesia, this process of accretion still continues at the present day. In the early Cretaceous the southeastern margin of Sundaland lay in Borneo. From that time until the present, subduction and accretion have added oceanic and microcontinental material to this margin. The history of collision and accretion is clearly documented in the Indonesian island of Sulawesi.

In Western Sulawesi the oldest basement rocks are serpentinite, pillow basalt, chert and sediments of oceanic origin, formed at a subduction trench by the offscraping of ocean floor materials in an accretionary complex. Some of these components were evidently carried down deep in the subduction zone to be metamorphosed under high pressures to form eclogites, gneisses and glaucophane schists which give cooling ages of 132–113 Ma (Early Cretaceous). Uplift and erosion was followed in the Late Cretaceous by subsidence and the development of a forearc basin on top of the accretionary complex, with the deposition of cherts and turbidites. In the Eocene the area became stabilised as part of the continental margin of Sundaland, with the development of rifts, filled with terrestrial sediments containing coal deposits in an extensional regime. The area then subsided to form part of an extensive carbonate platform, deposition of carbonates continuing until the mid-Miocene.

The accretion history can be followed in Central and Eastern Sulawesi. Central Sulawesi is composed of rocks of oceanic and continental origin now metamorphosed in the amphibolite, greenschist and glaucophane schist facies, overlain by mélange, and then by a major ophiolite complex, which forms the whole of the East Arm. Detailed petrographic, geochemical and isotopic analyses of the metamorphic rocks show that the amphibolite and

A.J. BARBER

greenschist facies rocks were formed by westward subduction of a microcontinental fragment. Isotopic ages from these rocks show that they were metamorphosed in the Early Cretaceous, at the same time as the basement in Western Sulawesi. Glaucophane schist metamorphism affects both earlier metamorphic rocks and the mélange, which is overlain to the east by a high temperature metamorphic sole beneath the East Sulawesi Ophiolite. Formation of the mélange and metamorphism were due to mid-oceanic subduction towards the east. Subduction ceased at 28 Ma (Oligocene), when Sundaland ran into the subduction zone, and the ophiolite was obducted onto the continental margin.

Westward subduction then commenced beneath the eastern margin of the ophiolite, terminating in the mid-Miocene when the Banggai-Sula microcontinent ran into the subduction zone. Banggai-Sula originated as a fragment of Australia separated in the Jurassic, which was carried westwards along the Sorong Fault Zone by the movement of the Philippine Sea Plate. This collision had repercussions throughout Sulawesi. The collision zone in the East Arm is marked by the imbrication of Banggai-Sula continental margin sediments with slices of the ophiolite. The metamorphic rocks of Central Sulawesi were thrust across Western Sulawesi, and uplifted blocks of the basement were thrust westwards across the Eocene-Mid-Miocene carbonate platform. The downgoing continental rocks subducted beneath Western Sulawesi gave rise to a volcanic arc in which the volcanic rocks reveal the geochemical signature of their Australian origin.

Evidence from the tectonic evolution of Sulawesi shows that the southeastern margin of Sundaland has grown since the Early Cretaceous by the process of collision and accretion, with the addition of material of both oceanic and older continental origin. It evidently does not matter whether subduction was eastwards, away from the margin, or westwards towards the margin, the net effect was that material was added to the continental margin. The next major event will be the collision of the Australian continent with the southeast margin of Asia.

Ore fluid chemistry and genetic significance of hydrothermal processes: examples from Australian and Myanmar gold and base metal deposits

KHIN ZAW

Laporan (Report)

Dr. Khin Zaw who is with the Centre for Ore Deposit and Exploration Studies, University of Tasmania, Hobart, Tasmania, gave the above talk on the 30 July 1996 at the Geology Department, University of Malaya.

Abstrak (Abstract)

Myanmar, formerly known as Burma has a long history of mining for base metals, tin-tungsten, gold-silver, and gemstones. Myanmar has world class deposits such as the Bawdwin Mine (the largest polymetallic base metal deposit in the world before World War II), and the famous gemstone tract of the Mogok-Momeik area in northern Myanmar. Australia is one of the most productive mineral-rich countries in the developed world and consists of base metal mineralisation such as volcanic- and sediment-hosted massive sulphide deposits and a diverse style of gold mineralisation from Archean lode gold deposits, ironstone-hosted Tennant Creek gold deposits to epithermal gold deposits.

Myanmar consists of tectonostratigraphic terranes which now form continental mainland SE Asia. Myanmar can be sub-divided into six N-S trending tectonic domains, from west to east (1) the Arakan (Rakhine) Coastal Strip as an ensimatic foredeep, (2) the Indo-Burman Ranges as an outer arc or fore arc, (3) the Western Inner-Burman Tertiary Basin as an inter-arc basin, (4) the Central Volcanic Belt (Central Volcanic Line) as an inner magmatic-volcanic arc, (5) the Eastern Inner-Burman Tertiary basin as back-arc basin and (6) the Sino-Burman Ranges or Shan-Tenasserim Massif as an ensialic continental region. The Sagaing Transform

Fault occurs as a tectonically significant boundary between the Eastern-Burman Basin and the continental, ensialic Sino-Burman Ranges.

The Indo-Burman Ranges contains Triassic to Eocene flysch sediments and obducted ophiolites which contains chromite, nickel, PGE and precious metals, and has potential for the discovery of Cyprus type Cu (Au) deposits. The Central Volcanic Belt forms as a magmatic-volcanic arc of Late Cretaceous-Tertiary age and hosts the Monywa porphyry Cu (Au) deposits and a variety of gold-silver deposits (e.g. Kyaukpahto deposit). The Sino-Burman Ranges, which is also termed the Shan-Thai terrane contains Late Pre-Cambrian to Paleozoic sedimentary rocks and local Mesozoic clastics. The Sino-Burman Ranges is the most important region in terms of Myanmar's mineral potential and include at least three different styles of base metal mineralisation, the finest, world class ruby, sapphire, jade deposits and the potential for the discovery of sizeable alluvial diamond deposits. In addition, tin-tungsten veins and structurally controlled, turbidite-hosted, gold deposits are associated with Early Cretaceous-Late Eocene granites at the western margin of the Indo-Burman Ranges in a narrow zone along the Sagaing Transform Fault. The enrichment of base metal mineralisation is exemplified by the Bawdwin Mine (volcanic-hosted base metal deposit), the Theingon Mine (Mississippi-Valley type) and the Yadatheingi Mine (cavity-filled, epigenetic deposit).

Ore fluid research has been currently undertaken at Centre of Ore Deposit and Exploration Studies (CODES), University of Tasmania in collaboration with CSIRO (Commonwealth Scientific and Industrial Organisation) and AGSO (Australian Geological Survey Organisation) using advanced analytical techniques such as fluid inclusion heating/freezing stage, electron microprobe, SEM/WDS, PIXE (Proton-induced X-ray Emission) and LRS (Laser Raman Spectroscopy), FTIR (Fourier Transform Infra-Red) and mass spectrometry. The research has shed light on the understanding of the evolution of hydrothermal processes for the Australian and Myanmar gold and base metal deposits. The research results also provide guidelines for the selection of targets for mineral exploration.

The Hellyer and Mt. Chalmers deposits are mound-style volcanic-hosted massive sulphide (VHMS) deposits in Australia. At Mt. Chalmers, Type I inclusions up to 20 μm are found in quartz from the mineralised zone, and these inclusions yielded homogenisation temperatures of 160–268°C and salinities of 5–8 NaCl equiv. wt %. Laser Raman spectroscopic (LRS) analysis indicates the presence of CO_2 (< 1 mole %) in the Mt. Chalmers VHMS systems. Semi-quantitative SEM/WEDS microprobe analyses of fluid inclusion decrepitates indicate that the Mt. Chalmers ore fluids were enriched in potassium and calcium but depleted in magnesium relative to seawater. PIXE microanalysis of fluid inclusions in quartz also indicates a significant base metal concentration in these fluids. Cation composition and higher salinities relative to seawater suggest that recycled seawater alone cannot be the sole source of the ore fluids. High base metal content and the presence of CO_2 in the fluid inclusions imply that magmatic input of ore metals during seawater leaching of the footwall volcanic pile is a distinct possibility.

KHIN ZAW receiving momento from E.B. Yeap.

Gold-copper-bismuth mineralisation in the Tennant Creek goldfield of the Northern Territory occurs in pipe-like, ellipsoidal, or lensoidal lodes of magnetite ± hematite ironstones which are hosted in turbiditic sedimentary rocks of Proterozoic age. Fluid inclusion studies have revealed four major inclusion types in quartz associated with mineralised and barren ironstones at Tennant Creek; (1) liquid-vapour inclusions with low liquid/vapour ratios (Type I), (2) liquid-vapour inclusions with high liquid/vapour ratios or high vapour/liquid ratios and characteristic dark bubbles (Type II), (3) liquid-vapour-halite inclusions (Type III), and (4) liquid-vapour inclusions with variable liquid/vapour ratios (Type V). Type I inclusions are present in the barren ironstones and the unmineralised portions of fertile ironstones, whereas Types II and III inclusions are recognised in fertile ironstones. Type I fluid inclusions have homogenization temperatures of 100° to 350°C with a mode at 200° to 250°C. Type II inclusions in mineralised ironstones (e.g. Juno, White Devil, Eldorado, TC8 and Gecko K-44 deposits) have homogenisation temperatures of 250°C to 600°C with a mode of 350°C. Type I fluid inclusions have a salinity range of 10 to 30 NaCl equiv. wt %. Salinity measurements on fluid inclusions in the mineralised zones gave a range of 10 to 50 NaCl equiv. wt % with a mode of 35 NaCl equiv. wt %.

Fluid inclusion studies indicate that the Tennant Creek ironstones were formed from a relatively low temperature and moderately saline fluid, whereas gold and copper mineralisation was deposited from later hydrothermal fluids of higher temperature and salinity. Gas analysis indicates the presence of N_2 and CO_2, with very minor CH_4 in Types II inclusions but no N_2 or CH_4 gases in Type I inclusions. Microprobe analysis of the fluid inclusion decrepitates indicates that the inclusions from Tennant Creek contain sodium and calcium as dominant cations and potassium in a subordinate amount.

The high temperatures (≥ 350°C), high salinities (≥ 35 NaCl equiv. wt %) and cation composition of the Tennant Creek ore fluids suggest that the ore fluids were derived from upward migrating heated basinal brines, although contribution from a magmatic source cannot be ruled out. Close association of vapour-rich Type IIb and salt-rich Type III inclusions in the mineralised ironstones (e.g. Juno, White Devil, Eldorado, TC8 and Gecko K-44) indicates heterogeneous trapping of ore fluids. This heterogeneous trapping is interpreted to be due to unmixing (exsolution) of a gas-rich (e.g. N_2) fluid during the upward migration of the metal bearing brines and/or due to degassing caused by reaction of oxidised ore fluids and host ironstones. Fluid inclusion data have important implications regarding the deposition of gold in the ironstones, and can be used in discriminating fertile from barren ironstones in conjunction with other exploration techniques.

The Kyaukpahto gold deposit in Myanmar is located at Latitude 23° 47' 55" N and Longitude 95° 56' 35" E in the Kawlin-Wuntho district, Sagaing Division. Gold mineralisation is hosted in turbiditic sandstone of Male Formation (Lower to Middle Eocene) and occurs as stockwork and dissemination. Gold mineralisation is also associated with intense silicification, sericitisation and argillic alteration. Major sulphide minerals are pyrite and arsenopyrite with minor galena, chalcopyrite, and sphalerite. Gold occurs predominantly as free gold grain (electrum) in stringery quartz veins, and native gold as electrum is also a dominant mineral in the oxidised and supergene zones. The gold grains vary in size from 1 μm to 250 μm and electron microprobe analysis of the grains yields a range of fineness from 844 to 866. Preliminary fluid inclusion study at Kyaukpahto gold deposit reveals three major fluid inclusion types in quartz in the ore zone: (1) Type I, two-phase, H_2O liquid, vapour and CO_2 liquid inclusions and (3) Type III, two-phase, liquid-rich inclusions with variable liquid and vapour ratios. Primary Type I fluid inclusions are 5–15 μm across and yielded homogenisation temperatures of 239°–310°C and salinities of 1.2–10.9 NaCl wt %. Present geological, mineralogical and fluid inclusion characteristics demonstrate that the Kyaukpahto gold deposit is comparable to the Carlin type sediment-hosted gold deposits.

BERITA-BERITA PERSATUAN
News of the Society

KEAHLIAN (Membership)

The following applications for membership were approved:

Full Members

1. Gerald Jelod Jetony
   Pejabat Hasil bumi, Jabatan Ketua Menteri, 88502 Koata Kinabalu.
2. Geh Poh Khong
   36-2, Jalan manis Tiga, Taman segar, Ceras, 56100 Kuala Lumpur.
3. Ali Ab. Jalal
   Petronas Carigali Sdn. bhd., 50776 Kuala Lumpur.
4. Maarof Seman
   Terratech Consultants (M) Sdn. Bhd., Lot 8359, Mukim Batu, Batu 8, 68100 Batu Caves.
5. Malek Musa
   Terratech Consultants (M) Sdn. Bhd., Lot 8359, Mukim Batu, Batu 8, 68100 Batu Caves.
6. Tay Thye Sun
   19 Tanglin Road, #B2-02, Singapore 247909.
7. Malliga Palaniapan
   L & M Geotechnic Sdn. Bhd., No. 2, Jalan SS21/62, Damansara Utama, 47400 Petaling Jaya.
8. Tan Ai Lin
   L & M Geotechnic Sdn. Bhd., No. 2, Jalan SS21/62, Damansara Utama, 47400 Petaling Jaya.

Student Members

1. Yew Hwa Hin
   Jabatan Geologi, Universiti Malaya, 50603 Kuala Lumpur.
2. Tan Yaw Teong
   Jabatan Geologi, Universiti Malaya, 50603 Kuala Lumpur.
3. Wigneswaran A/L Rengganayar
   Jabatan Geologi, Universiti Malaya, 50603 Kuala Lumpur.
4. Roland Jaudin
   Jabatan Geologi, Universiti Malaya, 50603 Kuala Lumpur.
5. Rahayu Abdul Rashid
   Jabatan Geologi, Universiti Malaya, 50603 Kuala Lumpur.
6. Faridah Kamaludin
   Jabatan Geologi, Universiti Malaya, 50603 Kuala Lumpur.

PETUKARAN ALAMAT (Change of Address)

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

1. M. Naser Bin Husin
   82 Jalan BK 2/9, Bandar Kinrara, 58200 Kuala Lumpur.
2. Teoh Lay Hock
   160 SS2/16, 47300 Petaling Jaya, Selangor.

PERTAMBAHAN BAHARU PERPUSTAKAAN (New Library Additions)

The Society has received the following publications:

1. U.S. Geological Survey Prof. Paper (1995): nos. 1567; (1996): 1563, 1409-B, 1497-D, 1408-A.
2. U.S. Geological Survey Bulletin (1996): no. 2000-K, 1917-T, 2150-C, 2130.
3. Episodes, vol. 18, no. 4, 1995.
4. Geoscience & Development, no. 3, 1996.
5. AAPG Bulletin, vol. 80/6, 80/7 & 80/3, 1996.
6. Monthly statistics on mining industry in Malaysia, April & May, 1996.
7. Journal of the Natural History Museum & Institute, Chiba, vol. 4, no. 1, 1996.
8. Journal of the Natural History Museum & Institute, Chiba, Special issue no. 2, 1995.
9. Natural History Research, vol. 4, no. 1, 1996.
10. AAPG Explorer, June, July 1996.
11. Bulletin of the National Science Museum, vol. 22, nos. 1 & 2, 1996.
12. The laboratory of lithosphere tectonics and its dynamics: 1995 annual report.

Second Malaysian Geology Photographic Competition

The Second Malaysian Geology Photographic Competition was launched in the fourth quarter of 1995 with the closing date on 31st December 1995. However due to poor response, the closing date was extended to 31st March 1996. After the second closing date, a total of 18 entries were received.

The Society appointed Dr. H.D. Tjia and Dr. Lee Chai Peng, together with the organising chairman of the competition, Dr. Abdul Ghani Rafek, to judge the competition. Judging was carried out on 17.4.96, based on geological as well as technical aspects of the photographs.

The winners of the competition were as follows:

1st prize	:	Ng Tham Fatt (Botryoidal hematite)
2nd prize	:	Ng Tham Fatt (Baryte)
3rd prize	:	Frank Siew Kee Yong (Limestone cave chamber)
4th prize	:	J.J. Pereira (Peacock Ore)
5th prize	:	Abdul Jalil b. Buyadi (Isoclinal folds)

Five consolation prizes were awarded to:-

J.J. Pereira (Chalcanthite precipitate)
J.J. Pereira (Silicified Oolitic Limestone)
Philemon George (Kink band fold)
Ng Tham Fatt (S-C Mylonite)
Askury Abd. Kadir (Ptygmatite)

The Society intends to organise a third photographic competition in the near future. In view of the somewhat poor response, a publicity campaign will be carried out to attract greater participation, as the competition is open to the public.

Abdul Ghani Rafek

BERITA-BERITA LAIN
Other News

Local News

Three dams to be built in Jelebu

Three dams with a total capacity of about 50 billion gallons will be built in the districts of Jelebu under the Eighth and Ninth Malaysian Plan periods.

Mentri Besar Tan Sri Haji Mohamed Isa Abdul Samad said a study by the State Water Supply Department indicated that the projects were viable.

"The three dams will be able to supply water to Jelebu and outlying districts to supplement existing water projects in the state," he said at a press conference after a ceremony to witness the completion of the 6.2 km transfer tunnel between Sungai Kelinchi Reservoir and Sungai Terip Reservoir in Kampung Mampas here yesterday.

He said the three dams in Jeriang, Kongkoi and Kenaboi would ensure adequate water supply up to the year 2020.

He said designs for an 11-billion-gallon capacity dam in Gemencheh would be tendered out this year for construction.

He said the dam which would have a 1,000 ha water catchment area would solve water woes in Gemencheh, Johol and southern Rembau.

On the RM54.5 million transfer tunnel, Isa said it was the first in Malaysia and South East Asia.

The Sg. Kelinchi Dam and transfer tunnel project was developed for interbasin transfer from the new Kelinchi reservoir to the existing Sungai Terip reservoir via a 6.2 km by 3.5 m-diameter tunnel.

The Kelinchi/Terip interbasin transfer scheme involved the construction of the Sg. Kelinchi reservoir in the upper reaches of the Upper Muar reservoir catchment area.

The Sg. Kelinchi stores water for subsequent transfer to the Sg. Terip reservoir via the tunnel passing through Gunong Berembun which separates the Upper Muar Basin and the Sungai Linggi basin.

Star, 2.7.1996

MMC gets govt nod to lead consortium in highway deal

Malaysian Mining Corp. (MMC) has been given the go-ahead by the Government to lead a consortium in negotiating the privatisation of the RM2.7 billion East Coast Highway, Works Minister Datuk Seri S. Samy Vellu said in Kuala Lumpur yesterday.

The MMC, United Engineers (M) Bhd. and Malaysia-Thai Development Corp. consortium has been given six months from the date of the yet to be signed concession agreement, to finalise details of their participation.

The consortium has been unable to agree on important issues such as equity distribution, resulting in delays to the start of the project.

MMC would also hold discussions with any other parties, such as the Terengganu and Pahang state governments, which show an interest in participating in the project, Samy Vellu said.

The project will be implemented in four phases over a period of six to eight years.

The cost of RM2.7 billion involves construction of a 336-km highway between Karak and Kuantan, followed by Kuantan to Kuala Terengganu, is expected to be completed in three to four years.

The East Coast Highway project holds a 33-year concession.

Star, 5.7.1996

RM19m spent to ensure safe gold mining using cyanide

The mining company which will begin prospecting for gold reserves in Penjom, Kuala Lipis, has spent more than RM19 million to ensure the technology which uses cyanide is safe.

Cyanide is a poisonous chemical used to extract gold ore from earth and stones.

Pasdec Corporation mining project development division geologist Ahmad Rosdi Abdul Razak said Specific Resources Sdn. Bhd., a subsidiary of Canada-based Avocet Ventures Inc., spent a substantial sum to ascertain that only "the best, advanced, safe and modern technology" was adopted.

"So, there is no reason for nearby residents to be worried once the project takes off before the end of this year."

"Besides, the company has also assured the State Government that the method is not harmful and does not have any adverse effect on the environment."

Ahmad Rosdi said the company had also spent another RM80 million for the project, including RM30 million to build its processing plant.

Apart from the technology being safe, the project is located far from the main road and housing areas.

Pahang is set to become the country's leading producer of top-quality gold when SRSB and another mining company, AK Holding Sdn. Bhd., begin their gold mining project in the western part of the State at the end of the year.

SRSB and AK Holding Sdn. Bhd. have received approval from the State Government to prospect for gold on a 361.6 ha area in Penjom, Kuala Lipis, and 260 ha area in Bukit Koman, Raub, respectively.

The two mines are expected to produce 2.92 million grammes of gold worth RM94 million per year. Of these, SRSB will produce 1.55 million grammes annually for 10 years while AK Holding will produce 1.37 million grammes every year for five years.

The State Government will get a five per cent royalty from the area with 2.5 per cent going to Pasdec Corporation.

Ahmad Rosdi said SRSB had confirmed that they would adopt the Inco method for cyanide destruction and arsenic precipitation.

Cyanide destruction using the system has proven that cyanide and arsenic concentrations of less than one milligramme can be achieved.

He said the final discharge would comply with the Malaysian drinking water standards for cyanide and arsenic.

"The water treatment system has been designed to accommodate the safety design."

He said the method had been proven safe and was being used in mining projects in Rusila, Terengganu, and in Bau, Sarawak.

The Pahang Government has given approval for the company to engage the services of six mining experts from Australia to assist in the project.

"They will be based in Penjom for two or three years. A total of 200 local people will be recruited and the experts will conduct on-site training."

Ahmad Rosdi said the company had conducted a feasibility study to ascertain whether it could dig deeper into the earth from the present 90 metres now approved by the Pahang Government.

Early this year, director of Mines (east) Mohamad Yunus Abdul Karim had issued a warning to the companies to follow the guidelines in handling cyanide or face a shutdown.

Mohamad Yunus said since the companies would adopt the "carbon in leach" or "carbon in pulp" methods using cyanide to extract gold ore, they had been told to handle the discharge of the chemical with extra care.

If the companies fail to comply with the regulations, the mines will be closed.

Mohamad Yunus said the department had issued guidelines, on the amount of cyanide to be discharged, to the companies.

The limit that the department will allow is one part per million which is equivalent to one milligramme per litre of the total cyanide to be discharged.

Mohamad Yunus said the amount was very small and would not affect the environment or safety of the people. The department wants a zero discharge.

"We do not want them to discharge any cyanide but if there is, then the limit is only one ppm," he said, adding that cyanide, being an expensive chemical, would not be discharged in large amounts.

"It will be reused to treat more ore. If it is discharged, the effluent will go to the tailings dam. Even before it goes to the dam, it has to undergo many complicated processes to rid it of arsenic or cyanide."

NST, 5.7.1996

Sabah Shell achieves success in drilling, production

Sabah Shell Petroleum Co., the upstream arm of Shell Malaysia and a joint venture partner of Petronas Carigali, yesterday announced a successful drilling and production at the South Furious field, 100 km off the shore of Kota Kinabalu.

This was made possible with the use of a new multi-lateral well drilling technology expected capable of draining 80 per cent more reserves compared to that used for a conventional well.

Sabah Shell, in a statement said that the success is timely for Shell and is attributed to its decision to apply the technology, the first of its kind in Malaysia and in the Asia Pacific region.

"This again puts Shell as a leader in technology application in the upstream petroleum business," it said.

It said the South Furious field is the most complex field in Sabah in terms of geological and reservoir characteristics.

Back in the 1980s, the company pioneered the use of horizontal drilling in this part of the world.

The application of the multi-lateral drilling technology reduces the cost of development.

The multi-lateral well was completed within the budget of RM14 million, reaching several separate drainage points which would otherwise require two wells at a cost of RM18 million.

It said that the success of the operation is the starting point for many more multi-laterals which it believes are a welcome technical edge to cope with low oil price, marginal field development and competitive business environment.

NST, 6.7.1996

Penang spent RM550,000 for slope repairs

Penang has spent about RM550,000 to repair hillslopes on the island following some 60 landslips during the big floods last September.

State Public Works Department district engineer (island) Zainuddin Omar said yesterday the repairs were recommended by three soil experts from the Public Works Institute in Kuala Lumpur after their study on several landslip sites last year.

He said the experts' report, submitted to the PWD in February, showed that the abnormal intensity of the "100-year return period rainfall" in September had caused the landslips.

"In hydrological terms, it means that the probability of rainfall with such intensity will only occur every 100 years," he told *The Star*.

Penang Island was hit by the worst floods in history last September 17 following two days of heavy rain, which caused more than 60 landslips. The areas hit included Penang Hill, Tanjung Bungah, Batu Ferringhi, Teluk Bahang, Paya Terubong, Relau and Jalan Tun Sardon.

Zainuddin said that so far, all landslip sites had been cleared and major slope repairs completed, except for a sea-facing slope beside the Penang Swimming Club in Tanjung Bungah which PWD was seeking tenders for it repair.

PWD, he said, had given priority to repairing slopes which could pose a danger to the public.

"We spent about RM350,000 to do 'guniting' and earth and earth reinforcement at a slope fronting the Penang Swimming Club because the road there is the only link from George Town to the Batu Ferringhi and Teluk Bahang areas."

"At Penang Hill, the major repair is along the jeep track where about RM200,000 was spent to construct 'gabion walls' measuring from three to nine metres to protect the slopes from soil erosion."

Zainuddin also said that PWD workers were inspecting all hilly areas in the island every week to check for any tell-tale signs of landslips.

Star, 6.7.1996

Mineral development board to be set up in '97

A Malaysian mineral development board (MMDB) to oversee development of all metal and non-metal mineral resources will be set up in the middle of next year.

Primary Industries Minister Datuk Seri Dr. Lim Keng Yaik said the board would replace the existing Malaysian Tin (Research and Industrial) Development Board.

Two departments — the Geological Survey Department and the Mines Department — would be amalgamated under the new board, he told reporters after opening a reflexology path costing RM25,000 at Kampung Baru Merbau in Pantai Remis on Saturday.

Dr. Lim said the new board would enable the country's mineral resources to be exploited to the maximum as well as facilitate a paradigm shift towards downstream activities.

He said a National Mineral Policy was adopted several years ago but there was no single body to enforce it, a shortcoming that will be solved with the establishment of the MMDB.

Representatives from the mineral industry will be included in the new board, he added.

Besides tin, Dr. Lim said, the other main minerals in the country that can be exploited are metals such as gold, zinc and copper; and non-metals like granite, limestone, ball clay and kaolin.

Star, 8.7.1996

Perak plans to start making advanced ceramic products

Perak will embark on the manufacture of advanced ceramic products used in the electrical and electronics industry in an effort to diversify.

International Trade and Industry Minister Datuk Seri Rafidah Aziz said efforts had been made to bring in a US-based company specialising in the manufacture of such products.

"This is also part of our efforts to ensure that more attention is put into the manufacture of high value-added goods," she told reporters after the MITI-state government joint committee meeting in Ipoh on Monday.

Rafidah said at present the ceramics industry was only producing traditional and ordinary tiles and it was time for the operators, especially those at the Perak Ceramic Park, to expand their operations.

At present, ceramics contribute RM25 million to the state's revenues annually.

Star, 10.7.1996

Third gas discovery in joint development area

A third gas discovery has been made in Block A-18 of the Malaysia-Thailand Joint Development Area, off the north-east coast of Kelantan.

The Malaysia-Thailand Joint Authority said yesterday Bulan-1 well, spudded on June 4, was drilled to a depth of 7,140 feet to test potentials of the Bulan prospect, west of the Cakerawala Gas Field in Block A-18.

Three drill stem tests, conducted over intervals of 4,044 to 6,842 feet, yielded a combined gas flow rate of 36 million standard cubic feet per day plus 123 barrel per day of condensate measured through choke sizes ranging from 56/64 inches to 96/64 inches, it added.

The Bulan-1 well is located about seven kilometres north-west of the first gas discovery Cakerawala-1A well, and about 260 km east of Songkhla and 140 km north-east of Kota Baru.

MTJA said the operator, Carigali-Triton Operating Company Sdn. Bhd., on behalf of the contractors for Block A-18 — Petronas Carigali (JDA) Sdn. Bhd., Triton Oil Company of Thailand (JDA) and Triton Oil Company of Thailand — was plugging and abandoning the well.

MTJA said the drilling rig "Falcon" was moving to the Suriya Gas Field in Block A-18 to drill an appraisal well.

The two groups of MTJA contractors under its production sharing contracts signed on April

21, 1994 are Petronas Carigali (JDA) Sdn. Bhd., Triton Oil Company of Thailand and Triton Oil Company of Thailand (JDA) Ltd. for Block A-18, and PTTEP International Ltd. and Petronas Carigali (JDA) Sdn. Bhd. for Blocks B-17 and C-19.

NST, 17.7.1996

Fourth gas discovery for Carigali-Triton

Carigali-Triton Operating Company (CTOC) has made a fourth natural gas discovery in the southwest portion of the recently discovered Cakerawala Field in the Thai Gulf.

This followed the successful testing of the Cakerawala-3 appraisal well on Block A-18 in the Malaysia-Thailand Joint Development Area, Triton Energy Limited, a Dallas-based international oil and gas exploration company, said in a statement yesterday.

This is the fourth successful well drilled in the field and the sixth successful well drilled on Block A-18 by CTOC. Oil has been discovered too, the statement added.

The oil reservoir discovered by the drilling of Cakerawala-3 was previously untested and would require more evaluation to determine its exact size.

CTOC recently discovered a natural gas field immediately west of the Cakerawala Field with the Bulan-1 well.

NST, 19.7.1996

Report: Erosion at Penang Hill serious

Erosion risk at Penang Hill is "severe" according to the Penang Hill Local Plan report.

Evidence of erosion and landslides had been found along the summit, the roadside and both sides of the furnicular railway.

The opening up of forest land and increase in agricultural activities had exposed bare soil to rain and led to serious erosion.

The report also noted that a total 277.8 hectares, mostly forest or land that had been cleared for some form of agricultural uses, needed rehabilitation.

Most of the farming and terracing in privately-owned land were illegal as they had contravened the Land Conservation Act which prohibited farming on steep slopes.

Due to sedimentation of rivers, flash floods were becoming more common in areas where tributaries and main Sungai Pinang flow.

The report pointed out that floods had occurred in the Air Itam and Waterfall area besides becoming more serious in the city.

It also noted that the jeep track leading from the Botanic Garden to Strawberry Hill had been "fraught with problems of gully erosion on the track, slope failure and collapse of road embankments."

It also identified three major pockets of unplanned settlement at the base of the hill.

"The present administrative system allowing this form of development to continue should be discouraged," it said.

The Local Plan called for a comprehensive water catchment management plan, consisting of both structural and non-structural measures.

"During the course of any land development activities, sediments transported with storm water should be controlled at the point of the source itself. Vegetative cover measures should be instituted to reduce erosion."

To ensure proper land clearing practises, the Plan called for proper scheduling of land activities.

Star, 19.7.1996

Buoyant outlook for granite

The granite industry is projected to grow between 12 and 15 per cent annually for the next five years, according to the Johor Granite Quarries Association.

Its president K.C. Tey said the positive outlook was due to the buoyant construction market as well as several large infrastructure projects being planned.

He added that with the projected growth, greater efforts had to be taken to identify untapped granite reserves so as to maximise production.

"The outlook for the industry is very positive especially for Johor given its dynamic property industry and the state's massive rural road redevelopment programme."

"However, the state and the industry has to come up with a long-term plan to identify and extract granite reserves, or the industry may not be able to meet the expected demand over the next few years," he told *Star Business* after the association's third annual dinner here recently.

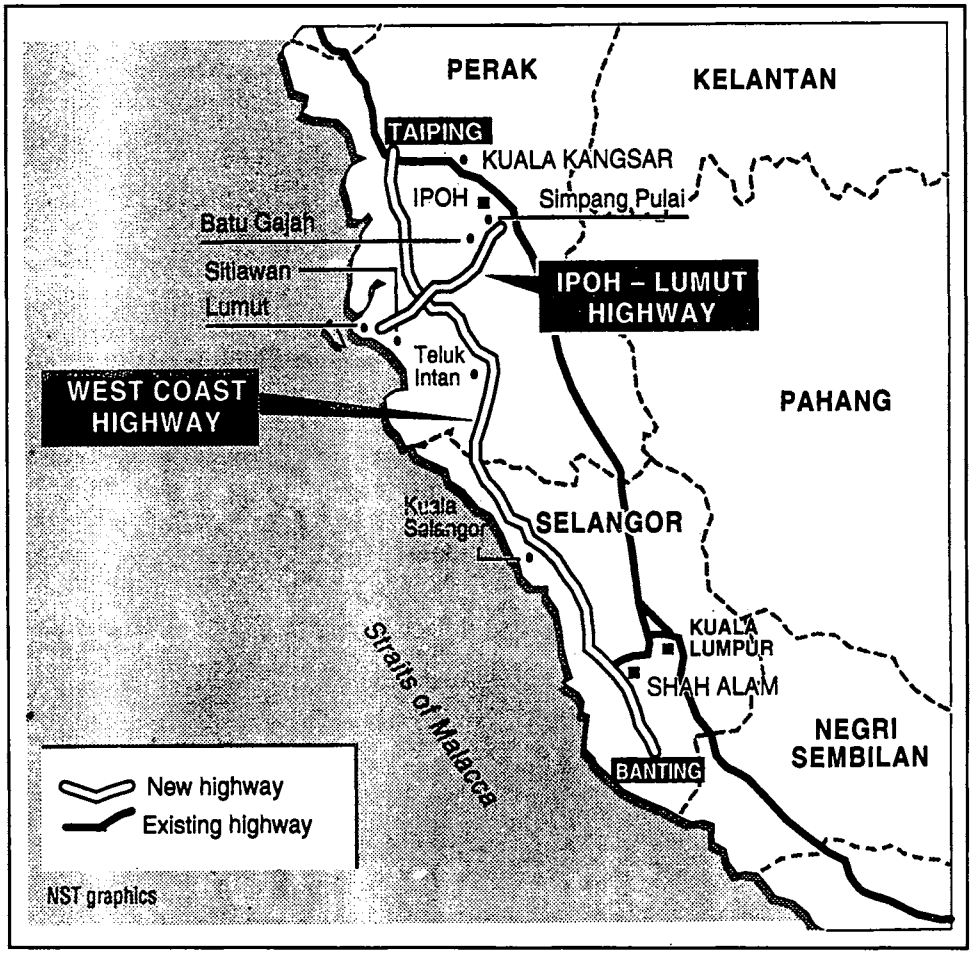
Tey said improper planning had already threatened the closure of several quarries in Johor, including three in Masai, two in Segamat and one each in Kluang and Batu Pahat, as the areas had been earmarked for development.

Star, 25.7.1996

Two highway projects costing RM7b approved

The Cabinet has approved the construction of two highways, costing about RM7.1 billion, to be undertaken by different consortiums under the privatisation programme.

The first is the West Coast expressway, a new 259 km road linking Banting and Taiping costing RM6 billion, to be built by Konsortium Lebuhraya Pantai Barat.



This consortium is made up of Talam Corporation Bhd., Larut Consolidated Bhd., Perak State Development Corporation and Kumpulan Darul Ehsan Bhd.

The other project is a new 68 km Ipoh-Lumut road which was awarded to a consortium made up of Malaysian Resources Corporation Property Holdings Sdn. Bhd. and PSDC.

Works Minister Datuk Seri S. Samy Vellu told a press conference today that construction of the highways was expected to begin next year as details of the projects have yet to be sorted with the companies.

He said the West Coast highway was expected to be ready by 2004.

It will be divided into two sections, a 230 km stretch from Taiping to Klang and a 29 km link between Klang and Banding.

Work will be carried out in three phases starting with the Kapar-Banting stretch which is due for completion by 2000.

Samy Vellu said the highway would be a dual carriageway with certain sections having four lanes and others, six. There will be 10 rest areas.

He said the Government has proposed that the consortium be given a 35-year concession period to collect toll based on the closed toll system, except for certain areas in the Klang Valley where an open system would be used.

He said the highway would have interchanges linking it to the North Klang Straits bypass, Federal Highway Route 2, Sri Andalas (Klang), Shah Alam Highway and South Klang Valley Highway.

Other interchanges along the highway will be at Beruas, Sri Iskandar, Kampung Gajah, Telok Intan, Hutan Melintang, Sabak Bernam, Asam Jawa and Kapar.

"The details of the projects will be sorted out with the Economic Planning Unit and Treasury."

On the RM1.1 billion Ipoh-Lumut highway, Samy Vellu said when completed by 1999, the highway would help develop Lumut, Sitiawan, Sri Iskandar and Batu Gajah.

The Government will provide a soft loan of RM212 million at eight per cent per annum for the consortium to undertake the four-lane dual carriageway project, which will have seven interchanges.

The consortium will be given a 33-year concession period to collect toll under the closed toll system.

NST, 2.8.1996

Nationwide power failure causes chaos

The national power grid collapsed yesterday, causing a total blackout in peninsular Malaysia.

The massive failure was traced to the Paka power station transmission line in Terengganu which tripped at 5.17 pm.

The cascading effect of the trip shut down supply in sequence at all power stations. Besides plunging homes and offices into darkness, the failure caused traffic chaos, industrial shutdowns and official functions and sports events to be cancelled.

Energy, Telecommunications and Post Minister Datuk Leo Moggie told reporters during a hastily convened press conference at Tenaga's National Load Dispatch Centre in Jalan Bangsar at 9 pm yesterday that the company was working round the clock to restore power within 24 hours.

Moggie, who had earlier briefed the Prime Minister on the blackout, said all indications pointed to the Paka power station.

However, he could not state the actual cause of the power debacle, the worst in this decade. The last major breakdown on September 29, 1992 affected all but three states in the peninsula — Kelantan, Terengganu and Perlis.

Moggie said he would recommend to the Cabinet to review Tenaga's network and propose that foreign experts be engaged to study the existing system.

"The problem is to make sure that balance in the system is maintained properly. It is a sensitive equilibrium of supply as the transmission has to be monitored to prevent the risk of the line tripping again."

Among the areas where supply was back to normal by 11 pm were Paka and Dungun in Terengganu, Kelumpang and Rawang in Selangor, Cheras in Kuala Lumpur and Damansara in Petaling Jaya.

Other places were Grik, Kuala Kangsar in Perak, Kuala Pilah, Kuala Kelawang and Jempul in Negeri Sembilan, Pasir Gudang, Skudai,

Tampoi, Kluang and Johor Baru in Johor as well as Cameron Highlands in Pahang.

In Penang, supply came back to parts of the island from Gelugor to Batu Ferringhi, in stages from 11.15 pm while power was restored to Bukit Mertajam at about 10.30 pm.

Star, 4.8.1996

Archaeologists discover oldest pre-historic site

Malaysia's oldest pre-historic site dating back to between 50,000 and 100,000 years has been discovered by archaeologists in Bukit Jawa here.

Universiti Sains Malaysia director of the Centre for Archaeological Research Malaysia Prof. Datuk Zuraina Majid said they found various types of stone tools at the site on July 31.

"This may have been the capital and centre of activity in Palaeolithic times in Malaysia," she said at the site yesterday.

The area, spreading over one square kilometre, is believed to be the oldest because the material evidence found there was far more primitive than those found at 30,000 years old Kota Tampan which was declared as the oldest site in 1987.

According to Prof. Zuraina's theory, the Bukit Jawa site was an island surrounded by a lake which existed in the middle-Palaeolithic times.

Prof. Zuraina said she hoped they would be given more time to excavate the area to gather more evidence. The site happens to be the route for the expansion of the road linking Lenggong and the East-West Highway.

Star, 7.8.1996

Shell launches massive offshore exploratory ops

Shell Malaysia has embarked on massive deep-water operations off the coasts of Sabah and Sarawak to explore oil and gas reserves beneath the seabed.

The company is spending some RM75 million to carry out the undersea seismic surveys, among the largest exercises to date, covering 4,000 sq. km.

The exercise, being conducted by the geophysical department of the Sarawak Shell Bhd./Sabah Shell Petroleum Co. Ltd. (SSB/SSPC), is being carried out on two frontier deep-water blocks offshore Miri and Labuan.

The company, in its latest report, said the objective of the two seismic surveys was to acquire accurate and indepth data on the amount of hydrocarbon reserves in the region.

The two-dimensional seismic survey on *Block SK-E*, offshore Miri, will involve 3,172 sq. km seabed. The block is 50 km from the Miri coast.

A Norway-based seismic vessel, *MV Geco Echo*, has been hired for the job to image the 2,000 m deep subsurface.

In the operations off Labuan, a three-dimensional seismic survey has started on *Block SB-G*, about 100 km northeast of Labuan.

The company said at least RM30 million would have to be spent to explore and conduct drilling on *SK-E* while another RM45 million would be spent on similar operations in *SB-G*.

"About 5,200 gigabytes of data is expected to be recorded. Processing of the data will take place simultaneously with the acquisition, with the aim to have the first dataset fully processed and ready for interpretation by December."

"The two surveys bring to a total of five major seismic surveys to be carried out this year, giving an annual total of over 1,161 sq. km of 3D seismic and 4,915 sq. km of 2D seismic, the highest ever in the history of SSB / SSPC," said the report.

Star, 8.8.1996

No extra toll with wider highways

Toll rates will not be increased when Projek Lebuhraya Utara-Selatan (PLUS) widens the 862 km North-South Expressway from four lanes to six, Works Minister Datuk seri S. Samy Vellu said yesterday.

He said existing conditions on rates in the 30-year concession agreement between the Government and PLUS would not be revised for the project.

Samy Vellu said PLUS had been told to undertake widening work within its means, while the Government would help out if necessary.

"If the agreement does not permit it, I will approach the Finance Ministry and the Economic Planning Unit to subsidise the project."

Samy Vellu had said on Friday that the North-South Expressway would be expanded to six lands to overcome traffic congestion.

The minister had said the 13.5 km four-lane road on the Penang bridge also had to be widened to overcome traffic congestion.

Star, 11.8.1996

Hill plan gets nod

The Penang Island Municipal Council has approved the draft plan of the Penang Hill Local Plan, drawn up by the council's Town and Country Planning department.

Its president Dr. Teng Hock Nan said the plan was tabled during the full council meeting and unanimously approved yesterday.

Although the draft plan had been approved, Dr. Teng said the council would not reveal it to the public yet.

"We are forwarding it to the State Planning Committee for comments before exhibiting the plans to the public."

"This is only a draft plan. We can always withdraw this plan if the State Planning Committee does not approve it," he said.

Dr. Teng said the council would display the plan for 30 days after getting comments from the State Planning Committee.

The Penang Hill Plan, which took five years to complete, proposes for the hill to be promoted for its "interesting and appealing cultural history" and eco-tourism.

The hill covers a total area of 464.14 ha including the area within the Penang Hill gazetted town limit.

The plan also includes the areas in the vicinity of the Lowe Station, South View, Tiger Hill and Fern Hill and part of the water catchment area.

Penang Hill has been identified as an area with special characteristics in terms of flora, topography and heritage and the plan specifies that any development must be carefully planned to preserve these features.

The State Government had requested the Town and Country Planning Department to draw up guidelines to ensure a balanced and systematic development of Penang Hill.

This followed the submission of a comprehensive plan to develop the hill by a private consortium, Bukit Pinang Leisure Sdn. Bhd. in 1989, which drew widespread public protest.

Two Environmental Impact Assessment reports submitted by the consortium were also rejected by the Department of Environment in May 1991 and January 1992 respectively.

Besides the Penang Hill Local Plan, Dr. Teng said the council was also looking at four other plans.

They are the Tanjung Tokong, Tanjung Bungah, Batu Ferringhi and Teluk Bahang Local Plans.

"The draft plans are almost ready now," he said.

NST, 11.8.1996

Visitors to Tasik Bera wetland will be limited

The State Government will limit the number of tourists to Tasik Bera, which is a protected wetland site under the Ramsar Convention.

This is to ensure proper conservation of the wetland habitat can be undertaken effectively.

Deputy Menteri Besar Datuk Hasan Arifin said the number of visitors, however, had yet to be finalised and measured aimed at protecting the wetland would be carried out soon.

"We do not want the visitors to treat this lake like other tourist spots although it will be gazetted as a public reserve."

"We hope they can assist the State Government in taking care of the lake and realise the importance of wetlands to the environment."

Hasan said the objective of the move was also to attract nature-lovers to come to the areas.

"The actual number of visitors will be finalised soon and we hope that everybody will work together to preserve this wetland which has become the pride of the country."

"If they extend their cooperation, this means they are contributing to the national wetland policy and action plan."

Under the Ramsar Convention, member countries are obliged to promote the wise use of wetlands in their territory or create wetland reserves. They are also to have consultation on shared wetlands or water systems.

Member countries are obliged to list at least one wetland site for inclusion in the List of Wetlands of International Importance. Tasik Bera is Malaysia's sole site that has been registered as such.

Wetlands are defined as areas of marsh, peatland or water, which are natural or artificial. They can be permanent or temporary, with water that is fresh, brackish or salty. Also included are sea areas which are less than six metres deep at low tide.

Menteri Besar Tan Sri Mohd Khalil Yaakob had said that the State Government had gazetted 26,000 ha in Tasik Bera as a public reserve for the purpose of conservation as agreed under the treaty.

The areas gazetted included the surface of the lake. It also declared 27,500 ha of water catchment area around the freshwater lake as a buffer zone.

Khalil added the State Government had also adopted an integrated development programme for the area.

NST, 12.8.1996

Dam to meet water needs for next 25 years

The Ulu Sungai Lembing dam which is scheduled to be completed in 1999 will ensure enough water supply here for the next 25 years.

Mentri Besar Tan Sri Haji Mohamad Khalil Yaakob said the dam would be able to meet all domestic and industrial needs of the state capital.

"We will give priority to its completion. It will be able to supply up to 200 million gallons a day when fully operational."

"The current consumption rate is about 32 million gallons a day and this figure is expected to increase rapidly with industrialisation," he told reporters recently.

Khalil said work on the dam was expected to start this year.

He said the construction would take two years while filling the dam would take another two years.

He said tenders were opened only to local contractors.

"Further studies on the water needs up to 2020 is being conducted by the Economic Planning Unit, a private consultant and the state government."

Star, 13.8.1996

Lenggong may be oldest Stone Age site

Foreign archaeologists believe that the pre-historic site discovered at Lenggong, dating back to between 50,000 and 100,000 years, is the largest and oldest site of the Paleolithic Age (early Stone Age) in the world.

Archaeologists Dr. Surin Pookajorn of Thailand's Silpakorn University and Dr. Alfred Ferdinand Pawlik from Germany base this belief from unusual archaeological evidence unearthed in the area.

Pookajorn said his conclusion was based on the stratigraphy of the soil and ash deposits (soil layers and ash remnants) from the volcanic explosion in North Sumatra at Lake Toba, which occurred between 20,000 and 30,000 years ago.

The Lenggong site, he added, was believed to have been covered by layers of soil before the explosion occurred.

He said the area, covering more than eight hectares, should be preserved and excavation should be allowed to continue.

Pookajorn said archaeologists, local and foreign, would then have the opportunity to do more research and conduct tests to ascertain the age of the site.

"Results from the study could prove that the site was one of the most significant archaeological findings in the world," he said during a visit to the site today.

Pookajorn, a professor at the university, said an indepth research was needed to uncover further archaeological evidence such as animal bones, botanical seeds and possibly skeletal human remains.

He also said several undisturbed cave sites in the area could be excavated to find evidence to link it with the activity of pre-historic man.

Pawlik, a stone tool expert attached to Universität Tubingen, Germany, said the stone tools discovered at the site were made from local materials, quartz and quartzite, which were found in abundance during that period.

This, he said, showed the tools were dated between 50,000 and 100,000 years ago.

"The site is unique, not only from the structure and size of the area, but also from the artefacts which have been found."

"Furthermore, the morphology (shape and size) of the stones also seem to point in that direction."

Pawlik said based on geological data, the site was already covered with soil before the volcanic explosion occurred in North Sumatra.

He added this meant that it must be older than the other previous pre-historic sites unearthed at Kota Tampan, some six km from the existing site.

He also said geological findings revealed that the volcanic ash was about 34,000 years old.

The Lenggong site covering an area of 8 ha at Bukit Jawa, Kampung Geluk, had been earmarked for the expansion of a road from Kuala Kangsar to Lenggong-Lawin-Grik. Construction is expected to begin soon.

Head of the archaeological team excavating at the site, Universiti Sains Malaysia Centre for Archaeological Research Malaysia director Datuk Zuraina Majid, and her team of 40 researchers have until the end of the month to complete their excavation.

Zuraina said her team was trying to gather as much evidence as possible before the August 31 deadline.

She said excavation cost for site to date was RM30,000 and that more was needed if work were to continue.

She, however, was doubtful that they would be allowed a further extension because she said the agreement had already been made with the Public Works Department to complete by then.

"We are not only short of funds but also lack manpower to continue after the deadline."

Zuraina and the researchers, including geologists, have worked on the site since early this month.

So far, they have discovered a few hundred artefacts, particularly stone tools, believed to have belonged to a civilisation dating back to the early Stone Age.

NST, 15.8.1996

Fossils of 'Perak Man' go to Tokyo

The 11,000-year-old renowned 'Perak Man' — the oldest skeleton of modern man found almost intact in Malaysia — was flown to Tokyo yesterday for display at the *Early Man in the World* international exhibition next month.

Museums and Antiquities Department director-general Dr. Kamarul Baharin Buyong said the skeletal remains would be featured, alongside other human fossils discovered around the world, during the three-month long exhibition at the Tokyo National Science Museum.

A similar exhibition in Tokyo five years ago attracted more than one million visitors.

"Two research staff from Universiti Sains Malaysia's Centre for Archaeological Research Development from Penang yesterday, carrying the remains."

"They will be greeted by officials from the science museum, who had requested us to provide the human artifact for the exhibition," he told *The Star* yesterday.

Dr. Kamarul said the USM centre, headed by Datuk Prof. Dr. Zuraina Majid, had carried out further analysis into the Perak Man fossils, which had been unearthed in June, 1990 at Gua Gunung Runtuh in Lenggong, Perak.

The Perak Man has been identified as belonging to the Australomelanesoid race.

He is believed to have been between 40 and 45 years old when he died.

Star, 20.8.1996

Landfill can now treat 4,000 tonnes

The 58-hectare Air Hitam sanitary landfill, which utilises French technology to minimise the environmental impact of waste management, can now treat up to 4,000 tonnes of waste per day.

The landfill, in Puchong, was originally planned to treat up to only 2,500 tonnes per day. It is now treating up to 1,400 tonnes of waste per day.

Selangor Menteri Besar Tan Sri Muhammad Taib, speaking to reporters after opening the site, said the landfill was needed to overcome waste disposal problem.

"Though there are some complaints about the 'tipping fees' (between RM25 to RM33 per tonne), the amount is reasonable if we consider the benefits," he said.

Muhammad said the State Government opted for the sanitary landfill system because other methods, like using incinerators would also eventually result in waste being disposed at a landfill site.

Worldwide Holdings Berhad through a joint venture with a well-established waste management company Sita Group of France, has formed Worldwide Sita Environmental Management Sdn. Bhd. to manage the landfill.

It has a 20-year concession and estimated to have a turnover of RM10 million per year or RM750,000 per month.

Worldwide Holdings chairman Datuk Yaacob A. Hamid said the landfill was the first environmentally-friendly landfill of its kind to be operational in Malaysia.

"It provides a scientific approach to waste disposal and protects the environment by containing and isolating the waste, using specific pollution control measures to minimise environmental impact. The WSEM has allocated RM30 million to set up the facilities at the site."

With the closure of the Kelana Jaya and Bukit Kemuning dumpsites, all rubbish collected from areas within the jurisdiction of the Petaling Jaya Municipal Council, Petaling District Council and Kuala Lumpur City Hall is being diverted to Air Hitam.

NST, 20.8.1996

Downpour triggers torrent of death

An avalanche of logs, earth and debris swept down a hill burying alive at least 16 people and wiping out the Pos Dipang orang asli settlement near here after an hour of heavy rain on Thursday evening.

The swollen Sungai Dipang swept away about 30 houses at the settlement, about 5 km south of Gunung Tempurung.

The avalanche left in its wake a 15 km trail of destruction, damaging two bridges across the river and cutting off the road from Kuala Dipang to the settlement.

The tragedy, described as the worst in Perak since the "great floods" of 1926, occurred a few minutes after 6 pm on Thursday.

Survivors said they heard a loud roar just before the earth and debris hit the settlement.

Except for the 36 orang asli who were dead or missing, the rest of the 600 villagers in the settlement managed to escape to higher ground.

Star, 31.8.1996

September 22-25

EARTH SCIENCE EDITING (30th Annual Meeting of the Association of Earth Science Editors), Sudbury, Ontario, Canada. (c/o MNDM, B4-933 Ramsey Lake Rd., Sudbury, Ontario, Canada P3F 6B5. Phone: (705) 670 5765; Telefax: (705) 670 5770)

September 25-27

CALIBRATION AND RELIABILITY IN GROUNDWATER MODELLING (International Conference, CARE '96), Golden, Colorado, USA. (International Groundwater Modelling Center, Colorado School of Mines, Golden, Colorado 80401, USA. Phone: 303 273 3103; Telefax: 303 273 3278; E-mail: igwme@mines.colorado.edu)

September 25-29

CHARNOKITE AND GRANULITE FACIES ROCKS (International Symposium), Madras, India. (Dr. V. Ram Mohan, Dept. of Geology, University of Madras, AC College Campus, Madras, India PIN 600 025. Phone: 091 44235 1137; Telefax: 091 44 235 2870)

September 29 – October 3

SCIENTIFIC DATA IN THE AGE OF NETWORKING (15th International CODATA Conference), Tsukuba, Japan. (Codata '96, Express Co., Ltd., Daiichi Shibuya Shimizu Building, 1-11-8 Shibuya, Tokyo 150, Japan. Phone: 81 3 54851200; Telefax: 81 3 54851266; E-mail: kayo@express.co.jp)

September 30 – October 3

GROUND PENETRATING RADAR (6th International Conference), Sendai, Japan. (Dr. M. Sato, Dept. of Resources Engineering, Tohoku University, Sendai 980-77, Japan)

October 7-11

ENVIRONMENTAL ISSUES AND WASTE MANAGEMENT IN ENERGY AND MINERAL PRODUCTION (4th International Symposium), Cagliari, Italy. (R. Ciccu, Dipartimento di Geoingeneria et Tecnologie Ambientali, Universita degli Studi di Cagliari, Piazza d' Armi, 09 123 Cagliari, Italy. Phone: 39 7022 2317; Telefax: 39 7027 2031)

October 9-12

NATURAL HAZARDS AND DISASTERS (2nd Caribbean Conference), Kingston, Jamaica. (Dr. B. Carby, Dept. of Geology, UWI, Mona, Kingston, Jamaica)

October 16-19

MINERAL DEVELOPMENT IN ASIA PACIFIC — CHALLENGES IN THE 21ST CENTURY, Jakarta, Indonesia. (Indonesian Mining Association (IMA), Jl. Prof. Dr. Supomo SH. No. 10, Jakarta 12870, Indonesia. Phone: (62-21) 830 3632, 828 0763; Fax: (62-21) 830 3632, 828 0763).

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)

November 6-8

THE 18TH NEW ZEALAND GEOTEHRMAL WORKSHOP, Auckland, New Zealand. (Professional Courses, Centre for Continuing Education, The University of Auckland, Private Bag 92019, Auckland, N.Z. Phone: 64-9-373 7599 ext. 7050; Fax: 64-9-373 7419; E-mail: professional.courses@auckland.ac.nz)

November 10-15

A WORKSHOP ON TUFFS — THEIR PROPERTIES, USES, HYDROLOGY, AND RESOURCES, Santa Fe, New Mexico. (Grant Heiken, Earth and Environmental Sciences Division, EES-1, Los Alamos National Laboratory, Los Alamos, New Mexico, 87545 USA. Phone: 505-667-8447; Fax: 505-665-3285; E-mail: heiken@lanl.gov)

November 17-22

HYDROLOGY IN THE HUMID TROPICAL ENVIRONMENT (International Symposium), Kingston, Jamaica. (A.I. Johnson, Water and Soils Consulting. 7474 Upham Court, Arvada, CO 80003, USA. Phone and telefax: 303 425 5610)

Downpour triggers torrent of death

An avalanche of logs, earth and debris swept down a hill burying alive at least 16 people and wiping out the Pos Dipang orang asli settlement near here after an hour of heavy rain on Thursday evening.

The swollen Sungai Dipang swept away about 30 houses at the settlement, about 5 km south of Gunung Tempurung.

The avalanche left in its wake a 15 km trail of destruction, damaging two bridges across the river and cutting off the road from Kuala Dipang to the settlement.

The tragedy, described as the worst in Perak since the "great floods" of 1926, occurred a few minutes after 6 pm on Thursday.

Survivors said they heard a loud roar just before the earth and debris hit the settlement.

Except for the 36 orang asli who were dead or missing, the rest of the 600 villagers in the settlement managed to escape to higher ground.

Star, 31.8.1996

International Conference
on

PERMIAN OF EASTERN TETHYS: BIOSTRATIGRAPHY, PALAEOGEOGRAPHY & RESOURCES

to be held at
Deakin University, Rusden Campus,
Melbourne, Australia
30 November – 3 December 1997

INVITATION:

The Organizing Committee cordially invites you to join your colleagues at the first international conference on **The Permian of Eastern Tethys: Biostratigraphy, Palaeogeography and Resources**, to beheld at Deakin University, Melbourne, between 30 November – 3 December 1997.

OBJECTIVE:

In many respects, the Permian Period has been regarded as a critical turning point in geological history. Economically, the Permian System is also extremely important as it contains extensive black coals, metalliferous deposits and locally significant quantities of oil and gas. This conference is designed to improve our current understanding of the System, with particular emphasis on the Eastern Tethys region.

THEMES

The Conference will be structured into seven main themes:

- Permian stratigraphy, sedimentology and palaeontology of peri-Gondwanan and eastern Asian terranes;
- Antitropical (bipolar) distribution of Permian biota and biostratigraphical/palaeoclimatic implications;
- Permian palaeogeography and climate of Eastern Tethys;
- Permian migration pathways of biotas in eastern Tethys;
- Correlation of Permian sequences between Gondwanan, Tethyan and Boreal Realms;
- Distribution of Permian coal deposits in relation to climate and palaeogeography;
- Geochronology and boundaries of the Permian Period.

PAPER AND POSTERS:

The Organizing Committee now calls for titles, abstracts and papers from intending participants. The abstract volume will be published as a special issue of the Deakin university, School of Aquatic Science and Natural Resources Management Technical Paper Series (with ISBN number). Abstracts to be included in the abstracts volume will be required as photo-ready copy, disc or email by July 1997. Abstracts may be up to three A4 pages in length (both illustrations and references inclusive). Posters are also welcomed.

FIELD EXCURSIONS:

Two excursions are planned:

1. During-Conference excursion:

A full-day during-conference excursion is being planned to examine the classic Permian Gondwanan glacial sequence in the Bacchus Marsh area, about 60 kilometres from Melbourne (Non-marine Triassic and Tertiary outcrops can also be examined on the same excursion).

2. Post-Conference excursion: southern Sydney Basin, New South Wales

This post-conference excursion will take place between 4–7 December 1997, to examine the Permian sedimentary sequences (both marine and non-marine) of the southern Sydney Basin along the southeastern coast of New South Wales. Participants will have the opportunity to collect abundant Permian brachiopod, bivalve, gastropod, bryozoan and plant fossils. The excursion will end in Sydney on 7th December 97. Participants who are to attend the PAFF conference will be dropped off at Wollongong. For more details of PAFF conference, see the 'Special Note for Participants' on the back of this page.

PUBLICATIONS:

We anticipate that referred and accepted papers will be published either as a book or as a monograph/ special issue of an international journal series. A paper must be presented (either orally or in poster) before being considered for publication.

REGISTRATION, EXCURSION & ACCOMMODATION:

Registration fee for the Conference (including abstracts volume, proceedings and morning and afternoon teas) will be $150 Australian dollars ($75 for student participants). Details of fees for field excursions and accommodation will be distributed in the second circular.

DATES TO REMEMBER:

July 1996	:	Release of First Circular;
1 February 1997	:	Deadline for submission of response to first circular;
15 April 1997	:	Release of second circular and registration form
1 July 1997	:	Deadline for submission of abstracts
1 August 1997	:	Deadline for submission of pre-registration

SPECIAL NOTE TO PARTICIPANTS:

The Permian Eastern Tethys conference is closely linked in time to another international conference on "Palaeobiogeography of Australasian Faunas and Floras" (PAFF) to be held at the University of Wollongong from 8 to 11 December 1997 with a session on Permian palaeobiogeography and a five-day post-conference excursion planned in New South Wales on biostratigraphy and contemporary floral associations of the Snowy Mountains. For further details, please contact Associate Professor Tony Wright on

Tel: 61-42-213 329;
Fax: 61-42-214-250;
E-mail: t.wright@uow.edu.au

Please send all correspondence to:

The Secretariat,
PERMIAN OF EASTERN TETHYS CONFERENCE,
School of Aquatic Science & Natural Resources Management,
Deakin University, Rusden Campus,
662 Blackburn Road, Clayton, Victoria 3168,
AUSTRALIA

Tel: 61-3-9244 7429;
Fax: 62-3-9244 7480;
E-mail: asnrm@deakin.edu.au

Conference on recent advances in soft soil engineering

Kuching, Sarawak, Malaysia
5–7 March, 1997

Organised by:
Universiti Malaysia Sarawak
The Institution of Engineers Malaysia (IEM) Sarawak Branch
Public Works Department, Sarawak

Main Sponsor:
Cahya Mata Sarawak Berhad

Co-Sponsors:
Sarawak Economic Development Corporation (SEDC)
Association of Consulting Engineers Malaysia (ACEM) Sarawak Branch

This conference will provide a forum for the interaction and exchange of experience in soft soil engineering amongst practising engineers, contractors, academicians, regulatory authorities and professionals in related fields. Particular emphasis is given to organic peat soil in tropical regions. The conference also aims at providing an arena for professionals in land use studies (agricultural engineers etc.) and the environment to contribute their experiences.

The conference will focus on the following topics related to engineering in soft soils.

- Characteristics, testing and fundamental behavior of soft mineral and organic peat soils.
- Engineering analysis and design methods particularly in organic peat soils.
- Construction procedures and appropriate technologies.
- Land use and environmental issues.

Authors are invited to submit 2 copies of 200–300 word abstracts on relevant topics by 2 December 1996 to the Conference Secretariat.

The official language of the Conference is English.

Submission of abstracts	:	2 December 1996
Acceptance of abstracts	:	16 December 1996
Submission of final manuscripts	:	1 February 1997
Acceptance of final manuscripts	:	15 February 1997

Authors	RM200.00
Members of IEM	RM750.00
Others	RM850.00

Please address all correspondence to:

The Conference Secretariat
(Ms. Saptuyah Hj. Mahmud)
Faculty of Engineering
Universiti Malaysia Sarawak
94300 Kota Samarahan
Sarawak
Malaysia

Fax : 082-672317
Tel : 082-672316
082-671000 ext. 521
E-mail : sap@feng.unimas.my

KALENDAR (CALENDAR)

1996

September 2-5

PREDICTION AND PERFORMANCE IN ROCK MECHANICS AND ROCK ENGINEERING (Eurock '96 International Symposium), Tyrin, Italy. (c/o AGI Associazione Geotecnia Italiana, via Baglivi 5, 00198 Rome, Italy. Telefax: 39 6 44249274)

September 2-8

DIATOM RESEARCH (Mtg.), Tokyo, by International Society of Diatom Research. (Hiromu Kobayashi, Tokyo Diatom Institute, Honcho, 3-8-9-813, Koganei-shi, Tokyo 184, Japan. Phone: +81-423-84-7795; Fax: +81-423-84-7495; E-mail: mayama@u-gakugei.ac.jp)

September 3-6

MINERALS, METALS AND THE ENVIRONMENT (2nd International Conference), Prague, Czech Republic. (Conference Officer, Institution of Mining and Metallurgy, 44 Portland Place, London W1N 4BR, UK. Phone: 44 171 580 380-2; Telefax: 44 171 436 5388)

September 4-11

AGE AND ISOTOPES OF SOUTH AMERICAN METALLOGENIC PROVINCES (Final Meeting of IGCP Project 432), Salvador, Bahia, Brazil. (Aroldo Misi, IGEO, Univ. Fed. Da Bahia, Rua Caetano Moura, 123 Federacao, Salvador, Bahia 40210-340 Brazil. Phone: 55 71 2356789; Telefax: 55 71 2473004; E-mail: misi@ufba.br)

September 8-12

CONTAMINATED LAND AND GROUNDWATER, FUTURE DIRECTIONS (32nd Annual Conference of the Engineering Group of the Geological Society), Portsmouth, UK. (D.N. Lerner, Department of Civil and Environmental Engineering, University of Bradford, Bradford BD7 1DP, UK. Phone: 01274 3854; Telefax: 01705 842 244)

September 9-12

MINEXPO INTERNATIONAL '96 (Conf.), Las Vegas, by National Mining Association. (MINExpo, 5420 LBJ Freeway, Suite 410, Dallas, 75240. Phone: 800/693-3216; Fax: 214/702-1042)

September 10-20

KARST WATERS AND ENVIRONMENTAL IMPACTS (Mtg.), Beldibi, Turkey, by the International Association of Hydrological Sciences, and others. (Gultekin Gunay, UKAM, Hacettepe University, 06532 Beytepe, Ankara, Turkey)

September 15-20

DEEP SEISMIC PROFILING OF THE CONTINENTS (Int'l Symposium), Asilomar, Calif., by Stanford University, and U.S. Geological Survey (Simon Klemperer, Dept. of Geophysics, Mitchell Building, Standard University, Stanford, Calif. 94305-2215. Phone: 415/723-8214; Fax: 415/725-7344; E-mail: klemp@pangea.stanford.edu)

September 16-20

COMPUTER APPLICATIONS IN THE MINERAL INDUSTRIES (26th International Symposium, APCOM '96), Pennsylvania, USA. (K. Henry, Dept. of Mineral Engineering, Pennsylvania State University, 104 Hosler Building, University Park, PA 16802-5000 USA)

September 17-19

ANDEAN GEODYNAMICS (3rd International Symposium, ISAG '96), St. Malo, France. (D. Gapais, Géosciences Rennes, Université de Rennes 1, 35042 Rennes cedex, France. Phone: 33 99 28 67 36; Telefax: 33 99 28 61 00; E-mail: isag96@seth.univ-rennes1.fr)

September 22-24

PETROLEUM GEOLOGY AND HYDROCARBON POTENTIAL OF THE BLACK SEA AREA (2nd symposium), Sile, Turkey. (S. Derman, TPAO Turkey. Phone: 90 312 286 9040; Telefax: 90 312 286 9049)

September 22-25

EARTH SCIENCE EDITING (30th Annual Meeting of the Association of Earth Science Editors), Sudbury, Ontario, Canada. (c/o MNDM, B4-933 Ramsey Lake Rd., Sudbury, Ontario, Canada P3F 6B5. Phone: (705) 670 5765; Telefax: (705) 670 5770)

September 25-27

CALIBRATION AND RELIABILITY IN GROUNDWATER MODELLING (International Conference, CARE '96), Golden, Colorado, USA. (International Groundwater Modelling Center, Colorado School of Mines, Golden, Colorado 80401, USA. Phone: 303 273 3103; Telefax: 303 273 3278; E-mail: igwme@mines.colorado.edu)

September 25-29

CHARNOKITE AND GRANULITE FACIES ROCKS (International Symposium), Madras, India. (Dr. V. Ram Mohan, Dept. of Geology, University of Madras, AC College Campus, Madras, India PIN 600 025. Phone: 091 44235 1137; Telefax: 091 44 235 2870)

September 29 – October 3

SCIENTIFIC DATA IN THE AGE OF NETWORKING (15th International CODATA Conference), Tsukuba, Japan. (Codata '96, Express Co., Ltd., Daiichi Shibuya Shimizu Building, 1-11-8 Shibuya, Tokyo 150, Japan. Phone: 81 3 54851200; Telefax: 81 3 54851266; E-mail: kayo@express.co.jp)

September 30 – October 3

GROUND PENETRATING RADAR (6th International Conference), Sendai, Japan. (Dr. M. Sato, Dept. of Resources Engineering, Tohoku University, Sendai 980-77, Japan)

October 7-11

ENVIRONMENTAL ISSUES AND WASTE MANAGEMENT IN ENERGY AND MINERAL PRODUCTION (4th International Symposium), Cagliari, Italy. (R. Ciccu, Dipartimento di Geoingeneria et Tecnologie Ambientali, Universita degli Studi di Cagliari, Piazza d' Armi, 09 123 Cagliari, Italy. Phone: 39 7022 2317; Telefax: 39 7027 2031)

October 9-12

NATURAL HAZARDS AND DISASTERS (2nd Caribbean Conference), Kingston, Jamaica. (Dr. B. Carby, Dept. of Geology, UWI, Mona, Kingston, Jamaica)

October 16-19

MINERAL DEVELOPMENT IN ASIA PACIFIC — CHALLENGES IN THE 21ST CENTURY, Jakarta, Indonesia. (Indonesian Mining Association (IMA), Jl. Prof. Dr. Supomo SH. No. 10, Jakarta 12870, Indonesia. Phone: (62-21) 830 3632, 828 0763; Fax: (62-21) 830 3632, 828 0763).

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)

November 6-8

THE 18TH NEW ZEALAND GEOTEHRMAL WORKSHOP, Auckland, New Zealand. (Professional Courses, Centre for Continuing Education, The University of Auckland, Private Bag 92019, Auckland, N.Z. Phone: 64-9-373 7599 ext. 7050; Fax: 64-9-373 7419; E-mail: professional.courses@auckland.ac.nz)

November 10-15

A WORKSHOP ON TUFFS — THEIR PROPERTIES, USES, HYDROLOGY, AND RESOURCES, Santa Fe, New Mexico. (Grant Heiken, Earth and Environmental Sciences Division, EES-1, Los Alamos National Laboratory, Los Alamos, New Mexico, 87545 USA. Phone: 505-667-8447; Fax: 505-665-3285; E-mail: heiken@lanl.gov)

November 17-22

HYDROLOGY IN THE HUMID TROPICAL ENVIRONMENT (International Symposium), Kingston, Jamaica. (A.I. Johnson, Water and Soils Consulting. 7474 Upham Court, Arvada, CO 80003, USA. Phone and telefax: 303 425 5610)

1997

ASSOCIATION OF EUROPEAN GEOLOGICAL SOCIETIES (10th Meeting), Karlovv 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)

January

DROUGHT, GROUNDWATER POLLUTION AND MANAGEMENT (International Workshop), Dindigul, India. (Managing Director, Tamilnadu Water Supply and Drainage Board, TWAD House, Chepauk, Madras 600 005, India)

January 6-8

INTERNATIONAL CONFERENCE ON LAND MANAGEMENT, London, UK. (Dr. Richard K. Bullard, School of Surveying, University of East London, Longbridge Road, Dagenham, Essex, RM8 2AS, UK. Tel: +44 (0181) 590 7722; Fax: +44 (0181) 849 3618; E-mail: Bullard@UEL.AC.UK)

April 6-9

1997 APPG ANNUAL MEETING — FUTURE LEGENDS (Annual Convention), Dalas, Texas. (AAPG Convention Department, P.O. Box 979, Tulsa, OK 74101-0979 USA or 1444 S. Boulder Ave., Tulsa, OK 74119-3604 USA.)

April 14-18

GEODYSSEA (GEODYNAMICS OF S. AND S.E. ASIA) (International Symposium), Penang, Malaysia. (Dr. Peter Wilson, GeoForschungZentrum Potsdam, Telegrafenberg A17, D-14473 Potsdam, Germany. Fax: (49)-331-288 1111; E-mail: wilson@gfz-potsdam.de)

May 14-16

GEOTECHNICAL ENGINEERING IN ASIA: 2000 AND BEYOND (Third Asian Young Geotechnical Engineers Conference), Singapore. (Dr. T.S. Tan, Department of Civil Engineering, National University of Singapore, 10 Kent Ridge Crescent, Singapore 119260. Phone: (65) 772-2160; Fax: (65) 779-1635; E-mail: cvetants@nus.sg)

May 21-23

PETROLEUM SYSTEMS OF S.E. ASIA & AUSTRALASIA (International Conference), Jakarta, Indonesia. (Dr. Ron Noble, ARCO Indonesia Inc., PO Box 260888, Plano TX 75026. Phone: 62-21-521-9028; Fax: 62-21-521-9063; E-mail: rnoble@is.arco.com)

May 25-30

GEOCHEMICAL EXPLORATION (18th International Symposium of AEG), Jerusalem, Israel. (IGES Secretariat, P.O. Box 50006, Tel Aviv, 61500 Israel. Telefax: 972 3 5140000; E-mail: iges@mail.igs.gov.il)

June 15-21

CLAY CONFERENCE, Ottawa, Canada. (J.B. Percival, Geological Survey of Canada, 601 Booth St., Ottawa, Ontario, K1A 0E8. Phone: 613/992-4496; Fax: 613/943-1286; E-mail: percival@gsc.emr.ca)

June 22-25

ROCK SUPPORT — APPLIED SOLUTIONS FOR UNDERGROUND STRUCTURES (International Symposium), Lillehammer, Norway. (Mrs. Siri Engen, Norwegian Society of Chartered Engineers, P.O. Box 2312, Solli, N-0201 Oslo, Norway. Fax: +47 22 94 75 02)

June 23-27

ENGINEERING GEOLOGY AND THE ENVIRONMENT (International Symposium of IAEG), Athens, Greece. (Symposium Secretariat, P.O. Box 19140, GR-117 10 Athens, Greece. Telefax: 301 381 3900; 301 924 2570)

July 28 – August 1

LEARNING ABOUT THE EARTH AS A SYSTEM (Second International Conference on Geoscience Education), University of Hawai'i, Hilo. (Dr. M. Frank Watt Ireton, GeoSciEd II Local Arrangements Coordinator, American Geophysical Union, 2000 Florida Avenue, NW, Washington, DC 20009. E-mail: fireton@kosmos.agu.org)

August 28 – September 3

GEOMORPHOLOGY (4th International Conference of International Association of Geomorphologists), Bologna, Italy. (Planning Congressi, s r l Via Crociali 2, I-40138 Bologna, Italy)

September 1-5

GEOLOGY AND ENVIRONMENT (50th Geological Congress of Turkey), Istanbul, Turkey. (Secretary GEOENV '97, PK 464, Kizilay, 06424 Ankara, Turkey. Phone: 90 312 4343691; Telefax: 90 312 4342388; E-mail: jdogan@et.cc.hun.edu.tr)

September 2-6

GEOLOGY AND ENVIRONMENT (Int'l. Symposium), Istanbul, Turkey, by the Chamber of Geological Engineers. (I. Yilmazer, GEOENV '97, P.K. 464 Kizilay, 06424 Ankara, Turkey. Phone: 9-0-312-4343601; Fax: 9-0-312-4342388; E-mail: jdogan@et.cc.hun.edu.tr)

September 21-27

GROUNDWATER IN THE URBAN ENVIRONMENT (27th IAH Congress) (Professor J.D. Mather, Geology Dept., Royal Holloway and Bedford New College, Egham, Surrey TW20 0EX, UK. Telefax: 784 471780)

September 30 – October 3

CONCEPTS AND MODELS FOR SUSTAINABLE WATER RESOURCES MANAGEMENT (FRIEND '97 Conference on Regional Hydrology), Postojna, Slovenia. (Dr. M. Brilly, FGG Hydraulics Division, Hajdrihova 28, 6100 Ljubljana, Slovenia. Phone: (386) 61 1254 333; Telefax: (385) 61 219 987; E-mail: mitja.brilly@uni-lj.si)

November 30 – December 3

PERMIAN OF EASTERN TETHYS: BIOSTRATIGRAPHY, PALAEOGEOGRAPHY & RESOURCES (International Conference), Melbourne, Australia. (The Secretariat, Permian of Eastern Tethys Conference, School of Aquatic Science & Natural Resources Management, Deakin University, Rusden Campus, 662 Blackburn Road, Clayton, Victoria 3168, Australia. Phone: 61-3-9244 7429; Fax: 62-3-9244 7480; E-mail: asnrm@deakin.edu.au)

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)

June 29 – July 18

8TH INTERNATIONAL PLATINUM SYMPOSIUM (IAGOD/CODMUR), Johannesburg, South Africa. (Dr. C.A. Lee, P.O. Box 68108, Bryanston, South Africa. Phone: 2711 411 2253; Telefax: 2711 692 3693)

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 3BI. Phone: (461) 978 3030; Telefax: (416) 978 3938; E-mail: ima98@quartz.geology.utoronto.ca)

August 17-19

GEOSEA '98 (Ninth Regional Congress on Geology, Mineral and Energy Resources of Southeast Asia), Kuala Lumpur, Malaysia. (The Organising Secretary, GEOSEA '98, Geological Society of Malaysia, c/o Department of Geology, University of Malaya, 50603 Kuala Lumpur, Malaysia. Phone: +(603) 757 7036; Fax: +(603) 759 3900; E-mail: geologi@po.jaring.my)

October/November

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

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 be 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.

Unless with the consent of the Editor, papers which have been published before should not be submitted for consideration.

Authors must agree not to publish elsewhere a paper submitted and accepted.

Authors alone are responsible for the facts and opinions given in their papers and for the correctness of references etc.

One set of proofs will be sent to the author (if time permits), to be checked for printer's errors. In the case of two or more authors, please indicate to whom the proofs should be sent.

Twenty-five reprints of each article published are supplied free-of-charge. Additional reprints can be ordered on a reprint order form, which is included with the proofs.

Correspondence: All papers should be submitted to

The Editor (Dr. Teh Guan Hoe)
Geological Society of Malaysia
c/o Geology Department
University of Malaya
50603 Kuala Lumpur
MALAYSIA
Tel: (603) 7577036 Fax: (603) 7563900

Script Requirements

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

Two copies of the text and illustrations must be submitted. The scripts must be typewritten double-spaced on paper not exceeding 210 x 297 mm (or 8.27 x 11.69 inches, A4 size). One side of the page must only be typed on.

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.

Photographs should be of good quality, sharp and with contrast. For each photograph, submit two glossy prints, at least 8 x 12.5 cm and preferably larger. Use of metric system of measurements (SI) is strongly urged wherever possible.

An abstract in English which is concise and informative is required for each paper.

References cited in the text should be listed at the end of the paper and arranged in alphabetical order and typed double-spaced. The name of the book or journal must be in *italics*. The references should be quoted in the following manner:

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

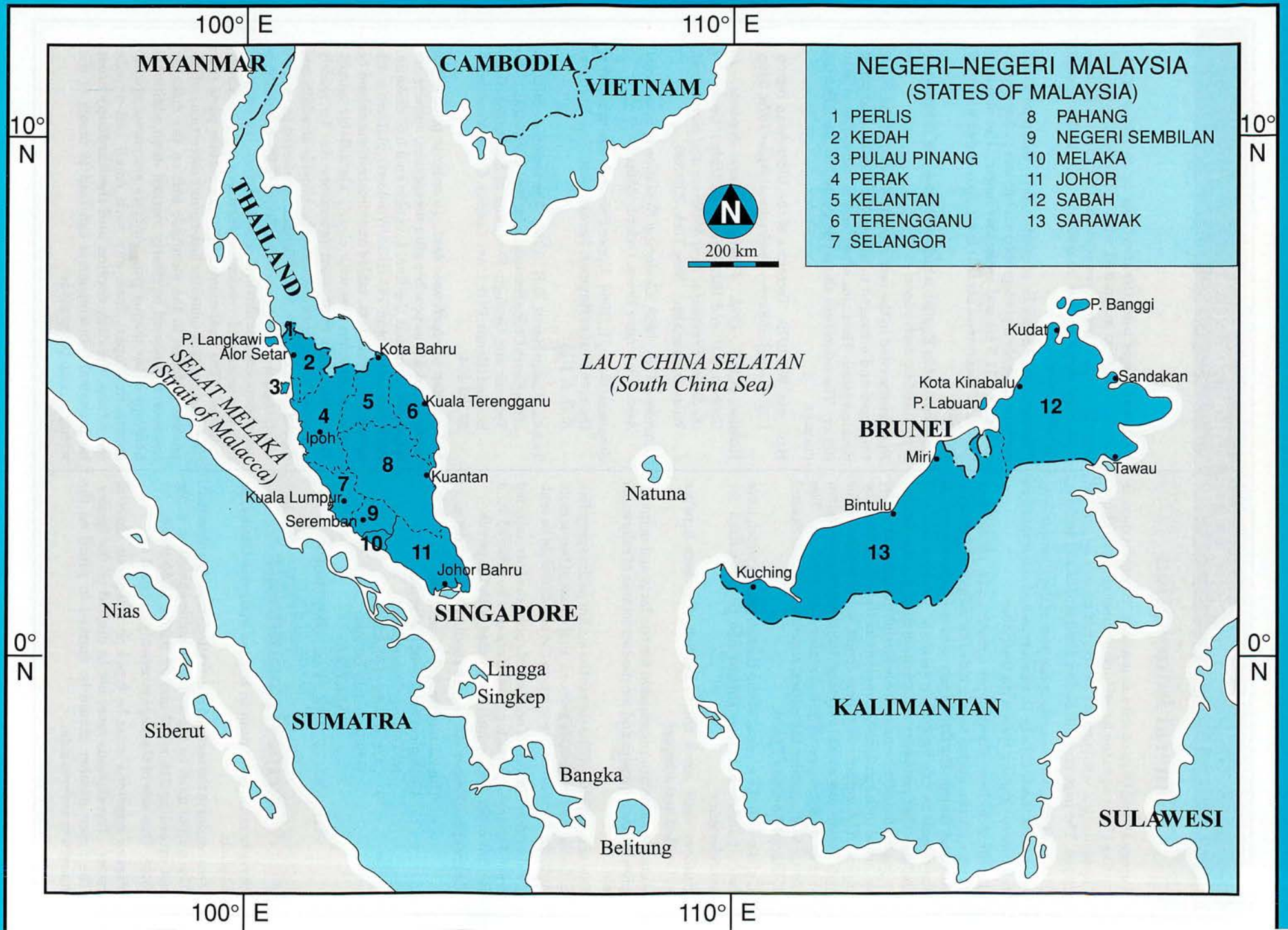
HOSKING, K.F.G., 1973. Primary mineral deposits. *In* Gobbett, D.J. and Hutchison, C.S. (Eds.), *Geology of the Malay Peninsula (West Malaysia and Singapore).* Wiley-Interscience. New York, 335-390.

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.

Submission of electronic text. In order to publish the paper as quickly as possible after acceptance, authors are requested to submit the final text also on a 3.5" diskette. Both Macintosh and PC (DOS/Windows) platforms are supported. Main text, tables and illustrations should be stored in separate files with clearly identifiable names. Text made with most word processors can be readily processed but authors are advised to provide an additional copy of the text file in ASCII format. Preferred format for illustration is Encapsulated PostScript (EPS) but authors may submit graphic files in their native form. It is essential that the name and version of softwares used is clearly indicated. The final manuscript may contain parts (e.g. formulae, complex tables) or last-minute corrections which are not included in the electronic text on the diskette; however, this should be clearly marked in an additional hardcopy of the manuscript. Authors are encouraged to ensure that apart from any such small last-minute corrections, **the disk version and the hardcopy must be identical**. Discrepancies can lead to proofs of the wrong version being made.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VIETNAM
THAILAND
NEGERI–NEGERI MALAYSIA
(STATES OF MALAYSIA)
1 PERLIS
2 KEDAH
3 PULAU PINANG
4 PERAK
5 KELANTAN
6 TERENGGANU
7 SELANGOR
8 PAHANG
9 NEGERI SEMBILAN
10 MELAKA
11 JOHOR
12 SABAH
13 SARAWAK
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P. Langkawi
Alor Setar
Kota Bahru
Kuala Terengganu
Ipoh
Kuantan
Kuala Lumpur
Seremban
Johor Bahru
SELAT MELAKA
(Strait of Malacca)
LAUT CHINA SELATAN
(South China Sea)
Natuna
SINGAPORE
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P. Banggi
Kudat
Kota Kinabalu
Sandakan
P. Labuan
BRUNEI
Miri
Tawau
Bintulu
Kuching
KALIMANTAN
SULAWESI